

revista | journal

ISSN 1646-107X eISSN 2182-2972

Motricidade

Volume 21 | Número S2 | 2025 | <http://dx.doi.org/10.6063/motricidade.41603>

<http://revistas.rcaap.pt/motricidade>

Proceedings of the CIDESD International Congress 2025



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Andreia Carvalho (CIDESD office/UTAD)

The papers published in these proceedings were submitted to the Scientific Committee of the CIDESD International Congress 2025, held from June 5 to 7, at Covilhã, Portugal. Authors are exclusively responsible for the content of the manuscript published. The editors and the Scientific Committee of the CIDESD International Congress 2025 assume no responsibility for the opinions and statements expressed by the authors. Partial reproduction of the texts and their use without commercial purposes is allowed, provided that the source/reference is duly mentioned.

Elite

Sports Sciences

The effect of Padel training on Upper Limb strength performance in Recreational Young Players

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Conflict of interest: nothing to declare. **Funding:** This research was funded by FCT—the Portuguese Foundation for Science and Technology, under project number UIDB/DTP/04045/2020 and grant number BIPD/UTAD/7/2023

Padel practice has improved in different countries with the participation of players of different ages (Priego et al., 2013; Sögüt, 2018). Padel modality is played in doubles, males, females, or mixed pairs in social competitions on a rectangular court divided by a central net (Courel-Ibáñez et al., 2017) surrounded by walls and fence wire. Specifically, Padel practice is characterised by alternating moderate-low exercise intensity (Castillo-Rodríguez et al., 2014). Recent research has been focused on the analysis of the effect of Padel practice on physical performance in athletes (Courel-Ibáñez et al., 2017), in young players, however, the information is still scarce (García-Benítez et al., 2018). Accordingly, the present study aimed to compare the effect of 8-week padel training (PD) on strength and power in the upper and lower limbs in untrained healthy young boys. Twelve children aged 11–15 (mean±SD: 13.00±1.20 years; height 1.62±0.04 meters; body mass 57.25±7.28 kg, and BMI 21.63±2.12

kg/m²) trained twice weekly for 8 weeks. Medicine ball throw and handgrip strength (Pereira et al., 2013) were measured at baseline and after intervention. A grip strength dynamometer (Takei Kiki Kogyo, Tokyo, Japan) was used to determine handgrip strength. Players maintained a standing position with the shoulder adducted and neutrally rotated and the elbow fully extended. Players were instructed to perform a maximal isometric contraction for five seconds, three repetitions, with 1-minute rest intervals. The medicine ball throwing performance was tested with a 1-kg medicine ball. Each subject sat on the floor with the posterior trunk region positioned against the wall, and both hands held the ball in front. Three approved attempts were made with 1-minute rest intervals. The maximal throwing distance was determined using a flexible steel tape. Only the best attempt was used for further analysis. A value of $p < 0.05$ was considered statistically significant. The Shapiro-Wilks test was used to test normality, followed by the Levene test to confirm the homogeneity of variances. The independent sample t-test was used to compare pre-training variables between groups, allowing for the determination of any significant differences at baseline between groups. A two-way mixed-design analysis of variance (ANOVA) with one factor and repeated measures (pretest and post-test) was used to examine how different interventions affect outcomes over time, assessing both the within and between-subject effects. An independent samples t-test compared the differences between groups in the percentage change from pre- to post-training. After 8 weeks of training, the results showed an increased performance in handgrip strength (Pretraining: 21.68 ± 2.55 kg and Post training 22.94 ± 2.03 kg; Mean difference 95% Lower Limit-Upper Limit -1.93 ± 0.35 ; $p = 0.009$). However, no significant results were observed for 1-kg medicine ball throwing (Pretraining: 2.5 ± 0.26 cm and Post training: 2.6 ± 0.36 cm). Nevertheless, for 8 weeks, a clear improvement of 5% was observed from pre- to post-training in medicine ball throwing. Individual results showed an improvement, suggesting the practice of padel to be a good strategy for enhancing performance in upper strength, specifically in handgrip strength, which is a good predictor of health (Ruiz et al., 2009). Teachers and coaches must care about training strength with explosive exercises to increase the reaction time, which is a determinant in racquet sports, such as Padel. Also, throwing requires a specific control movement and time to develop technical skills. Padel practice could

be considered an alternative to traditional sports to improve body fitness in young children and should be applied in school-based programs and the sports club community.

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The impact of personal characteristics on motivation in sports: A narrative review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Motivation plays a fundamental role in sports, influencing athletic performance and the psychological well-being of athletes and sports practitioners. This presentation offers a narrative review of the impact of personal characteristics, such as personality traits, age, gender, and experience level, on sports motivation. The review explores the influence of various motivational theories, including the Achievement Motive Theory (McClelland et al., 1953), Achievement Goal Theory (Nicholls, 1984), and Self-Determination Theory (Deci & Ryan, 1985), on behavior and athletic performance. Additionally, it highlights the Five-Factor Personality Model (Costa & McCrae, 1987), emphasising the five personality dimensions and their impact on sports motivation, while considering the role of age. This study aims to provide a critical synthesis of recent research investigating the relationship between these variables, identifying significant differences across populations and sports modalities. Participants were grouped into three categories created to standardise concepts from the literature: "High Level Athletes" (competing at national or international levels with superior performance), "Recreational

Athletes" (engaging in recreational sports or lower-scale competitions), and "Sports Practitioners" (focused on health and well-being without regular competitive involvement). While these terms are not explicitly used in the reviewed studies, the categorization enables a more consistent analysis of the variables.

The research includes empirical studies, systematic reviews, and meta-analyses published between 2004 and 2024 in spanish, english, and portuguese, addressing the influence of personal characteristics on sports motivation, with a focus on relevant theories. The search was conducted in databases such as PubMed, Web of Science, Scopus, and ScienceDirect, with manual article screening.

Studies indicate that, with aging, goal definition and prioritization shift from immediate outcomes to the process of achieving goals, influencing motivation (Freund et al., 2008). Traits like extraversion and conscientiousness positively affect motivation, while neuroticism shows a more ambiguous influence (Mirković & Lovrić, 2019; Pineda-Espejel et al., 2021). Age and sports experience significantly influence motivation and personality, with experience strengthening intrinsic motivation, especially in high-level contexts (De Pero et al., 2009; Piepiora & Piepiora, 2021). Gender differences are notable in some sports but less evident in others (De Pero et al., 2009; Lyons et al., 2024). The type of sport practiced shapes distinct personality profiles, reflecting the psychological demands of each modality (Marchese et al., 2022; Shuai et al., 2023), although personality variations can occur within team sports (Piepiora, 2021a).

Finally, directions for future research are suggested, emphasising the interaction between personal characteristics and how these can be used to promote, sustain, and recover athletes' motivation, optimising performance and long-term well-being.

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Comparison of external load during differing microcycle structures across two competitive seasons in elite female Portuguese soccer players

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Conflict of interest: nothing to declare. **Funding:** this work was funded by National Funds by FCT-Foundation for Science and Technology under the following project UIDP/04748/2020 and UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

Soccer microcycles involve varying numbers of training sessions and matches each week, which can influence load distribution. Understanding the exact distribution may allow appropriate planning of load

for players. Thus, this study aimed to: (i) compare accumulated load between three and four training session plus a match weeks across two consecutive seasons in elite female soccer players, and (ii) compare the training/match ratio (TMr) of external load. Twenty players participated in the study. During the study period, data from 10 players in each season were analysed. The microcycle structure of the first season included three training sessions (3dW) and a match per week, while the microcycle structure of the second season included four training sessions (4dW) plus a match per week. The following measures were used for analysis: duration, total distance, high-speed running distance (HSR, >15 km/h), number of accelerations (ACC, >1–2 m.s⁻² [ACC1]; >2–3 m.s⁻² [ACC2]; >3–4 m.s⁻² [ACC3]; >4 m.s⁻² [ACC4]) and decelerations (DEC, < 1–2 m.s⁻² [DEC1]; < 2–3 m.s⁻² [DEC2]; < 3–4 m.s⁻² [DEC3]; < 4 m.s⁻² [DEC4]). The accumulated load was calculated by summing key metrics for all training and match sessions, while TMr was calculated by dividing the accumulated load by match data. The main results showed that with the exception for ACC4 and DEC4, all variables showed meaningful differences ($p < 0.05$). Specifically, only total distance was higher in 3dW than 4dW ($p = 0.007$), while the remaining variables were higher during 4dW. Moreover, all TMr were higher in 4dW than 3dW ($p < 0.001$ for all variables with the exception of ACC4 and DEC4). As expected, this study showed that adding one training session per week increased accumulated load and TMr for several key variables. However, it was not possible to determine if that increased load improved soccer performance considering physical output and injury risk, which should be considered in future research.

Moderate and low volumes produce similar hypertrophy adaptations than high volumes in full-squat training when isolating the effect of fatigue

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

It has been shown that higher velocity loss (VL) thresholds (20-40%) maximised muscle hypertrophy, while lower VL thresholds (<20%) produced higher strength gains using the same relative load (from 70 to 85 percentage of one-repetition maximum [%1RM]), in the full-squat (SQ) exercise. Nevertheless, using VL as an independent variable rises the problem that resistance training (RT) programs differ in both volume and level of fatigue. Accordingly, the effects will be the product of the interaction between the volume completed and the fatigue induced in each protocol. Therefore, this research targeted to assess the effects of three training volumes trying to isolate the effect of fatigue on hypertrophic adaptations. Thirty-six resistance-trained men were randomised in three interventions: HIG (n=12),

MOD (n=12), LOW (n=12). The three groups trained the SQ exercise twice a week for 8 weeks using the same relative intensity, increasing from 70% to 85% of 1RM. The groups differed in the accumulated volume for each session: HIG performed 24, 21, 18, and 15 repetitions at 70%, 75%, 80%, and 85% of 1RM, respectively; MOD performed 12, 10, 8, and 6 repetitions at 70%, 75%, 80%, and 85% of 1RM, respectively; and LOW performed only 3 repetitions per session regardless of the intensity used. Each session consisted of a single set with 10-second rest periods between repetitions to minimise fatigue accumulation during the training session. If the difference in MPV between the fastest repetition and the subsequent repetitions was greater than $0.03 \text{ m}\cdot\text{s}^{-1}$, a 20-second rest period was imposed. If the difference was greater than $0.06 \text{ m}\cdot\text{s}^{-1}$, an additional 10 seconds of rest was added between repetitions, and so on. The cross-sectional area (CSA) of the vastus lateralis (VLA) muscle was assessed through B-mode ultrasonography (MyLab 25, Esaote Biomedica, Italy) with a 50 mm linear probe and 5-12 MHz. Three images were recorded at the following VLA lengths: 40%, 57.5%, and 75%, obtaining aCSA40, aCSA57.5, and aCSA75, respectively. All groups, except MOD for aCSA40, achieved significant increases in the aCSA and volume of the VLA muscle after the RT program ($p < 0.001-0.05$). No significant "group $\times$ time" interaction was observed ($p = 0.08-0.96$). The similar VL and average MPV across groups suggest that hypertrophic responses depend more on the effort level in each set than on training volume. Our design isolated volume as an independent variable, showing for the first time that training volume may play a secondary role in hypertrophic adaptations from strength training.

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Motivation for practice in young rink hockey players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Motivation can be identified as an active, intentional and goal-directed process, which depends on the interaction of personal (intrinsic) and environmental (extrinsic) factors (Januário et al. 2012). Moreno, Dezan, Duarte and Schwartz (2006) relate motivation to the word motive, as an intrinsic strength, an impulse, a purpose, leading the individual to act in a specific context, directing their actions and their efforts to achieve a goal. Several coaches highlight motivation as a determining factor for success in sports, in which the expectations that athletes create for their results can condition their feelings and their motivation for future events (Vílchez & Francisco, 2017). Some literature has shown that athletes' motivation, participation and performance vary depending on their goals (Lemos & Magalhães, 2011). Furthermore, in younger athletes, motivation is more closely linked to status and socialization, whereas in older athletes, it is more related to competition (Vílchez & Francisco, 2017). According to Palmi (1991), some of the most relevant characteristics of rink hockey stem from its limited social visibility

compared to other sports. This lack of visibility often results in resource shortages, particularly financial ones, which can affect the motivation of those who practice the sport. It is also a sport that, due to the type of equipment, such as skates and sticks, can be restricted to participants with medium and/or high socioeconomic levels. The aim was to evaluate the motivation of athletes to practice Rink Hockey according to their level. The sample consisted of 43 rink hockey athletes, 21 Under-15 (15.22 ± 0.67) and Under-17 (17.13 ± 0.72). It was also intended to know the reasons that motivate these athletes to practice rink hockey. For this purpose, the Participation Motivation Questionnaire, translated and validated by Serpa and Frias (1990) was applied. Each of the dimensions were evaluated (Status; Technical learning; Extrinsic influence; Teamwork; Energy release and Socialization) and the Kolmogorov-Smirnov test was applied to verify data normality. It was found that in both levels the dimension with the best results was “Teamwork”, followed by “Technical Learning”, with significant differences ($p=0.11$) between levels. Quite satisfactory levels of motivation were observed, with means higher than 3, where the highest motivation levels are centered on “Teamwork” and “Technical Learning”.

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Characterization of usual warm-up and rewarm-up in Futsal, in Portugal

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Conflict of interest: nothing to declare. **Funding:** This research was supported by FCT—the Portuguese Foundation for Science and Technology, grant number UIDB/DTP/04045/2020.

Introduction

The sports warm-up has emerged as fundamental for sports performance in the subsequent task and can compromise or enhance the player's performance (McGowan et al. 2016). The adaptations caused by sports warm-up tend to respond to an increase in temperature and to the performance of the activity itself (Neiva et al., 2014). To better understand the warm-up and the rewarm-up in futsal, it is necessary to comprehend the type of methodologies that elite coaches use in their teams. The objective of this study was to characterise the pre-competitive warm-up that coaches from the Placard League and National Championship of the 2nd futsal division perform before the game in order to understand the physical, physical and mental methodologies they apply in the pre-competitive warm-up and rewarm-up.

Methods

Twenty coaches from the two most important divisions of the Portuguese futsal championship and Nacional Teams participated in this study. An observational study was carried out using a cross-sectional descriptive questionnaire with 23 questions (Warm up and rewarm up in futsal: characterization of the strategies used by coaches in Portugal.) The questionnaire was designed based on literature and has been validated by experts. During the questionnaire, coaches were asked to provide specific information about the type of warm-up and rewarm-up used in their teams and their importance from a technical/tactical, physical and psychological point of view. The questionnaire was administered to coaches via the Google Forms platform. Data were analysed using SPSS (v. 23.0, IBM, USA) using descriptive statistics. In addition, the ethical principles of the Declaration of Helsinki were respected throughout the research process. The work was approved by the Ethics Committee of the University of Beira interior.

Results

Coaches seemed to prefer to implement a structured warm-up in a general and specific way with an average duration of between 21 and 25 minutes (55%). The general warm-up component lasts 6 to 10 minutes (55%) and the specific warm-up component lasts between 6 and 15 minutes (60%). Some coaches showed that they are concerned about re-warm-up the players before entering the game (65%), however, after the break, the majority do not have this concern (60%). During breaks in games, some coaches are not concerned with maintaining the appropriate temperature (55%). In our study, we found that when we subdivided the respondents by coaching level (level 2, 3 and 4), we found that coaches at level 3 and 4 performed the warm-up time between 21 and 25 minutes, more specifically 74.4% at level 3 and 100% at level 4. While coaches at level 2 are divided in minutes, with 36.4% of respondents performing the warm-up between 21 and 25 minutes, 27.3% performing it between 16 and 20 minutes and 18% more than 30 minutes. Regarding the re-warm up after the break, we concluded that 54.4% of coaches at level 2 do not use re-warming after the break and that 57.1% of coaches at level 3 perform the same option, with coaches at level 4 (100%) also not worrying about re-warm up after the break.

Table 1. General and specific warm-up time duration and answers (N - %) provided

	<2 minutes	2 a 5 minutes	6 a 10 minutes	11 a 15 minutes	16 a 20 minutes	21 a 25 minutes	26 a 30 minutes	+ 30 minutes
Total warm-up duration (N - %)	0 - 0%	0 - 0%	1 - 5%	0 - 0%	4 - 20%	11 - 55%	2 - 10%	2 - 10%
General component duration (N - %)	0 - 0%	0 - 0%	11 - 55%	2 - 10%	4 - 20%	2 - 10%	0 - 0%	0 - 0%
Specific component duration (N - %)	0 - 0%	4 - 20%	6 - 30%	6 - 30%	2 - 10%	2 - 10%	0 - 0%	0 - 0%
Transition time between the end of the warm-up and the start of the game is important? (N - %)	1 - 5%	7 - 35%	10 - 50%	2 - 10%	0 - 0%	0 - 0%	0 - 0%	0 - 0%

Conclusions

With this study we characterised the pre-competitive warm-up of the Portuguese futsal championship and Nacional Teams. It was verified that the vast majority of coaches apply a warm-up between 21 and 25 minutes. We also noticed that coaches are concerned about rewarm-up substitute players, but there are still coaches who do not rewarm all players after the break and do not worry about the players' temperature during breaks.

Acknowledgments

We would like to thank all the coaches from Liga Placard, Second National Futsal Division and National Futsal Teams who responded to the questionnaire.

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Rating of Perceived Exertion: Current trends in research

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Conflict of interest: Nothing to declare. **Funding:** This work received funding from the Portuguese Foundation for Science and Technology, I.P. under the project UID04045/2020.

Rating of perceived exertion (RPE) is widely used for assessing training load in sports due to its validity, simplicity, and utility. Despite its broad application, the diverse contexts and methodologies in which it is used warrant a comprehensive review of the existing evidence. This scoping review aims to map the current evidence on the use of RPE, focusing on its application, measurement methods, and reliability across different continuous sports. Databases PubMed, SportDiscus (via EBSCO), Scopus, and Web of Science (core collection) were systematically searched using the search terms: (((RPE) OR (rating of perceived exertion) OR (Borg Scale)) AND (load) AND ((sports) OR (exercise) OR athletes)) Studies were included in this review if they complied with the following criteria: (1) conducted in continuous modes of exercise; (2) considering the comparison with other internal and external load measures; (3) when healthy and trained athletes were studied; (4) written in English language. A total of 226 studies were included in this review. Findings indicated that RPE is primarily used in training control and prescription. Literature gaps include female, master and elite athletes. The findings suggest that although RPE is a valuable tool, variability in application across different exercise settings highlights the necessity to standardise its guidelines. Future research should focus on assessing the use of RPE in under-represented continuous sports.

Acute Effects of Ashtanga Vinyasa Yoga Practice on Postural Control

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Postural control systems are complex mechanisms that enable the human body to maintain balance, both at rest and during movement. Through postural strategies, the body corrects deviations and maintains balance (Sibley et al., 2015). Yoga, originating in India over 3,000 years ago, combines postures (asanas), breathing techniques (pranayama), and body awareness, promoting physical and emotional balance. Yoga practice has shown potential to improve postural control even in healthy subjects (Pinto et al., 2022; Santos et al., 2024).

Methodology

Experimental Design

This non-randomised controlled study consisted of a 45-minute intervention of Ashtanga Vinyasa yoga applied to healthy adults. The primary outcome was determined by the number of falls in unipedal standing with closed eyes.

Materials and Methods

Participants stood barefoot in a stable unipedal stance with eyes closed (to assess vestibular and somatosensory system activity without visual input) for 60 seconds. The number of falls was recorded whenever balance was lost, requiring external support.

Participants

A convenience sample of eight students from the Human Movement course was recruited. All participants were informed about the study procedures and risks before providing verbal informed consent.

Yoga Practice

The exercises were based on breathing techniques (pranayama), physical postures (sun salutations, standing balance asanas, all-fours, seated, and inverted poses), relaxation techniques (nidra), and meditation techniques (dhyana).

Statistics

Jamovi version 2.6 was used to perform the paired t-test and the normality test (Shapiro-Wilk).

Results

Table 1. Paired Samples T-test to compare number of falls before vs after the yoga intervention

		statistic	p	Effect size (Cohen's d)
Before	After	4.08	0.005	1.44

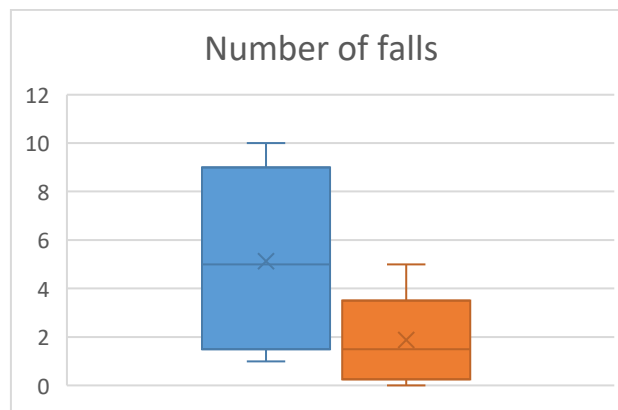


Figure 1. Scatterplot with number of falls before (blue) vs after (orange) the yoga intervention.

Discussion and Conclusion

The number of falls significantly decreased ($p = 0.005$), the effect size (Cohen's $d = 1.44$) is large, indicating the intervention's substantial impact and confirming beneficial effects on the vestibular and somatosensory systems involved in postural control. This practice added on the training regiment of elite athletes can be considered on future studies.

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Profiling of Physical Qualities of Highly Trained Portuguese Youth Football Players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

A comprehensive understanding of the variations in physical attributes both between and within young athletes is crucial for accurately identifying talent based on physical performance metrics and optimising training strategies tailored to individual player profiles. Therefore, this study aimed to compare maximum strength, explosive power and sprint test results among soccer players from different age categories and playing positions. A total of 103 players were categorised as under 23 (U23) (24 players; age: 19.7 ± 1.6 yrs; height: 1.80 ± 0.07 m; body mass: 75.6 ± 6.9 kg), U19 (28 players; age: 18.1 ± 0.6 yrs; height: 1.79 ± 0.06 m; body mass: 72.2 ± 6.8 kg), U17 (25 players; age: 16.6 ± 0.6 yrs; height: 1.76 ± 0.06 m; body mass: 67.9 ± 6.2 kg), and U16 (26 players; age: 15.5 ± 0.5 yrs; height: 1.72 ± 0.06 m; body mass: 65.2 ± 8.6 kg). These categories were determined according to their chronological age. All participants completed standardised warm-ups, and testing procedures followed protocols established in

previous studies. Significant differences were found between age categories regarding the Isometric Mid-Thigh Pull (IMTP) ($p < 0.001$; $\eta^2p = 0.326$), Countermovement Jump (CMJ) ($p < 0.001$; $\eta^2p = 0.495$), Squat Jump (SJ) ($p < 0.001$; $\eta^2p = 0.285$), Drop Jump (DJ) ($p < 0.001$; $\eta^2p = 0.222$) and Sprint ($p < 0.001$; $\eta^2p = 0.297$) tests. No significant differences were detected in the Broad Jump (BJ) results between age categories. In accordance with our initial hypothesis older athletes achieved generally better results. Indeed, significant differences were found on the IMTP between the U23 and U17/U16 groups, as well as between the U19 and U16 groups. Additionally, CMJ, SJ and sprint performance exhibited significant differences across all age categories when compared to U16. Similarly, in BJ, the U23 and U19 groups outperformed the U16 group. Contrary to our initial hypothesis, no differences were found between playing positions in any physical quality. One possible explanation could be due to modern football's increasing emphasis on outfield players contributing to the overall play, leading to more uniform physical performance across positions. The results of this study indicate that, contrary to playing positions, significant differences can be identified between age categories within the same club regarding IMTP, CMJ, SJ, DJ, and sprint performance.

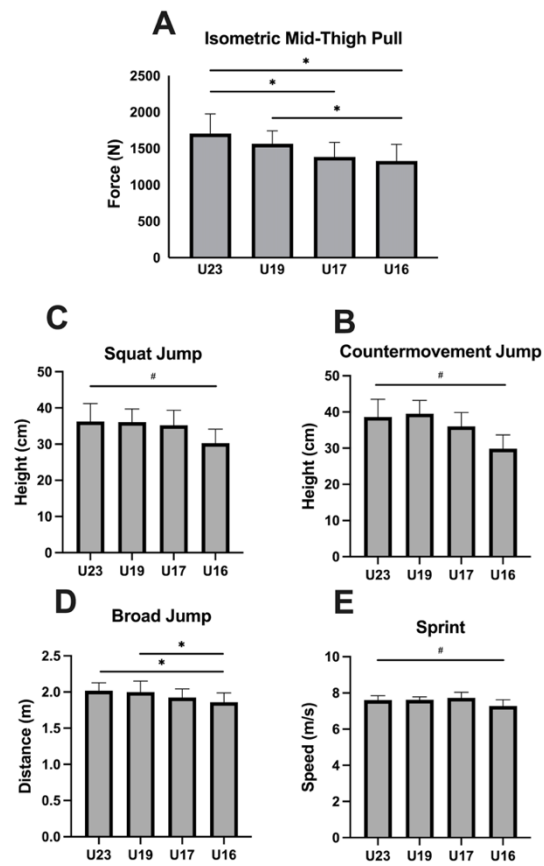


Figure 1. Comparison of tests performances between age groups. (A) Isometric Mid-Thigh Pull test (B) Squat Jump test; (C) Countermovement Jump; (D) Broad Jump test; (E) 40-m sprint speed test; (*) significant differences between age categories; (#) significant differences between U16 and all of the others age categories.

Comparison of the upper quarter Y-balance test between injured and non-injured young female volleyball players

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Conflict of interest: nothing to declare. **Funding:** This work was supported by national funds (FCT–Portuguese Foundation for Science and Technology) under the project UIDB/DTP/04045/2020.

Introduction

The Y-Balance Test (YBT) for the upper quarter is a valuable tool for assessing dynamic stability, strength, and mobility in athletes. This test evaluates an individual's ability to stabilise their upper body while reaching in multiple directions with their free hand, providing insight into shoulder stability, core strength, and functional movement patterns (Gorman et al., 2012). It is essential for athletes, as it helps identify asymmetries, weaknesses, or deficits that may increase the risk of injury, particularly in sports involving overhead movements or upper body demands, such as volleyball. Thus, the main aim of this study was to compare the dynamic balance and asymmetries of the upper trunk in young female volleyball players with previous injuries and absence of injury.

Methods

The sample comprised 8 female volleyball players with 14.44 ± 0.60 years, 57.0 ± 9.0 kg of body mass, and 164.6 ± 6.6 cm of height, participating in a regional volleyball championship. Four recovered from an upper trunk injury a month before data collection. The remaining four were non-injured. The YBT was used to compare the dynamic balance and asymmetries of the players' upper trunk (Gorman et al., 2012). The independent samples t-test ($\alpha=0.05$) was used for such comparison and the Cohen's d was used as an effect size index.

Results and Discussion

Players absent from injuries presented greater CS scores (both right and left) than those with injuries. In both cases, the right side presented greater scores. Despite non-significant differences, at least the right side was quite close to the cut-off threshold of the p-value (0.062), and the effect sizes were moderate (left side: $d = 0.74$) and large (right side: $d = 1.26$). As for the differences in the reaches between sides, overall, the injured players presented greater differences than the non-injured (but with non-significant differences). Also, none of them above the 4.5 cm threshold. However, the non-injured players did present a difference greater than the 4.5 cm threshold in the postero-medial difference (5.17 ± 6.41). This may indicate that such players are likely to suffer injuries.

	Mean $\pm$ SD		Comparison	
	Non-injured	Injured	p-value	Effect size
CS _{right}	91.03 $\pm$ 7.97	78.22 $\pm$ 11.95	0.062	1.26
CS _{left}	89.38 $\pm$ 7.33	82.32 $\pm$ 11.36	0.168	0.74
Anterior absolute difference [cm]	1.54 $\pm$ 1.17	3.79 $\pm$ 5.60	0.231	0.56
Anterior relative difference [%]	1.93 $\pm$ 1.51	4.63 $\pm$ 6.71	0.232	0.55
Postero-lateral absolute difference [cm]	2.17 $\pm$ 1.71	4.21 $\pm$ 3.45	0.165	0.75
Postero-lateral relative difference [%]	2.72 $\pm$ 2.21	5.26 $\pm$ 4.38	0.171	0.73
Postero-medial absolute difference [cm]	5.17 $\pm$ 6.41	4.33 $\pm$ 3.86	0.415	0.16
Postero-medial relative difference [%]	6.39 $\pm$ 7.90	5.41 $\pm$ 4.91	0.420	0.15

Conclusions

The YBT for the upper quarter seems valuable for understanding the differences between injured and non-injured female volleyball players in movements related to the upper trunk. Thus, coaches can use the YBT results to identify deficits, adjust training or rehabilitation programs, and track progress to ensure a safe return to play.

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Can dietary nitrate supplementation modulate hematological and muscle oxygenation response to hypoxic high-intensity exercise?

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Conflict of interest: nothing to declare. **Funding:** This work received funding from the Portuguese Foundation for Science and Technology, I.P. (SFRH/BPD/114670/2) and under the project UID04045/2020.

The beneficial effects of dietary nitrate (NO_3^-) supplementation on the metabolic control and exercise performance may be elicited through a non-intracellular mechanism (1). In fact, it can improve oxygen delivery and utilisation by enhancing arterial and tissue oxygenation (2). This could theoretically support better adaptation to hypoxia, potentially influencing haemoglobin mass and erythrocyte production. However, the direct modulation of haematological variables by NO_3^- supplementation during hypoxic exposure is not yet well-established. This study investigates the influence of dietary NO_3^- supplementation, combined with 4-weeks high intensity interval training (HIIT) under hypoxic exposure, on both haematological and muscle oxygenation parameters. Twenty endurance trained male subjects (mean $\pm$ SD: 36.8 $\pm$ 5.2 yrs, 70.6 $\pm$ 7.3 kg, 174.6 $\pm$ 6.9 cm) performed 12 HIIT sessions during a 4-

week period in simulated altitude conditions ($F_{I}O_2 = \sim 14\%$, $\sim 3.000\text{m}$), either ingesting a NO_3^- supplement (HNO: $n=10$) or a placebo drink (HPL: $n=10$). In pre- and post-intervention periods, one venous blood sample was withdrawn (for further haematological analysis), and a square wave transition from rest to severe intensity until exhaustion (at $80\% \Delta$) was performed (for *vastus lateralis* changes in local O_2 saturation measurement). Independent-samples Mann-Whitney U test (HNO vs. HPL) and related-Samples Wilcoxon signed rank test (pre- vs. post) were used ($p < 0.05$).

Table 1. Mean $\pm$ SD parameters of hematologic and muscle oxygenation data assessed pre- and post 4-weeks of HIIT training when combined with (HNO) or without (HPL) NO_3^- supplementation.

Parameters	HNO		HPL	
	Pre	Post	Pre	Post
ΔSmO_2 (%)	-81.53 ± 7.89	-81.84 ± 8.22	-77.08 ± 5.69	-74.80 ± 5.83
$[\Delta \text{THb}]$ (AU)	0.16 ± 0.07	0.13 ± 0.05	0.17 ± 0.06	0.14 ± 0.12
Hematocrit (%)	43.27 ± 1.90	45.23 ± 4.68	42.24 ± 2.81	42.47 ± 1.37
Erythrocyte volume (ml)	2086.44 ± 236.94	2192.42 ± 299.60	1991.05 ± 237.83	2011.62 ± 230.47
Haemoglobin (g/dl)	15.15 ± 0.59	14.96 ± 0.90	14.51 ± 0.82	14.60 ± 0.59
Carboxy-haemoglobin (%)	4.23 ± 1.34	3.84 ± 1.39	3.94 ± 0.92	4.73 ± 0.67
Erythropoietin (mU/ml)	10.48 ± 3.86	11.94 ± 3.59	11.04 ± 3.37	11.72 ± 3.85

ΔSmO_2 : changes in local oxygen saturation and $[\Delta \text{THb}]$: change in concentrations of total haemoglobin.

Significant changes in SmO_2 and in THb were not confirmed between pre-post intervention periods and between HNO vs. HPL groups in any time periods. The same trend was observed for all hematologic parameters. Our data suggests that oxygen delivery and extraction by the muscle were similar between conditions. As many endurance athletes spend some of their preparation time under hypoxic conditions, these results suggest that dietary NO_3^- supplementation fails to support a better adaptation to hypoxia as a potential influencer in increasing arterial and muscle oxygenation. Future studies should focus on using larger sample sizes, more precise measurement techniques (especially on muscular O_2 saturation), and explore different dosages and type of athletes, to determine if there are any conditions under which dietary NO_3^- supplementation might be effective.

Acknowledgments

The authors would like to thank all the participants of this study.

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Sleep Patterns in Professional Male Soccer Players: A Systematic Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Sleep is associated with various physiological processes that help athletes recover from training and sporting competition (Clemente et al., 2021). Professional soccer players face high physiological demands due to a congested schedule (Costa et al., 2019). While adults generally need 7–9 hours of sleep per night, athletes may require more to support their physical and mental performance (Walsh et al., 2020). However, elite athletes are particularly prone to sleep deficiencies, often sleeping less than 7 hours per night (Walsh et al., 2020). This systematic review sought to consolidate the evidence on sleep patterns among professional male soccer players and identify key factors contributing to inadequate sleep. A systematic review was conducted using the Web of Science, Scopus, and SPORTDiscus databases, under PRISMA guidelines. A search string was applied to all the databases: ('soccer' OR 'football') AND ('sleep quality' OR 'sleep pattern') AND ('performance'). The inclusion criteria for these articles were: (1) original articles, written in English; (2) professional soccer players with an

average age of over 18 years and playing in the first or second national division; and (3) the presence of nocturnal sleep variables, such as sleep duration, sleep quality, sleep efficiency and sleep onset latency. The total sample included 548 athletes. The studies covered a range of leagues, including European leagues (e.g., English Premier League, Bundesliga, and Ligue 1), international tournaments (e.g., UEFA Champions League), and domestic leagues from South America and Asia. Elite male soccer players frequently experience poor sleep quality, reduced duration, and disruptions, particularly following night matches and during congested schedules. Sleep deficiencies have been associated with an increased risk of injury, compromised recovery, and diminished performance, with contributing factors including travel, match outcomes, and psychological stress. Studies using actigraphy, questionnaires, and sleep indices consistently highlight prevalent sleep disturbances, while interventions such as sleep optimisation programs demonstrate potential benefits. Implementing systematic sleep monitoring and targeted interventions may be essential for improving recovery, performance, and overall well-being in elite soccer players. Strategies like implementing a recovery monitoring protocol that includes questionnaires on fatigue, muscle pain and amount of sleep are recommended for clubs. The exclusion of non-English publications could limit the generalizability of the findings. However, the findings contribute to the existing literature and highlight directions for future research.

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The Most-Demanding Passages of Play in the 2022 FIFA World Cup: Position-Specific Peak Physical Demands in Elite Soccer

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Ministry of Science, Technology and Higher Education Fundação para a Ciência e a Tecnologia (FCT) under [Grant: 2021.06456.BD], and partially by CIDESD, through FCT – Portuguese Foundation for Science and Technology, I.P., under [Grant: UID04045/2020].

Identifying the most demanding passages (MDP) of external load activity during soccer competition is critical for optimising training prescription. However, limited research has examined player- and position-specific peak locomotor demands in elite competition. Therefore, this study analysed the MDP of kinematic (running distance) activity in the 2022 FIFA World Cup according to playing position.

Locomotor profiles of 494 players across 64 matches were assessed using multi-camera computerised tracking systems. A moving average analysis identified the 1-min kinematic MDP using the MDPk composite criterion variable, composed of moderate-speed running (MSR; 15–19.8 km/h), high-speed

running (HSR; 19.8–25.2 km/h), and sprinting (SPR; >25.2 km/h) constituent variables. The absolute distances and relative composition (%MDPk) of the respective constituent variables, total distance (TD) and %MDPk (% of TD) variables were analysed. The absolute and relative (% composition) values of all external workload variables were categorised through K-means clustering. Linear mixed model and Pearson's chi-square analyses assessed differences and associations between MDPk clusters according to playing positions.

K-means clustering analysis revealed three distinct MDPk clusters ($p < 0.05$; ES:0.2-2.8): cluster 1 (Cl#1) exhibited the highest MDPk, MSR, HSR, TD, %MSR and %MDPk ($p < 0.001$; ES:0.3-2.8), Cl#2 had the highest SPR and %SPR, and the lowest %HSR ($p < 0.05$; ES:0.2-2.0), and Cl#3 displayed the lowest MDPk and TD. Position-specific tendencies were evident ($\chi^2(10, N=1023)=284.5$, $p < 0.001$, ES=0.37), with Cl#1 associated with central-midfielders, Cl#2 with wide-defenders and wide-midfielders, and Cl#3 with central-defenders. Linear mixed models indicated that central-defenders had the lowest MDPk distances in Cl#1 and Cl#2 ($p < 0.01$; ES=0.6–1.3), while wide-position players exhibited the highest SPR ($p < 0.01$; ES=0.8–1.1) and %SPR ($p < 0.05$; ES=0.8–1.3) in Cl#1. Additionally, 36 unique player-specific MDPk cluster distribution profiles were identified throughout the tournament.

These findings provide novel insights into the 1-min MDPk demands across clusters and positional roles in elite soccer. The results underscore the need for tailored training interventions that account for both player-specific and position-specific peak physical demand profiles to optimise match preparation.

Volume matters: An intraindividual approach to quantify the most demanding periods of play

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Conflict of interest: nothing to declare. **Funding:** João Lino-Mesquita is currently receiving a research grant (grant number 2022.11239.BD) from The Foundation for Science and Technology (FCT). All research under the affiliation CIFI₂D should be considered financed by the Portuguese Foundation for Science and Technology, under the DOI <https://doi.org/10.54499/UIDB/05913/2020>. The remaining authors have no conflicts of interest or funding to report.

The most demanding periods of play (MDPs) represent a small portion of the overall match time but have caught the interest of several researchers. The MDPs are typically analysed as single events (i.e., the peak value experienced by players) that occur during a match. This view is reductionist: given the large match-to-match intraindividual variability in physical performance (e.g., high-speed running distance [HSRD], sprint distance [SpD]), it is reasonable to predict that the MDPs will vary from match. Moreover, players may achieve the MDPs multiple times during a single match. Therefore, it is

important to understand the range of values for the MDPs, and how frequently these occur in a match. Our objectives in this research were to: (1) introduce a novel approach based on intraindividual match-to-match variability in physical performance to quantify the MDPs' volume during the match; (2) characterise the MDPs' volume in a U23 soccer team; (3) compare the differences in the MDPs' volume between positional groups. Fifteen players from an under-23 soccer team (Portugal's Revelation League) participated in this observational study throughout the 2023/2024 season. The activities were monitored using a 10 HZ global position system (GPS [Catapult, Vector S7, Catapult Sports, Melbourne, Australia]). We recorded the MDPs (1 min) for TD, HSRD and SpD and profiled individual players over time (minimum and maximum values). The volume of the MDPs that occurred in each match was also analysed. Data were analysed in RStudio (v. 2023.09.1+494); a linear mixed model was applied for each metric using the *lme4* package. A mean $\pm$ standard deviation (SD) of 3.88 ± 2.25 (TD – 1 min), 4.44 ± 2.27 (HSRD – 1 min), 3.93 ± 2.25 (SpD – 1 min) was observed by player in each match. Comparisons between players' positions showed a larger volume of the MDPs for the TD of forwards (FW) (standardised $\beta = 0.3899$ [95%CI: 0.0865 – 0.6933]; $p = 0.0154$) and offensive midfielders (OMF) (standardised $\beta = 0.4009$ [95%CI: 0.0668 – 0.7350]; $p = 0.0205$) than central defenders (CD). No significant differences were observed in the remaining metrics. On average, the MDPs occurred more than once during a match. The high variability (SD) observed in volume may be associated with the match-to-match intraindividual variability of the MDPs. Regarding the differences between players' positions, the limited statistical results can be explained by the high variability within positional groups. In addition, the sample size is small given that only players who played in at least 10 matches and at least 45 minutes per match were included in the study. It is important to note that this approach to quantifying the volume of the MDPs within the match is novel, suggesting an extension to the analysis of the MDPs in the future. In the practical environment, we encourage sports scientists to capture the MDPs systematically over time, interpreting benchmarks as dynamic and evolving to develop player profiles. In this way, when an individual range of values is set, the volume of the MDPs that occur during matches can be measured. Such information can help practitioners enhance their usual programming approaches, improving weekly load management with a focus on progressively improving performance and/or recovery (replicating the MDPs in certain training sessions in alignment with the training load distribution throughout the microcycle). Given the observed heterogeneity of the positional groups (i.e., high variability within players' positions), the volume should be individualised when prescribing training. Future research must further frame the MDPs in their tactical context, possibly through synchronization of GPS data with video data.

Load Exposure Variations Among Elite Youth Soccer Players: Comparing Starters and Non-Starters Across Age-Groups

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Athletes exhibit fluctuating performance levels during a competitive season, largely influenced by variations in workload and game participation. During competitive periods, Starters (ST) and Non-Starters (NST) experience different workloads due to differences in match participation. These fluctuations impact competitive and training demands, encouraging practitioners to implement strategies to fine-tune load exposure based on competitive status. Of note, within the microcycle, the training sessions alone may not fully compensate for such reduced cumulative underexposure. Therefore, this study aims to assess the presence of unbalanced loading between ST and NST across different competitive contexts (game vs. training) and age-groups. The study examined three age-groups (U15, U17, and U19), integrating data from both matches and individual training sessions. Eighty-two male elite-youth athletes from U15 (29), U17 (28), and U19 (26) teams from the same elite academy were divided into ST and NST groups based on the previous game exposure (± 60 min). Positional data were collected over 4 months, analysing a total of 15 workload variables, including, but not limited to high-intensity actions, sprint distance, number of sprints, acceleration and deceleration, and further variables. All statistical analyses were performed using Jamovi software (The Jamovi Project, 2025). Jamovi (Version 2.6) [Computer Software]. Regarding the main results, training loads fluctuated significantly throughout the period ($P < 0.05$), with microcycles affecting workload variations in all groups. Moreover, concerning status analysis, all groups exhibited higher values for ST in the combined dataset, mainly associated with game stimuli. Furthermore, significant differences were observed in the U15 group for 16 out of 23 load variables ($P < 0.05$), mainly in condition-over-time interactions. These included total distance, running distance, high-speed running distance, walking distance, number of

accelerations and decelerations, number of sprints, sprint distance, and the matching variables expressed per minute. The U19 group exhibited differences in 9 variables, including total distance, running distance, high-speed running distance, high-intensity running distance, sprint distance, number of high-intensity actions, number of sprints, repeated sprints, and number of accelerations (3 m/s), though with weaker significance. In contrast, the U17 group showed minimal variations, with isolated significant differences. Additionally, the observed status*microcycle meaningful relationship throughout age-groups, underscores that accumulated load and physiological responses varied over the weeks depending on the group. For training-only data, NST had higher workloads in the U15 and U19 groups (three variables each; $p < 0.05$), while differences in the U17 group were marginal. This suggests that, generally, substitutes experience a higher training load, however, in the latter group, this effect was not pronounced enough to reach statistical significance. Notably, despite the implementation of compensatory strategies, these efforts have proven insufficient to mitigate game-induced burden, failing to effectively balance loading across the team. In summary, the U19 and U15 groups showed higher training loads for NST, whereas the overall analysis revealed the opposite trend, with ST displaying greater values than NST. Conversely, U17 group showed ST overload in both cases. In conclusion, the data presented in this study highlights that distinct age-groups exhibit distinctive loading patterns. Although each phase may not provide equal stimulus, the overall exposure (competition and load) should be carefully considered when transitioning between stages. In addition, practitioners should place greater emphasis on compensatory strategies to enhance squad competitiveness and maintain the load balance within the team. These findings provide new insights into the effect of game participation on load exposure and its potential impact at different stages, highlighting the importance of carefully monitoring the demands throughout the youth pathway. Therefore, practitioners and academy directors should recognise this issue and prioritise practices accordingly to support optimal development.

Body changes & performance in basketball

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Conflict of interest: nothing to declare. **Funding:** Partially subsidised by the Spanish National Agency of Investigation through the project “Scientific and Technological Support to analyse the Training Workload of Basketball teams according to sex, level of the players and season period” (PID2019-106614GB-I00) MCIN/ AEI /10.13039/501100011033. The author López-Sierra is a grantee of the "FPU 2023" of the Ministry of Science, Innovation and Universities, code FPU23/029.

Body Composition (BC) varies across the basketball season, with greater changes in pre-season than during competition (Walker et al., 2022). Zaric et al. (2020) found that optimal BC correlates with better performance. This descriptive correlational study examines BC changes during the competitive period and its relationship with player performance, analysing ten professional basketball players from Spain’s second-tier league. BC was measured using the TANITA MC-780MA analyser. A t-test and cross-correlation analysis were employed.

Table 1. Body composition inferential results between measurements 1 and 2.

	95% confidence interval		<i>t</i>	<i>gl</i>	<i>p</i>
	Lower	Upper			
Weight	-,2653	2,3764	1,843	8	,103
BMI	-,0524	,6746	1,974	8	,084
Fat Mass (kg)	-,7943	1,5054	,713	8	,496
Fat Mass (%)	-,9195	1,5639	,598	8	,566
Fat-Free Mass (kg)	-,6868	2,0868	1,164	8	,278
Fat-Free Mass (%)	-1,5817	,9150	-,616	8	,555
Lean Mass (kg)	-,6614	1,9725	1,148	8	,284

Note: **p* < .05

Table 1 presents the results of the difference analysis between the two data collections, while Table 2 displays the correlations between body composition and performance.

Table 2. Cross-correlations between body composition and performance.

	Height (cm)	Weight (kg)	Fat Mass (kg)	Fat-Free Mass (kg)	Lean mass (kg)	Proteins (kg)
Starting	0.473	0.45	0.144	0.554	0.555	0.666
Minutes	0.255	0.281	0.211	0.28	0.28	0.486
Points	-0.107	0.05	-0.003	0.072	0.072	0.053
Offensive Rebounds	0.635	0.616	0.338	0.682	0.683	0.668
Defensive Rebounds	0.34	0.26	-0.147	0.444	0.445	0.653
Assists	-0.35	-0.309	-0.144	-0.356	-0.355	-0.253
Faults Committed	0.169	0.314	0.115	0.379	0.379	0.176
Faults Received	-0.167	-0.039	-0.185	0.046	0.047	-0.006
Valoration	-0.056	0.048	-0.015	0.076	0.076	0.108

Note: Values in **red** mean $p < .05$

BC showed no significant changes between collections, likely due to athletes maintaining peak fitness in the season's final games. Russell et al. (2024) found seasonal BC variations without significant differences. These findings underscore the need for regular BC monitoring to detect drastic changes promptly. Zaric et al. (2020) found a correlation between muscle mass and performance. This study identified a significant link only with offensive rebounding, a key factor in game outcomes (Zhang et al., 2020). At high levels, where small details matter, BC monitoring is essential. BC remains stable throughout the season, with a correlation found only in offensive rebounding. These findings highlight the need for regular BC monitoring and dietary adjustments based on seasonal demands.

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Technical-tactical evolution of the Spanish Women's Soccer team during the 2023 World Cup and the 2024 Olympic Games

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Women's Soccer has emerged as a growing sports phenomenon. Although it has generated significant scientific interest (Oliveira et al., 2022), research in this field remains limited (Harkness-Armstrong et al., 2022). This research aimed to analyse the overall performance, by group phases and knockout phases of the Spanish national team in the 2023 Women's World Cup (WWC) and the 2024 Olympic Games (OG).

A total of 13 matches of the Spanish national team were analysed (WWC 2023= seven; OG 2024= six). Forty-eight variables were studied, but only 14 were analysed, as 34 showed no significant differences. Two variable normalization methods were used: one based on the total number of matches played in each tournament to evaluate overall performance and another based on the number of matches in the knockout phases to analyse this specific phase. A Linear Mixed Model (LMM) was performed to assess overall performance, considering the unique identifier of the opponent as a random factor and the participation of the Spanish team in both tournaments as a fixed factor. A second LMM was conducted to analyse performance during the group phases. The knockout phases were compared using the paired *t*-test.

The results of the LMM analysing overall performance between participations showed significant differences in Performance Indicators (PI) (attack= six and defense= one) ($p<.05$). The model adjusted for the random factor was not statistically significant in the analysed variables, indicating that the individual response of the opponents was not different. The LMM comparing performance in the group phases was statistically significant in three attacking PI ($p<.05$). The model adjusted for the random factor was statistically significant in the offers to receive variable, indicating that the individual response

of the opponents was different. The repeated measures comparison between the knockout phases showed significant differences in six attacking PI ($p<.05$) (see Table 1).

Table 1. Results of the LMM and repeated measures *t*-Student test comparing the performances of the Spanish women's soccer team

Analysis	Performance Indicator	Linear Mixed Model					ANOVA / <i>t</i> -Student					WWC 2023		OG 2024		x Dif	
		<i>CR</i> ²	<i>MR</i> ²	<i>AIC</i>	<i>ICC</i>	<i>P</i>	<i>F/t</i>	<i>p</i>	<i>d</i>	Type	Power	Type	<i>Mx</i>	<i>sd</i>	<i>Mx</i>		<i>sd</i>
Total	Total Possession	0.68	0.49	38	0.37	0.195	13.07	0.004	6.46	L	0.95	H	8.84	0.38	10.47	0.40	-1.63
	Final Third Entries Left Channel	0.63	0.30	46	0.48	0.161	6.59	0.028	1.75	L	0.95	H	3.93	0.58	5.55	0.60	-1.62
	Completed Line Breaks	0.43	0.43	76	0.00	1.000	9.03	0.012	1.16	L	0.95	H	20.57	1.90	28.97	2.05	-8.40
	Total Passes	0.53	0.27	110	0.35	0.337	5.04	0.047	0.83	L	0.95	H	98.69	10.66	127.53	11.13	-28.84
	Passes Completed	0.55	0.26	110	0.39	0.257	5.02	0.048	0.91	L	0.95	H	86.56	10.37	113.89	10.83	-27.33
	Switches of Play Completed	0.52	0.25	21	0.35	0.363	4.61	0.050	0.90	L	0.95	H	0.85	0.19	0.36	0.19	0.49
	Forced Turnover	0.70	0.37	58	0.52	0.189	9.71	0.012	1.06	L	0.95	H	11.66	1.05	8.17	1.09	3.49
Group Phase	Final Third Entries Right Channel	0.99	0.91	24	0.94	0.233	517.62	0.028	3.38	L	0.95	H	32.84	1.03	21.45	1.03	11.39
	Total Offers to Receive	1.00	0.72	58	1.00	0.002	114252.58	0.002	1.33	L	0.95	H	175.00	17.02	132.00	17.02	43.00
	Offers to Receive in Between	0.94	0.90	45	0.40	0.719	66.87	0.026	2.78	L	0.95	H	266.65	13.49	134.21	13.49	132.44
Knock Out	Total Possession						-38.74	<.001	22.37	L	0.95	H	1.96	0.22	3.28	0.19	-1.31
	Possession in Contest						-4.57	0.045	2.64	L	0.95	H	0.52	0.14	0.81	0.21	-0.29
	Attempts on Target						-28.82	0.001	16.64	L	0.95	H	0.26	0.14	0.50	0.15	-0.24
	Final Third Entries Left Channel						-4.38	0.048	2.53	L	0.95	H	0.74	0.25	1.96	0.73	-1.22
	Receptions Between Midfield and Defensive Lines						-9.58	0.011	5.53	L	0.95	H	5.74	1.96	10.50	1.73	-4.76
	Attempted Line Breaks						-6.32	0.024	3.65	L	0.95	H	8.04	2.44	12.02	1.35	-3.98

Notes. *CR*²= Conditional *R*², *MR*²= Marginal *R*²; *Mx*= Marginal Mean; *sd*= Standard Deviation; *x Dif*= Mean Difference; L= Large; H= High.

Iván-Baragaño et al. (2022), noted that the winning teams in the 2019 WWC excelled in ball possession, scoring first, and finishing attacks with goals or shots. Spain's overall performance in the 2024 OG was superior to that of the 2023 WWC, despite evolving from first place to fourth. In the group phase, Spain showed a solid start during the 2023 WWC compared to the 2024 OG. Finally, in the knockout phases, during the 2024 OG, Spain surpassed the actions performed in the 2023 WWC, indicating better adaptation and capability during the decisive moments of the competition. These results can contribute to adjusting the strategy for future tournaments in which Spain participates, to maintain a high level of competitiveness.

Acknowledgments

Agradecemos al GOERD por su respaldo y contribución en el desarrollo de esta investigación.

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Changes in Heart Rate Variability After a Musculoskeletal Injury in Futsal Players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

After a musculoskeletal injury, the autonomic nervous system initiates the inflammatory process, with an increase in the sympathetic nervous system activity and a decrease in the parasympathetic nervous system modulation. Due to this imbalance, changes in heart rate variability (HRV) indices could be used to detect early signals of somatic tissue distress and identify the development of a musculoskeletal injury. Therefore, the aim of this study is to analyse the changes in HRV after a musculoskeletal injury compared to the baseline. It was hypothesised that there is an alteration in HRV after a musculoskeletal injury. Five athletes ($27 \pm 7,13$ years old) from a futsal team with a recent musculoskeletal injury were assessed. HRV was collected using the chest strap H10 and a Polar m200 at the beginning of the season and within 72h after the injury. In frequency domain, very low frequency (ms^2), low frequency (ms^2), high frequency (ms^2), low frequency (n.u.), high frequency (n.u.) and LF/HF ratio variables were evaluated. Results showed significant differences ($p = 0,043$) in the very low frequency variable after injury compared to the baseline. No statistical differences were found in the other variables after the musculoskeletal injury. The reduction in very low frequencies observed after injury in athletes is

related to a higher level of inflammation and an increase in sympathetic tone. Thus, the use of heart rate variability seems promising to detect an imbalance in the autonomic nervous system and a possible non-traumatic musculoskeletal injury.

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Impact of inclination on metabolism responses in trained ultra-trail runners.

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Conflict of interest: Nothing to declare. **Funding:** Nothing to declare.

Endurance training is regulated through intensity zones based on physiological thresholds, divided into three zones according to ventilatory (VT1, VT2) or lactate (LT1, LT2) thresholds (Meyer et al., 2005). Different intensity distribution models exist, such as polarised, threshold, and pyramidal training. Hill training is a common strategy among endurance runners, as it enhances physiological, biomechanical, and neuromuscular parameters (Silva et al., 2021). However, it remains unclear whether these thresholds differ between level and uphill running conditions in ultrarunners, which has implications for training prescription. Additionally, fat oxidation plays a crucial role in endurance performance, but its variation between uphill and level running in ultrarunners remains unexplored. Thus, the aim of this study was to compare the fat metabolism during two types of incremental tests in trained ultra-endurance trail runners. In this line, fifteen trained ultra-trail runners (age: 38.5 ± 5.5 years; height: 1.78 ± 0.05 m; weight: 68.4 ± 6.6 kg) performed two incremental graded treadmill tests until exhaustion (level test (LR= 1% of slope); uphill (UP= 10% of slope)). Participants underwent a medical check-up before testing and completed both tests in a randomised order. A maximal treadmill test to determine VO_2max was performed. Thus, participants started after five minutes of passive rest at a 1% gradient for LR and 10% for UR. Speed began 2 km/h below the final speed of the first phase and increased by 0.5 km/h every 30 seconds until volitional fatigue. VO_2max was determined based on specific physiological criteria, including a VO_2 plateau, high lactate concentration (≥ 8 mmol/L), and maximal exertion indicators. Verbal encouragement was provided to ensure maximal effort, and VO_2max was calculated using a rolling 20-second average. Testing conditions were controlled, with temperatures between 20–22°C and 35–50% relative humidity. After de maximal test, maximal fat oxidation (MFO), power at MFO, the intensity at which fat oxidation rate was maximal (Fatmax), VO_2 , respiratory quotient (RER) and heart rate (HR) at Fatmax were determined. There were no significant differences in MFO between tests. However, significant higher values in Fatmax (% VO_2max) ($p=0.001$; $ES=1.42$), RER at Fatmax

($p=0.025$; ES= 0.68), VO_2 at Fatmax ($p<0.001$; ES=1.30), relative HR at Fatmax ($p=0.007$; ES= 1.29) and relative power at MFO ($p=0.005$; ES=0.56) were found in UP compared with LR (Table 1). In conclusion, this study demonstrates that trained ultraendurance runners obtained higher fat metabolism changes during the uphill test in comparison with level running test. These results reinforce the idea that UP and LR training zones should be individualised according to the slope.

Table 1. Fat metabolism results during level and uphill test.

	Level		Uphill		Effect Size	<i>p</i>
	Mean	SD	Mean	SD		
MFO (g/min)	0.45	0.16	0.44	0.15	0.09	0.748
Power at MFO (W/kg)	3.61	0.60	3.97	0.47	0.56	0.005
Fatmax (% VO_2max)	59.97	4.81	67.25	5.29	1.42	0.001
VO_2 at Fatmax (ml/kg/min)	35.51	4.73	42.06	4.43	1.30	<0.001
RER at Fatmax	0.93	0.04	0.95	0.02	0.68	0.025
HR at Fatmax (% HRmax)	69.64	5.56	77.20	5.92	1.29	0.007

HR: heart rate; HRmax: peak heart rate; MFO: maximum fat oxidation; RER: respiratory quotient; SD: standard deviation.

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Linear vs non-linear methods of evaluation of postural control: how to test the effectiveness of balance training modalities?

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Postural control systems enable the human body to maintain balance, at rest and during movement (Sibley et al., 2015). Center of Pressure (CoP) is a crucial metric in biomechanics to study postural responses and the vestibular system's impact on human behavior (Haxby et al., 2020). A method for assessing postural sway involves measuring CoP fluctuations standing on a force platform (Manor et al., 2013). We tested a portable force platform on an elite population before and after a yoga intervention and compared linear and non-linear CoP variables to verify the program's effectiveness.

Methodology

Évora University research ethics committee approval number: 21050. Study registered on ClinicalTrials.gov: NCT05821270. Study protocol published on: <https://doi.org/10.3389/fpubh.2024.1334880>. Eighteen military aviation pilots from the Portuguese Airforce were recruited, informed on study's procedure and provided written informed consent. CoP response was collected on Biosignals Plux (Santos et al., 2024), in a stable unipedal stance with eyes open and closed for 60 seconds each. Evaluations were done before and after a flight simulation and

both measures occurred before and after a 12-week yoga program. The yoga exercises were based on breathing, physical postures, relaxation, and meditation. Data preprocessing: EEGLAB toolbox in MATLAB. Descriptive statistics: Jamovi (version 2.3.16).

Results

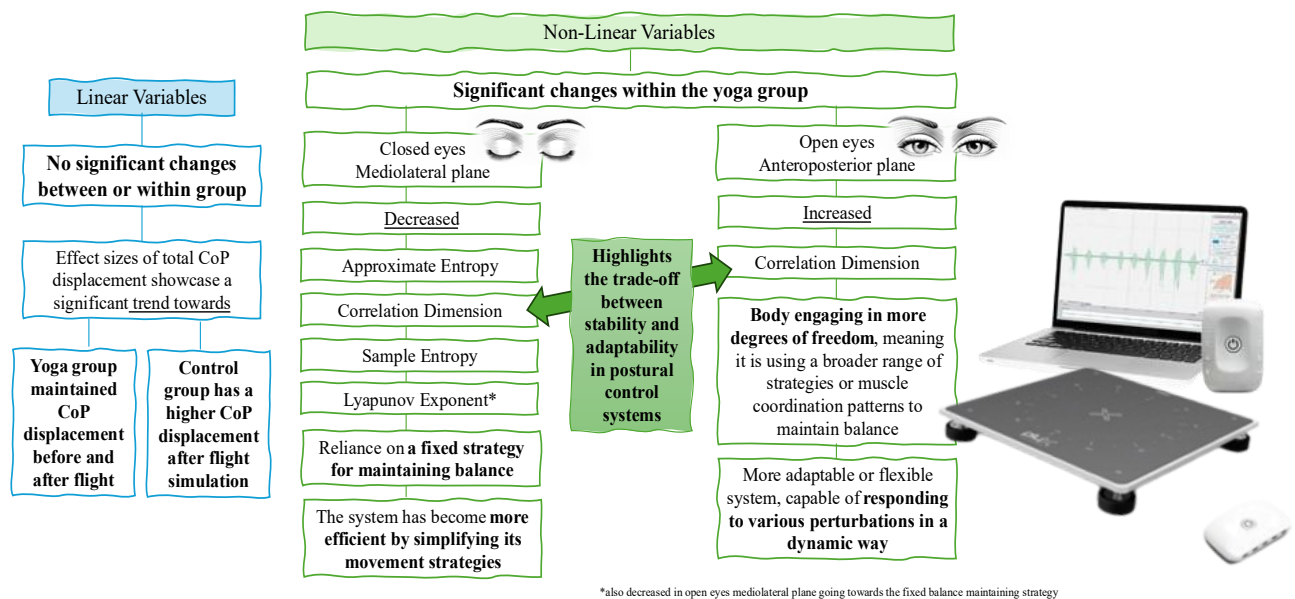


Figure 1. Linear variable results (blue) vs non-linear variable results (green) after the yoga intervention.

Discussion and Conclusion

Combining military aviation training with yoga enhances postural control, especially in sensory-deprived conditions, highlighting internal cues' role in motor control. Non-linear variables of CoP displacement showcase more precision in measuring postural control in elite environments, capturing subtle adaptations critical for high-performance demands. This evaluation strategy can be added to access the training regimen of elite professionals and considered on future studies.

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Acute sodium bicarbonate supplementation improves repeated sprint ability in female football players: a randomised, double-blind, controlled, crossover trial

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Conflict of interests: nothing to declare. **Funding:** Portuguese Foundation for Science and Technology (UIDB/00447/2020 and UIDB/04748/2020).

Repeated sprint ability (RSA) is a determinant aspect of football, but the high intensity of sprinting induces the release of H⁺. Sodium bicarbonate (SB) is an effective ergogenic supplement in reducing muscular acidosis, but its benefits in football need more evidence, especially with female players. Therefore, this study sought to investigate the effects of acute SB supplementation on RSA in female football players. Eleven athletes completed a randomised, double-blind, controlled, crossover trial (NCT06098794) with two RSA sessions (SB or placebo (PL), 0.3 g/kg) performed in a cycle ergometer, consisting of 3 sets of 6 maximal 6-s sprints performed every 30 s with a 5-min recovery between sets. Pulmonary gas exchange and muscle oxygenation were continuously evaluated during the RSA test with a gas analyser and a near-infrared spectroscopy device, respectively. Before and after the test, jump height was assessed with a countermovement jump (CMJ). The results showed that SB induced a greater

blood lactate accumulation (SB: 14.0 ± 4.32 vs PL: 10.9 ± 3.55 mmol·L⁻¹, $p = 0.010$) and a greater elimination of CO₂ through breathing ($p = 0.038$), while maintaining muscle oxygenation. These positive metabolic effects translated into preventing a decline of mean power output from the first to the second set (SB: +1.4% vs PL: -3.7 %) and of jump height after the protocol (SB: -2.0 % vs PL: -8.2 %). Therefore, this research suggests that acute ingestion of SB before a RSA test results in greater accumulation of lactate in blood and elimination of CO₂ through ventilation, delaying fatigue and preventing performance decline. Thus, female football players should consider this supplement to support the high physiological demands of training and competition.

Acknowledgments

We would like to acknowledge Farmácia da Luz for preparing the supplements needed for the research and the participants for their time and effort.

Benchmarking Player Positions and Performance: Portugal vs. Semi-Finalists at the 2023 FIFA Women's World Cup

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Conflict of interest: One of the authors participated as member of the staff of one team in the 2023 FIFA Women's World Cup. **Funding:** The work was supported by the Portuguese Foundation for Science and Technology [2023.03718.BDANA].

Women's football has seen a remarkable surge in popularity as well as increased financial support from governing bodies over the past decade, that enhanced the technical and tactical level of the players (Iván-Baragaño et al., 2024). As women's football continues to grow, there is a pressing need to assess and enhance player and team performance. Key performance indicators (KPIs) play a crucial role in this process, offering insights into the distinct roles and contributions of players across different positions. This study aims to characterise these roles and identify KPIs that distinguish players by position, while benchmarking the performance metrics of Portuguese players against the semi-finalist teams in the 2023 FIFA Women's World Cup (FWWC).

Using event data from the 2023 FWWC (sourced from www.fbref.com, with OPTA as the data provider; reliability between 0.92 and 0.94), we analysed players who reached the semifinals and played at least

45 minutes. Data were standardised by 90 minutes played, and a Linear Discriminant Analysis (LDA) was conducted to address the position classification problem. LDA works by identifying a linear combination of features that separates or characterises two or more classes of objects or events (IBM, 2023). The results of the LDA revealed two significant discriminant functions that account for a cumulative 87% of the total variance. We have considered the top 15 variables from the discriminant functions. The first function explains 62.61% of the variance, and the second discriminant function explains 24.39% of the variance.

To further explore performance differences, we compared Portuguese players with semi-finalist players using the Kruskal-Wallis test. Significant differences were observed in a limited number of variables, with small to moderate effect sizes (η^2). For forwards, differences were found in crosses ($\eta^2 = 0.07$) and blocks ($\eta^2 = 0.09$). For Midfielders, interceptions ($\eta^2 = 0.03$). In fullbacks were found differences across multiple variables, including Assists ($\eta^2 = 0.07$), touches in the attacking third ($\eta^2 = 0.09$), crosses ($\eta^2 = 0.08$), and interceptions ($\eta^2 = 0.10$), and in center backs were found a significant difference in crosses to the penalty area ($\eta^2 = 0.05$). However, for most variables across positions, no significant differences were found ($p > 0.05$).

These findings provide valuable insights into the KPIs that distinguish player roles and highlight areas for performance enhancement in women's football. The study highlights the importance of data-driven strategies to support the development of the sport.

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Exploring the Dynamics of the Coach-Athlete Relationship in Individual and Team Sports: Perspectives from Elite Coaches

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The connections between coaches and athletes' interactions are crucial in both individual and team sports, impacting motivation, well-being, and performance. Despite a thorough examination, there is less evidence on how elite coaches handle relationships in national teams' competitions. Therefore, 13 national coaches from different sporting backgrounds were invited, through a semi-structured interview, to share their experiences, emphasising how they cultivate and sustain positive relationships with athletes across national teams' major international competitions. Using thematic analysis, the findings underscore critical factors influencing coach-athlete relationships, such as relational strategies, leadership styles, and the constraints imposed by restricted time for athlete contacts within the national teams' realm. The growing responsibilities and expertise of coaches, criteria for athlete selection, psychological readiness, and relationship management before, during, and after competition emerged as key topics. The research highlights the importance of balancing technical requirements with interpersonal relationships, stressing trust, adaptability, and communication as fundamental elements. These insights enhance the comprehension of the coach-athlete relationship in elite sports and provide practical implications for improving coaching effectiveness in challenging and demanding athletic environments, marked by specific contextual factors, including the dynamics between the two main actors: coaches and athletes.

Characterization of the goalkeepers' actions and behaviors in the Portuguese Championship

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Football inherently consists of different specialised positions and, depending on their position on the field, players must exhibit unique characteristics that are essential for gameplay. Among these specialised positions, the goalkeeper stands out. Their primary role and responsibility are to prevent goals, which requires mastering appropriate technical behaviours and actions. Therefore, gaining a deeper understanding of these dynamics is crucial for creating better training conditions tailored to goalkeepers' specific competitive contexts. Therefore, the aim of this study was to characterise the most common defensive behaviours and technical actions performed by goalkeepers in the Portuguese championship.

Materials and Methods

For this study, a sample of 14 teams in the 2023/24 season of the Portuguese championship was analysed. Match footage was obtained from the Wyscout platform, and defensive actions were recorded using a previously validated observational instrument. Data analysis was initially conducted by tabulating the information in an Excel spreadsheet before transferring it to Jamovi (V.2.3) for statistical processing.

Results

In total, 182 matches were analysed, and 1,542 defensive actions were obtained. From those, the most frequently used body part for saves was both hands (n=320; 71.4%), followed by the right hand (n=37; 8.3%) and the left hand (n=19; 4.2%). The most common body position during defensive actions was high (n=987; 63.8%), followed by medium (n=490; 31.7%) and low (n=70; 4.5%). The most frequent technical action was a medium block (n=76; 16.6%), followed by 1x1 situations (n=59; 12.9%) and low block with a fall (n=46; 10.0%). Regarding positioning, goalkeepers were most found in zone A (n=200; 13.0%), followed by zone B (n=155; 10.1%) and zone C (n=121; 7.8%) (Figure 1b) (Table 1). In terms of shots faced, the majority were off-target (n=831; 53.7%), with most attempts originating from zones 17 (n=184; 11.9%), 18 (n=308; 19.9%), and 19 (n=193; 12.5%) (Figure 1a). Shots were most frequently taken with the right foot (n=978; 63.2%), followed by the left foot (n=543; 35.1%) and the head (n=27; 1.7%). There was an even distribution between shots taken under covered ball (n=777; 50.2%) and those taken uncovered ball (n=771; 49.8%). Opponents predominantly attempted shots from medium distance range (n=668; 43.2%).

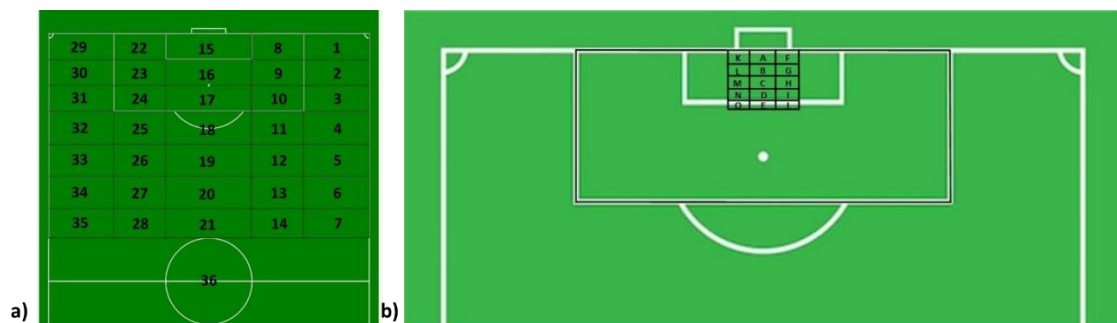


Figure 1. a) Shooting zones; b) Goalkeeper positioning zones

Conclusion

This study found that the goalkeepers in the Portuguese championship used both hands more predominantly for saves, in a high body position, and medium blocking as the most frequent action. Goalkeepers were mainly positioned in zones A, B, and C. These findings reinforce the need for position-specific training to enhance decision-making, positioning, and reaction time, helping goalkeepers better adapt to real-game scenarios.

Shooting type finishing performance on 3x3 elite basketball players: An observational study

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the Basket 2.0 project (No. 21076/PDC/19) granted by Fundación Séneca—Agencia de Ciencia y Tecnología de la Región de Murcia and Consejo Superior de Deportes (19/UPB/21).

The level of 3x3 competition has been growing in recent times and researchers are beginning to analyse what is happening both on a physical and technical-tactical level (Conte et al., 2019 & Sansone et al., 2023). The aim of the present study was to analyse the shooting type finishing performance indicators in elite women's 3x3 basketball games from the beginning of the offense phase to the end of the game. A total of 298 phases of play belonging to four games of the final phase of the Women's 3x3 Basketball World Cup 2023 were analysed. The variables analysed were a) running shot; Shot point shot (inside 6.75 line), and 2 points shot (outside 6.75 line). The analysis of the game actions was developed by the Lince Win program. The most outstanding results show that 3 types of finish had similar used global results (running shot – 25.9%, 2 points shot – 25.3% and 3 points shot – 23.6%). It is worth noting that 26.2% of the completion actions observed ended in a foul. However, it was founded differences in efficacy results (running shot – 53.2%, 1-point shot – 50.0% and 2 points shot – 24.3%). This data can be used by coaches to adapt their sessions to the needs of the competition to manage wins; as well as by professional 3x3 players. It can be observed that the use of 2-point shots is like running shot and 1-point shot but the hit rate is much lower, therefore it requires players to adapt for longer periods of time as the change from 5x5 basketball is relevant. This game (3x3) presents some characteristics and needs that

differ from the 5x5, identifying and analysing them for their subsequent application in the real game leads to the improvement of the 3x3 game.

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Is it necessary to adapt the goalkeeper's game in young futsal competitions? A study of coaches' opinions.

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Conflict of interest: nothing to declare. **Funding:** This research was funded by Ministerio Ciencia, Innovación y Universidades, grant number PID2023-150811NB-I00 MCIN/AEI/10.13039/501100011033/FEDER, UE.

Children and adolescents advocate for a sport where variability of their position is present as a norm (Garcia et al., 2023). The manipulation of rules leads to changes in the participation and performance of young futsal players (Milanez et al., 2020). The aim of this study was to analyse the perceptions of coaches and experts regarding goalkeeper rule modifications at young futsal levels. A total of 72 coaches and 12 experts participated in the questionnaire about possible modifications to the goalkeeper rules in the actual futsal rules related to under-8, under-10, under-12, and under-14. The variables analysed were: a) The goalkeeper is not allowed to go outside the penalty area with the feet, b) The goalkeeper's possession in half of the field is increased by 5 “(normal is 4)”, c) It is possible to play with a goalkeeper player in the last 5 min of the match; d) Goalkeepers must play at least one full half in a different position and e) substitution of the goalkeeper takes place when the play is stopped and the referee is informed.

The results showed significant statistically differences in variables: a) the goalkeeper is not allowed to go outside the penalty area with the feet in U12 ($t=-2.05$, $p=0.04$) and U14 ($t=-2.4$, $p=0.04$); and c) it is possible to play with a goalkeeper player in the last 5 min of the match in U8 ($t=-2.84$, $p=0.01$), U10 ($t=-2.76$, $p=0.01$), U12 ($t=3.09$, $p<0.01$) and U14 ($t=-2.29$, $p=0.03$). In both cases, the experts believe this rule needs to be modified, and coaches believe the rule should not be modified. It can be concluded that federations, clubs, referees, coaches, and experts should plan experimental studies to modify and adapt the goalkeepers' game to achieve a more formative competition.

Acknowledgments

Federación de Fútbol de la Región de Murcia (Spain).

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Transferability of the intra- and inter-sectoral coordination between training and competition in professional Portuguese football players

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Conflict of interest: nothing to declare.

Funding: This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Football players and ball positions across the playing ground and match phases can be calculated using Cartesian and Euclidean coordinates (xx, yy), contextualising physical demands in a tactical behaviour scale (Low et al., 2020; Teixeira et al., 2022a; Praça et al., 2022). However, it remains to be completely recognised the transferability of intra and inter-sector coordination between training and competition in Portuguese professional football players, specifically in the defensive, midfield and attacking sectors. Thus, the main purpose of this project is to analyse the transferability of intra- and inter-sectoral coordination between training tasks and official matches in professional Portuguese football players, by applying a multifactorial approach that integrates physical, technical, and tactical factors. Specifically, this project aimed to describe the intra- and inter-sectoral transferability by applying spatial-temporal features, key performance indicators (KPI) and training load metrics. Also, we aimed to develop a

machine learning model to predict individual and team tactical performance based on intra- and inter-sectoral coordination of the defensive, midfield and attacking lines during constrained training tasks and official matches of a Portuguese professional football team.

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Most-Demanding Passages in Elite Youth Soccer: Kinematic and Mechanical Load Profiles in an International Tournament

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Ministry of Science, Technology and Higher Education Fundação para a Ciência e a Tecnologia (FCT) under [Grant: 2021.06456.BD], and partially by CIDESD, through FCT – Portuguese Foundation for Science and Technology, I.P., under [Grant: UID04045/2020].

Understanding the most-demanding passages (MDP) of kinematic and mechanical activities during soccer competition provides critical insight for optimising training design and prescription. However, there remains a notable gap in research focused on MDP analysis in international youth tournaments. This study, therefore, characterised the MDP of kinematic (MDPk) and mechanical (MDPm) demands in youth players during the U20 CONMEBOL Copa Libertadores. Player locomotor activities were tracked for 17 players across five matches of the tournament using 10-Hz global navigation satellite system devices. The relative intensities (meters or number of efforts per minute) of the respective MDP were assessed using

composite criterion variables: MDPk (total running distances across moderate-speed (MSR; 15–19.8 km·h⁻¹), high-speed (HSR; 19.8–25.2 km·h⁻¹), and sprinting (SPR; >25.2 km·h⁻¹) velocity thresholds) and MDPm (total high-intensity acceleration (ACC3; >3 m·s⁻²) and deceleration (DEC3; < -3 m·s⁻²) efforts). The relative compositions of MDPk and MDPm, based on their constituent variables, were also analysed. Differences in relative MDPk and MDPm intensities and compositions across three rolling durations (1-, 3-, and 5-minute periods), tournament matches, and playing positions (central and lateral) were assessed using linear mixed models and Cohen's *d* effect size (*n* = 138 observations). The relative intensities of MDPk and MDPm decreased with increasing duration across matches ($p \leq 0.001$; $d = 2.5$ – 6.2) and positions ($p \leq 0.001$; $d = 0.9$ – 4.0). Statistically significant differences between matches ($p \leq 0.01$; $d = 1.2$ – 1.7) and higher values for lateral (67.2 ± 36.4 m·min⁻¹) compared to central (55.7 ± 27.1 m·min⁻¹) positions ($p \leq 0.01$; $d = 1.1$) were observed only for 1-min MDPk periods. Relative MDPk composition was highly influenced by duration, as %HSR and %SPR decreased across 1-, 3-, and 5-min periods, while %MSR exhibited the opposite trend across matches and positions ($p \leq 0.05$; $d = 0.6$ – 1.3). In contrast, relative MDPm composition remained unchanged across different durations for all factors analysed ($p > 0.05$). Regardless of duration, relative MDPk and MDPm compositions differed between matches, particularly for %HSR and %SPR ($p \leq 0.01$; $d = 0.6$ – 1.4) and %ACC3 and %DEC3 ($p \leq 0.001$; $d = 0.7$ – 1.1), respectively. However, no differences in relative MDPk and MDPm compositions were observed between playing positions ($p > 0.05$). In conclusion, practitioners should account for the influence of rolling durations on the intensities and compositions of multifactorial kinematic and mechanical MDP criterion variables when evaluating youth soccer performance in international tournaments. Duration-specific MDPk and MDPm response can be used to improve targeted locomotor training and optimising energy system development. Significant fluctuations in MDP intensities and compositions across matches further emphasise the need for tailored match preparation, training design, and recovery strategies to optimise player readiness and performance.

Practices and perceptions of personal Strength and Conditioning Coaches with Professional Athletes: A qualitative study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Nowadays, athletes are searching for personal coaches to enhance their individual performance levels, particularly those without adequate support from their clubs. However, despite the growing interest in individualised training within professional sports, there remains a lack of evidence in the literature regarding its effective implementation. Thus, the aim of this exploratory study is to understand the context, experiences and perceptions of personal strength and conditioning coaches in individual training with professional athletes in various sports. Fourteen strength and conditioning personal coaches were interviewed. The data were analysed using the thematic steps outlined by Braun and Clarke (2016). Through the analysis of interviews, key themes emerged. Within clubs that manage a large number of athletes, the emphasis on collective training often limits the ability to adapt programs to individual needs, which creates a barrier for athletes looking for specific support in their development. This pursuit of external coaching services highlights a significant gap in the current training methodology adopted by many clubs. Additionally, another critical theme that emerged is the difficulty in coordinating efforts between personal strength and conditioning coaches and the club's training programs. The disconnection between the individualised programs offered by external coaches and the overarching plans of the clubs can result in a misalignment of goals and training strategies. This gap underscores the need for improved collaboration and communication between external trainers and club personnel to enhance the overall athletic development and performance outcomes for athletes. Further research and understanding are required to integrate individualised practices effectively within the broader training paradigms employed in professional sports.

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Opposite player in volleyball: the Killer

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Volleyball has seen great progress in recent years, particularly in high-level women's volleyball. We can even say that women's volleyball is increasingly similar to men's volleyball, in terms of service speed, spike power, vertical impulse capacity, and players' physical capacity. The Subject of this research was to verify whether the intervention of the opposite player in elite women's volleyball could interfere with the final outcome of the match.

The sample consisted of 10 games from the Olympic Games (2008, 2012, 2016, 2020 and 2024), considering the serving, attacking and blocking skills. Discriminant analysis was used to confirm whether the variables discriminate for victory or defeat when the opposing player intervenes in these skills. The results indicate a tendency for setters to provide ammunition to opposing players on their teams. In a (KII) counterattack situation, there even seems to be a tactical orientation and behavior, outlined within the game plan, in the outcome of the sets, especially in their final part, since this player has a great decision-making capacity and influence on the outcome result, when compared with the Side-out (KI) answer to the service. It has been a tactical choice used, not only in its area of intervention, but also in other specific places, where there are specialisations in Volleyball (outsider hitter, middle blocker, setter, libero and opposite player). There appears to be a tendency and a choice among the technical teams in their strategic and tactical organisation to provide these players with influence on the final outcome, whether it be the outcome of the sets and respective games. There seems to be preparation by these players, not only in their intervention zone (position 1 and position 6), but in other areas of the field, such as position 4.

There is an initial choice of game formations (line-up), in the coaches' tactical intervention, in the network of 2 attackers or 3 attackers. Demonstrating decision-making tactical behaviour, placing this player in position 4, but also being used in position 2, where she is also used as a

blocker (specialist in this role). There appears to be an influential player (the opposite player) who scored 40 points per game, considering that a set has 25 points. With these results, coaches must prepare, in their micro cycles, scenarios close to the competition, and the more often they resort to this tactical organisation, the more prepared these players will be, and the teams and coaches will be able to be better organised, for the final outcome of the sets and games, with the use of these decision-making players.

The Youth Physical Development Model: An approach to long-term athletic development

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Physical activity is beneficial for the overall physical and mental health of youth. There has been an increasing focus on youth sports, moving from a recreational activity to becoming a launching pad for participation at elite levels. Several models of athlete development have emerged to guide specialised and nonspecialised athletes at an age-appropriate level, considering their physical and mental development. This review aims to summarise the current evidence and theoretical models regarding youth athlete development and discuss broader initiatives for sports participation and future directions for the field. An electronic databases search, including PubMed, Google Scholar, ScienceDirect, National Institutes of Health, UpToDate, and Springer, was conducted. Articles from 1993 to 2024 were included. The search terms long-term athlete development, LTAD model, youth physical development, youth athlete development, sports specialization, and pediatric athlete, among others, were used. Several models of youth athlete development are discussed in this article. More recent models have built upon previous models to incorporate more age- and development-specific recommendations; however, no single model can be identified as the gold standard for youth athlete development, especially given the lack of empirical data to support these models. Youth athlete development currently consists of several theoretical models, each with its strengths and weaknesses, that can guide the training of young athletes to maximise their performance.

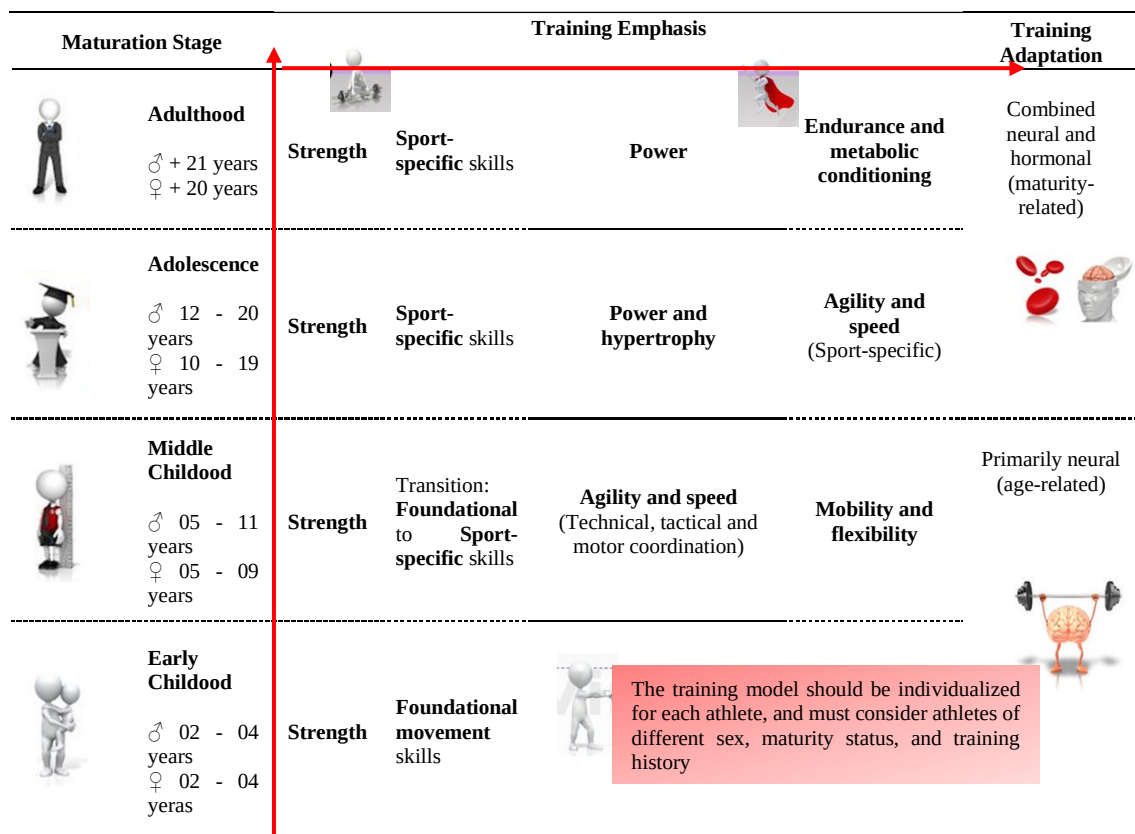


Figure 1. The Youth Physical Development Model. A new approach to long-term athletic development (adapted from Lloyd and Oliver, 2012).

The premises of the proposed development model focus on the individual and should be oriented towards them, contributing to social well-being and sporting development through a holistic approach, which makes it possible to achieve success in life, regardless of the degree of success achieved in the sporting field. Those involved in this process - physicians, athletic trainers, coaches, physical educators, and parents - should understand these various models and trial their various features to see what works best for their athlete with consideration given to factors such as their stage of development. Ultimately, more empirical data are required to definitively state which is the optimal approach.

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Effect of Active Warm-Up and Different Recovery Intervals in 50-Meter Freestyle.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The purpose of the present research was to determine the effect of active warm-up and different recovery intervals in 50-meter freestyle. Twenty-two young athletes (age 16.4 ± 2.23 years), with an average experience of 4.32 ± 2.85 years in training and national-level competitions, voluntarily participated. Participants completed four experimental conditions on different days (Wednesday - Friday and Wednesday - Friday of the following week) at the same time, following a randomised repeated measures research design, which consisted of: 1) 90 minutes before the test: participants performed a standardised 1000-meter warm-up (30 minutes), allowing for a 60-minute recovery period before the performance test (50m freestyle). 2) 60 minutes before the test: participants performed a standardised 1000-meter warm-up (30 minutes), resulting in a 30-minute rest period before the performance test (50m freestyle). 3) 30 minutes before the test: in this experimental condition, subjects performed a standardised 1000-meter warm-up (30 minutes) with no rest period before the 50-meter freestyle. 4) No Warm-Up: participants did not perform any warm-up before the 50-meter freestyle. The execution of the different experimental conditions was randomly assigned. Statistical analysis was performed using one-way repeated measures ANOVA, accepting significance with $p < 0.05$. Additionally, Bonferroni post-hoc analysis was used where significant differences were found. There was a significant difference in performance in 50-meter freestyle ($F=3.90, p=0.013$) when performing an active warm-up with different rest periods compared to not performing any warm-up (Table 1).

Table 1: Descriptive statistics for the performance variable, measured after each experimental condition, in 50-meter freestyle.

Experimental Condition	Mean	SD
Warm-Up 90 minutes before the test	31.66s	3.00s
Warm-Up 60 minutes before the test	31.84s	3.09s
Warm-Up 30 minutes before the test	31.49s	2.90s
No Warm-Up	31.37s	2.91s

Note: s = seconds

After conducting the Bonferroni analysis, it was found that there is a significant difference between participants who warm up 60 minutes before the test compared to those who did not warm up, specifically finding that participants who warm up 60 minutes before have a significantly lower sports performance compared to subjects who did not warm up ($a > b$; $p = 0.04$). Another important finding is that there is no significant difference in the time required for participants to complete the test when they do not warm up compared to when they warm up 90 or 30 minutes before the test. Additionally, individual data indicated that each subject's response to different recovery intervals and the presence or absence of warm-up is very varied, as seen in Figure 1.

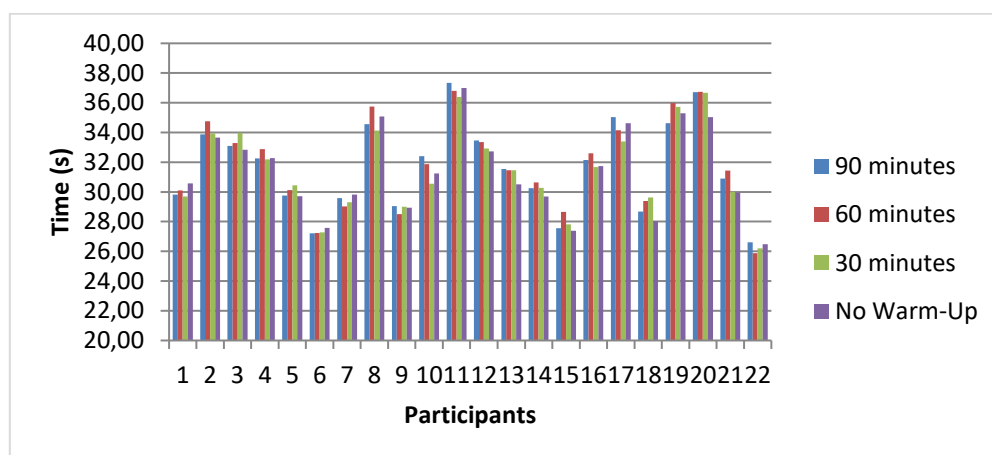


Figure 1. Individual Performance in 50 m Freestyle

Overall, the results of this study indicate that the best sports performance in a 50m freestyle test was obtained when participants did not warm up or when they performed a warm-up 90 or 30 minutes before the test. The worst performance was observed when subjects warmed up 60 minutes before the test. These results suggest that using a standard warm-up before a swimming test does not positively influence the sports outcome, as none of the three conditions involving warm-up were better than not warming up. Additionally, the importance of the individualised response of the swimmer to improve sports performance is demonstrated.

The influence of place of sports training and date of birth on the professionalization of elite soccer players in Brazil

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This study aimed to investigate the Effect of Relative Age (EIR) and the Effect of Place of Birth (ELN) on the professionalisation of soccer players by conducting a comparative analysis of their place of birth, initiation, and professionalisation. The sample consisted of 1,101 male elite players from the Brasileirão Série A championship between 2018 and 2021. The players' birthdates were analysed by month and grouped into quartiles. The results confirmed the EIR, as a higher percentage of players were born in the first quarter of the year: Q1 (January–March) 34%, Q2 (April–June) 29%, Q3 (July–September) 22%, and Q4 (October–December) 15%. These findings indicate a significant overrepresentation of older players (Q1) compared to younger ones (Q4). Regarding ELN, birthplace distribution was compared with the general population across different community sizes. The results (Table 2) confirmed that players tend to come from large metropolitan areas (cities with over 5,000,000 inhabitants), which accounted for 19.3% of the players. Interestingly, players from small towns (fewer than 49,999 inhabitants) represented 17.9%, even though such towns make up 40.4% of Brazilian municipalities. A migration trend was also observed in initiation cities (CI) and professional cities (CP), favouring high-density urban centres. In CI, 24.4% of players trained in cities with more than 5,000,000 inhabitants. In CP, this percentage increased to 28.5%, concentrated in just two cities. The data suggest that players tend to relocate to urban centres with populations exceeding 1,000,000, where Brazil's major soccer clubs are located, particularly in the

Southeast and South regions. This study provides a new mapping of the profile of Brazilian soccer players, identifying their regions of origin and the development of their professional careers.

The influence of a Training Program in Trail Running on Body Composition and Aerobic and Anaerobic Thresholds

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Trail Running is a sport that usually takes place on trails with steep gradients, both downhill and uphill (Rosado et al., 2020), generating physiological and biomechanical responses that differ and vary according to the specificity of each course (Ehrstrom et al., 2018). The aim of this study was to analyse changes in body mass, fat mass, muscle mass, heart rate, and speed at aerobic and anaerobic thresholds, over an average 6-month training period. It was hypothesised that there would be an improvement in change in body composition, as well as in running speed at both thresholds. The sample comprised 18 (Male =14; Female= 4) active trail runners (mean $\pm$ SD: 42 $\pm$ 7.31 years old) (. The program training was implemented for 6 months, with an average of 6 training sessions per week, of which one was strength training and five were running sessions. Body composition and threshold assessments were carried out before and after the training program. Heart rate and speed at the aerobic and anaerobic thresholds were obtained using the Conconi test (Conconi et al., 1982), a treadmill running test with a progressive increase in speed until fatigue. Body mass was assessed using a portable scale (SECA 761, Germany). Stature was determined using a portable stadiometer (Seca Bodymeter 208, Germany). Values of fat mass (%) and muscular mass (%) were determined using the tetrapolar bioimpedance (Inbody 270, USA). The Shapiro-Wilk test was performed to test the normality of the sample. To analyse the differences between the two phases, the paired samples t-test was used due to normal distribution of data, and the Wilcoxon test for non-normal distribution of data. The magnitude of the effect was calculated using Cohen's d effect size. After the training program, compared to the baseline, no

significant differences were found in body mass ($p = 0.097$; effect size = 0.0089). However, there was a significant reduction in fat mass ($p = 0.012$; effect size = 0.38) and an increase in muscle mass ($p = 0.016$; effect size = 1.387). With regard to the aerobic threshold, there were no significant changes in heart rate ($p = 0.279$; effect size = -0.315), but a significant improvement in speed was found ($p = 0.003$; effect size = -0.628). With regard to the anaerobic threshold, there were no significant changes in heart rate ($p = 0.574$; effect size = -0.127), but there was significant improvement in speed ($p = 0.019$; effect size = -0.46). The findings of the present study showed that targeted focus on improving performance in trail running promotes changes in body composition, namely a reduction in fat mass and increase in muscle mass. In terms of aerobic and anaerobic thresholds, although there were no changes in heart rate, the participants increased their speed at each threshold.

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The Effects of Teaching a Didactic Unit Using Two Different Methodological Approaches

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Implementing effective methodological approaches in Physical Education (PE) is essential for promoting meaningful learning, enhancing curriculum achievement, and increasing student motivation in team sports. This study examined the effects of two distinct teaching methodologies in a basketball didactic unit (12 lessons): one focused on isolated technical exercises and the other on task-oriented activities centred on gameplay. A total of 32 students (15 females, 17 males), aged 16 to 19 years (mean $\pm$ SD: 17.50 ± 1.14 years), participated in the study. The traditional approach emphasised technical drills through repetition, while the game-based approach utilised conditioning games that integrated technical and tactical skills in realistic play scenarios. Performance was assessed using the Game Performance Assessment Instrument (GPAI), while motivation was measured through a Likert-scale questionnaire (1 to 5), administered pre- and post-intervention. Statistical analysis included the Kolmogorov-Smirnov test to assess data normality and Levene's test to verify homogeneity of variance. Pre- and post-intervention comparisons were conducted using the independent samples t-test, with effect sizes calculated using Cohen's d. The game-based methodology significantly improved all performance variables, including game involvement ($p < 0.001$, $d = 2.93$), decision-making ($p < 0.001$, $d = 1.56$), and technical execution ($p = 0.005$, $d = 1.02$), whereas the isolated technical approach showed no significant

improvements ($p > 0.05$). Motivation levels remained high in both groups, with no statistically significant differences ($p > 0.05$). Results indicated that the game-based methodology significantly improved all performance variables, including game involvement, decision-making, and technical execution. Conversely, the group subjected to the isolated technical approach showed no significant progress in these variables. Despite these differences in performance, both groups exhibited high levels of motivation, with no significant differences. Findings suggest that the game-centred methodology fosters better tactical understanding, skill integration, and overall performance, reinforcing the principle of “learning to play by playing.” To optimise inclusive and high-quality PE instruction, the adoption of hybrid models that combine both methodologies is recommended.

The relationship between external training load and competitive season phase in a defensive sectorial line of a Portuguese professional football team

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Conflict of interest: nothing to declare.

Funding: This work is supported by the National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Football players, particularly in defensive roles, face varying external loads during different types of matches. Aim of the study: This study examines how preparatory versus official matches affect external load in defensive players of a professional Portuguese football team. Using 18.18 Hz GPS tracking, we analysed data from seven players across six matches (three preparatory and three official) during the 2022/23 season in the Portuguese second league. Significant differences in external load were observed: official matches saw higher levels of high external work at low speeds (high-extwork +FORCE) ($U = 102.50$; $W = 312.50$; $Z = -2.96$; $p = 0.003$), indicating increased physical demands from factors like opponents, ball, and environmental conditions. Event bursts, representing acceleration events and concentric activities, were more frequent in official matches ($U = 121.00$; $W = 331.00$; $Z = -2.50$; $p = 0.013$). Additionally, accelerations in zone 2, with speeds between 12.80 and 18.20 km/h (ACCz2), were higher in official matches ($U = 114.00$; $W = 324.00$; $Z = -2.67$; $p = 0.007$). These findings highlight that official matches impose greater physical demands due to increased

competitive intensity, including more frequent duels and transitions. Thus, the study emphasises the need for specific training adaptations to prepare players for the higher intensity of official games, potentially improving performance and reducing injury risk.

Acknowledgments

Sporting Clube da Covilhã, Ricardo Ferraz and José Eduardo Teixeira.

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Maturation assessment in children and adolescents

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

The interval between birth and adulthood is commonly divided into age periods. The first year after birth is labeled infancy, which is followed by childhood. Childhood is usually subdivided into two phases, early and middle. The former approximates the preschool years, about 1 through 5 years of age. The latter approximates the elementary school years, about 5-6 through 10-11 years. The upper limit of middle childhood is arbitrary because it is followed by adolescence, which is variable in when it starts. Some fourth-grade girls, for example, who are about 9-10 years of age, have already entered the early stages of adolescence. The termination of adolescence is also quite variable so that it is also difficult to specify when adulthood begins. This way, maturation assessment is an important issue with sports practice by children and adolescents. They experience three interacting processes: they grow, mature and develop (Table I). These terms are often treated as having the same meaning. They are, however, three distinct tasks in the daily lives of children and adolescents for approximately the first two decades of life. The first process refers to physical size and proportion; the second refers to skeletal, reproductive, somatic, neuroendocrine and neuromuscular functions; and the third refers to cognitive, emotional, social, motor and moral issues (Malina et al., 2004).

Table 1. The child and adolescent as biocultural individuals. Interactions of Growth, maturation, and development (Adapted from Malina et al., 2004).

GROWTH	MATURATION	DEVELOPMENT

Size	Skeletal	Cognitive
Proportions	Sexual	Emotional
Physique	Somatic	Social
Composition	Neuroendocrine	Motor
Systemic	Neuromuscular	Moral
SELF-ESTEEM		
BODY IMAGE		
PERCEIVED		
COMPETENCE		

This text aimed to review the methods to assess the maturation of children and adolescents, describing their main characteristics, strengths and weaknesses. We performed a systematic review in May 2024 in the PubMed/MEDLINE, Sport Discus, Web of Science and LILACS databases, with no restriction on time. A total of 294 potentially relevant articles were identified, and seven met the inclusion criteria. We find that the maturation of the various organ systems occurs at different rates and times, leading us to conclude that the assessment of the state of biological maturity varies within the body system. The efficiency of a given strategy is directly linked to its ability to identify the different stages of sexual maturation. Systems most commonly used for evaluation of maturation are reproductive (sex) and somatic. Dental maturation (calcification and eruption) is occasionally used but tends to behave independently of the other three systems. Hormonal maturation influences all these aspects and should also be considered. However, skeletal maturity (bone age) seems to have more advantages in determining the maturational stage of youth than the others, even if they are in the peripubertal period.

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Can psychological competencies be diagnosed on football matches?

- Relations between match indicators and Resilience Scale

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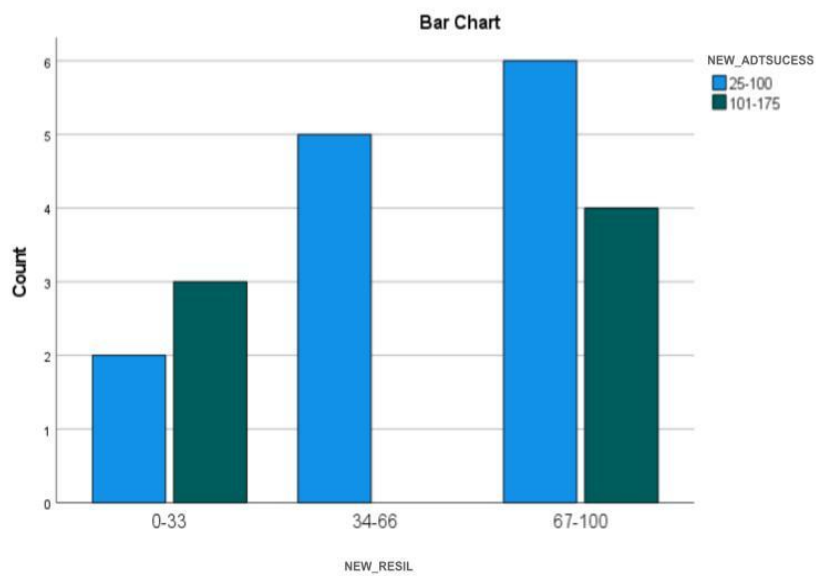
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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Understanding human behaviour in sports requires recognising that players' actions during a match also reflect underlying psychological competencies, which, naturally, can be linked to measurable indicators. This study explores the relationship between a specific match moment - attack-defence transition (ADT) - and resilience, assessed using the Portuguese version of the Resilience Scale (RS). A U14 male football team (n=20) participating in the 2023 Lopes da Silva Tournament (Portugal) was analysed across three matches. Results showed that, on average, players stopped or slowed their ball recovery actions in 22% of situations. Statistical analysis (Likelihood Ratio = 0.058; significance level = 0.10) suggests that individuals with moderate to high resilience scores tend to achieve greater success in ADT compared to those with lower resilience scores. These findings highlight the potential for match analysis to contribute to the assessment of psychological competencies, paving the way for further research on the interplay between psychological traits and in-game performance.

	N	Mean Rank
Negative Ranks	6	5.58
Positive Ranks	14	12.6
	% Maintained Intention - % Slowed Down/Canceled Intention	
Significance Level	0.007	



Association between genetic markers and non-contact ACL injury in female soccer players: a systematic review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Anterior cruciate ligament (ACL) injury is one of the most severe injuries in the soccer community, as it can result in prolonged absence from sport or even premature retirement (Nawas et al., 2023). Key risk factors for non-contact ACL rupture include the type of sport, sex, and genetic predisposition (Rodas et al., 2022). Injury risk is multifactorial, however, recent research on identifying risk factors predisposing individuals to injury has increasingly focused on genetic susceptibility (McAuley et al., 2022). Given the popularity of soccer and the anticipated growth in female participation, the incidence of ACL ruptures is expected to rise significantly shortly (Montalvo et al., 2019). In this context, ACL function and susceptibility to rupture are highly influenced by genetic variation (Rodas et al., 2022). This systematic review examines the association between genetic markers and the risk of ACL injury in female soccer players. Under PRISMA guidelines, a systematic review was conducted using the Web of Science, Scopus, and PubMed databases. A search string was applied to all the databases: (“soccer” OR “football”) AND (“anterior cruciate ligament”) AND (“genetics” OR “gene” OR “genotype” OR “snp” OR “polymorphism”). The inclusion criteria for these articles were: (1) original articles, written in English; (2) it was reported that female soccer players were included in their population sample; and (3) examined the association between a genetic variant and ACL injury. Sixty-five studies were initially identified, with 9 meeting the inclusion criteria for detailed analysis. The findings suggest that genetic factors are crucial in non-contact ACL injury susceptibility. Functional regions within ACAN, BGN,

DCN, and LUM may influence ligament fibril properties and ACL injury susceptibility. Additionally, VEGFA and KDR variants suggest a role for angiogenesis-associated signalling in ACL rupture pathophysiology. Variations in ACAN and BGN, including genotype, allele, and haplotype differences, may modulate ACL rupture susceptibility, whereas TNC variants showed no significant associations. The VEGFA rs2010963 polymorphism was significantly associated with ACL. Genetic polymorphisms such as COL5A1 rs13946 were linked considerably to ACL injury in female soccer players, while no significant associations were found for rs1800012, rs13946, rs240736, rs970547, and rs4870723. These findings underscore the complex genetic basis of ACL injuries, involving multiple genes influencing ligament structure, development, and regeneration. Nevertheless, additional research is essential to fully understand the underlying genetic mechanisms.

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Relationship between strength measures in young adults

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant numbers UIDB/04045/2020, PRT/BD/154638/2023, and BIPD/UTAD/7/2023, and project number UI/04045.

We analysed the relationship between strength parameters in young adults to access the magnitude of each parameter with a composite strength score. We recruited forty-five sport sciences students (12 women and 33 men; 20 ± 1 years; 69 ± 11 kg; 172 ± 9 cm) to perform strength tests and extracted the following variables: relative bench press strength, relative isometric mid-thigh pull peak force, relative isometric handgrip strength, countermovement jump height, squat jump height, standing long jump distance, and 3-kg medicine ball throw distance. We utilised the maximum values in each test and originated a composite strength score by averaging the Z scores of all tests (Z score = [participant score – sample mean] / sample standard deviation) (Maestroni et al., 2023). Pearson correlation coefficients (r) and coefficients of determination (r^2) were used to analyse the association between all strength measures, including the composite strength score. The results showed positive correlations between all strength parameters (all $p < 0.01$), with the strongest correlation being observed between countermovement jump and squat jump ($r = 0.93$) and the weakest between medicine ball throw and handgrip strength ($r = 0.38$). The composite strength score yielded r values ≥ 0.78 and r^2 values ≥ 0.62 with the strength measures. The countermovement and squat jumps had the strongest relationship with the composite strength scores ($r \geq 0.90$ and $r^2 \geq 0.81$). This study shows significant positive correlations between all included strength measures. Furthermore, the vertical jump tests revealed the strongest

association with the composite strength score, highlighting their relevance in representing the overall strength level in young adults.

Acknowledgments

We thank all participants included in this study.

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The effect of Dryland warm-up in water polo performance

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Warm-up routines have been studied in the last years, highlighting their crucial role in enhancing athletic performance across various sports (Gil et al.). Effective warm-ups not only optimise performance but also sustain these benefits throughout the competition (Silva et al.; Gil et al.). While coaches and players widely recognise the importance of pre-competition warm-ups in achieving optimal performance, scientific literature specifically addressing warm-up strategies in team sports, particularly water polo, remains limited. This study investigates the impact of Dryland warm-up (DWUP) versus no warm-up (NWUP) on water polo performance, aiming to address this gap in the literature and inform evidence-based coaching practices. Ten male water polo players at the national level (22.4 ± 3.53 years) randomly performed the match fitness test (WIST) (Mujika et al.). on two different days (48 hours between), after the usual DWUP or after NWUP. Blood lactate ([La-]) and heart rate (HR) were measured at baseline, before and after the performance test (WIST). The main results showed that the distance performed by athletes with the DWUP was not different from NWUP (226.5 ± 129.51 vs. 229.5 ± 74.18 m, $p = 0.911$, $d = 0.04$). Moreover, higher [La-] values were found after WIST without warm-up (15.26 ± 3.05 vs 12.62 ± 4.41 mmol/L, $p = 0.12$, $d = 1$). HR showed higher values before WIST assessment after DWUP (103.6 ± 15.49 vs 85.7 ± 18.49 bpm, $p = 0.03$, $d = 1.26$). This study demonstrated that the results of the NWUP condition are based on a superior response in the use of energetic pathways in water polo players, resulting in a greater reliance on anaerobic metabolism. This finding aligns with previous research in other sports, indicating a consistent effect of warm-up contribution on energy system pathways.

However, the increased anaerobic contribution in NWUP may lead to performance limitations. Based on the results presented, the DWUP condition seems to enhance performance. Therefore, it is recommended to perform the DWUP condition, as it effectively prepares the body for the demands of water polo, ensuring more efficient energy use during the game.

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Relationship Between Maximal Oxygen Consumption in Laboratory Testing and CrossFit WOD

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Maximal oxygen consumption ($\text{VO}_2 \text{ max}$) is a key determinant of aerobic capacity; however, its applicability to high-intensity functional training (HIFT), such as CrossFit, remains unclear (Wibowo et al., 2021). Traditional laboratory tests may not fully capture the physiological demands imposed by Workouts of the Day (WODs), raising questions about their predictive validity (Zeitz et al, 2020). This study examined the relationship between $\text{VO}_2 \text{ max}$ obtained through a standardised laboratory test (Lourenço et al, 1988) and VO_2 values recorded during a CrossFit WOD named “Fran” consisting of executing 21-15-9 repetitions of thrusters and pull-ups as fast as possible. Six CrossFit practitioners (mean age = 28.67 ± 7.29 years; mean weight = 72.17 ± 7.78 kg) had their respiratory gas exchange measured using a portable breath-by-breath gas analyser (VO_2 Master Health Sensors Inc., Vernon, Canada). A Mann-Whitney U was performed to compare VO_2 from the two conditions (Lab and WOD). Significant difference was observed between Lab and WOD ($U = 15.500$; $p = 0.042$). The analysis yielded a U-statistic of 15.500 and a p-value of 0.042, indicating a statistically significant difference between the two conditions. The VO_2 values obtained in a lab test differ significantly from those measured during a CrossFit WOD. The results suggest that lab-based $\text{VO}_2 \text{ max}$ testing may not fully capture the physiological demands of a WOD, highlighting the need for sport-specific metabolic assessments. The discrepancy between lab-based and field-based measures may be attributed to the intermittent high-intensity nature of functional training inherent to CrossFit workouts (Butcher et al, 2015). Future research should explore alternative assessment methods that better reflect the physiological requirements of CrossFit.

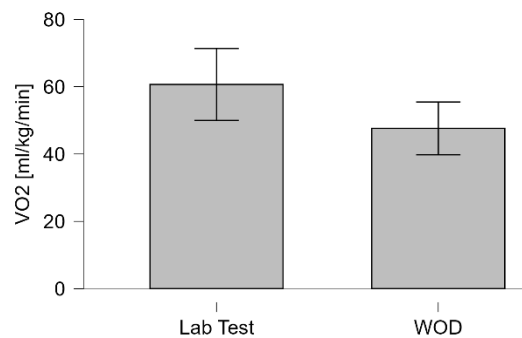


Figure 1. Mean and standard deviation of VO₂ [ml/kg/min] data for lab test and CrossFit WOD.

Acknowledgments

We would like to express our sincere gratitude to all the participants for their valuable contributions to this research study. All individuals included in this section have consented to the acknowledgement.

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Lactate response before and after a CrossFit WOD

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

CrossFit is a high-intensity sport that challenges both the cardiovascular system and anaerobic metabolism (Escobar et al, 2017). This study aimed to assess changes in blood lactate levels before and after a Workout of the Day (WOD) and investigate whether pre-exercise lactate levels can predict the physiological response post-WOD. Six CrossFit practitioners (mean age = 28.67 ± 7.29 years; mean weight = 72.17 ± 7.78 kg) had blood lactate samples collected before (Pre-WOD) and after (Post-WOD) a standardised WOD called “Fran” consisting of executing 21-15-9 repetitions of thrusters and pull-ups as fast as possible. Lactate concentrations were determined using the Lactate Pro analyser (Lactate Scout 4, Germany). Statistical analysis included a Mann-Whitney U test to compare the lactate levels from the two conditions (pre-WOD and post-WOD). A significant difference was observed between pre-WOD and post-WOD ($U = 36.000$; $p = 0.002$). The effect size, given by the rank biserial correlation, was 1.000, implying a strong effect. These findings indicate that post-WOD levels were significantly higher than pre-WOD, reinforcing the idea that physiological responses to the workout were markedly different between the two conditions. This result highlights the variability in metabolic responses, suggesting that factors such as individual fitness levels, training adaptations, or workout intensity may play a crucial role in post-exercise lactate accumulation (Tibana et al, 2019). Coaches and athletes should consider not only the pre-exercise metabolic state but also the workload and intensity of the WOD when prescribing and adjusting training.

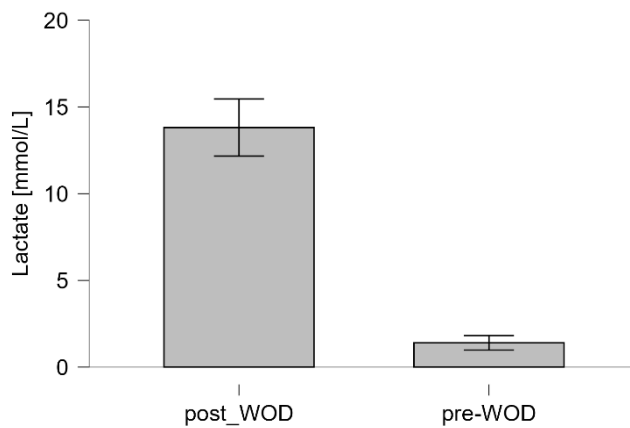


Figure 1. Mean and standard deviation of lactate levels pre- and post-WOD.

Acknowledgments

We would like to express our sincere gratitude to all the participants for their valuable contributions to this research study. All individuals included in this section have consented to the acknowledgement.

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Comparative study of lower limbs power and asymmetry in regional-level recreational cyclists on a power stage test performed on the bicycle

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Cycling is a sport characterised by a cyclical and repetitive movement pattern of the lower limbs, which are responsible for generating mechanical work. Therefore, the biomechanics of pedalling—precisely the force applied to the pedals and cadence, which determine power output—are key factors to consider in its analysis. Numerous studies have explored the relationship between power and force variables and the lower limbs (LL) during the specific cycling movement (e.g., Liu and Jensen, 2012). Some of these studies identified positive and significant correlations between lower limb asymmetries and performance, suggesting that cycling performance decreases as the differences between limbs increase. Therefore, the aim of the present study was to investigate the behaviour of asymmetry in pedalling power in each lower limb as exercise resistance increased.

Methods

The convenience sample consisted of five male regional-level cyclists, with an average age of 42.75 years (± 11.50). Data on lower limb power and asymmetry were collected through a progressive power stage test on the bicycle using Garmin Vector 3 pedals and a Tacx Neo 2T, reliable instruments for power measurements (Morais et al., 2024). The symmetry index (SI) was used to understand the level of symmetry/asymmetry.

Results and Discussion

The results indicated that the SI was greatest in the 100W stage ($-7.2 \pm 5.6\%$) and smallest in the 270W stage ($-1.6 \pm 1.2\%$). Negative values of SI indicate a predominance of the left limb. There was a consistent and significant decrease in the SI ($F=54.59$; $p<0.001$; $\eta^2=0.25$) with the power increase. In other words, as the power stage increased, the predominance of the left leg became less pronounced.

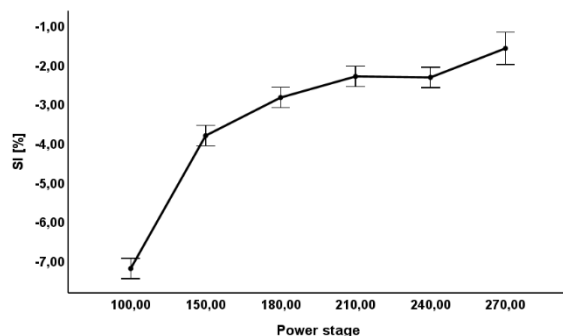


Figure 1. The symmetry index (SI) profile over the different power stages.

Conclusions

Regional-level cyclists presented an asymmetry with a predominance of the left limb. However, such predominance decreased with the power increase between 100 and 270W loads.

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In-season monitoring of single leg countermovement jump performance in youth basketball athletes: an exploratory study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The countermovement jump (CMJ) is widely used to monitor neuromuscular status in team-sport athletes (Claudino et al.). However, bilateral and unilateral CMJs differ in complexity, muscle recruitment, and the insights they provide. The single-leg CMJ (SL CMJ) imposes greater neuromuscular demand due to stabilisation requirements and allows for asymmetry detection. While bilateral asymmetry assessment in team-sports has been questioned regarding its link to performance deficits and injury risk (Afonso et al.), unilateral tests like the SL CMJ are more relevant for systematic monitoring, especially in sports with unilateral demands (e.g., basketball). This approach aids in designing training programs tailored to athletes' neuromuscular status. This study seeks to verify how an athlete's performance changes across the in-season with the CMJ as an assessment measure. Thirteen highly trained male basketball athletes (body mass: 82.6 ± 10.6 kg; height: 193 ± 6.6 cm) were recruited for this study. Each athlete trained on average, 733.84 ± 121 minutes per week and played 20.26 ± 6.5 minutes per game. Every fourteen days for 6 weeks (a total of 3 assessment time points), athletes performed 6 unilateral CMJs without arm swings (3 with the right leg, then 3 with the left leg) using the *Optogait* system. The data collection was carried out at the UCAM facilities (gym) in the early morning,

on match-day +2. Based on this data, the bilateral asymmetry index was calculated as described elsewhere (Bishop et al.). The Wilcoxon signed-rank test was used to assess differences between the assessment time points in different parameters (bilateral asymmetry, and SL CMJ height). A significantly lower SL CMJ height was recorded in the second assessment when compared to the third time point for the dominant leg ($Z = -2.197$; $p < 0.05$). Despite there being no differences in these six weeks of monitoring, when it comes to the asymmetry index, with the accumulation of training and playing minutes as well as possible minor injuries there is no guarantee that the same will be true for the remaining of the season. That's why the importance of monitoring shouldn't be understated and should be regular practice across the in-season.

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Unlocking the Training Process: How Different Training Tasks Shape the Physiology and Biomechanics of Professional Futsal Players

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Conflict of interest: No potential conflict of interest was reported by the author (s). **Funding:** nothing to declare.

This study aims to analyse and classify the physiological and biomechanical demands of different futsal training tasks in order to enhance the understanding of training task demands in elite futsal players' performance. Conducted over three seasons with a professional Spanish futsal team, the research meticulously categorised training exercises into six task categories: introductory, analytical, mid-court, $\frac{3}{4}$ court, full-court, and superiority/inferiority tasks. The WIMU PROTM device was used to monitor physiological and biomechanical metrics and to assess how task variations impact player workload. It was verified that superiority/inferiority tasks followed by full-court tasks showed significantly higher physiological and biomechanical loads when compared to introductory, analytical, and mid-court tasks. Interestingly, these variations occur due to higher ($p \leq 0.05$) values of heart rate average, total distance covered, and high-speed running by the minute for the physiological load and higher ($p \leq 0.05$) values of the number of accelerations, decelerations, and player load per minute for the biomechanical load. A visual 4-quadrant efforts assessment allowed the understanding of the contribution of each task category by the specific load distribution, revealing significant variations tied to player numbers, field

dimensions, and task objectives. These findings suggest that specific task configurations can be strategically used to optimise training outcomes by matching the physical demands according to staff goals.

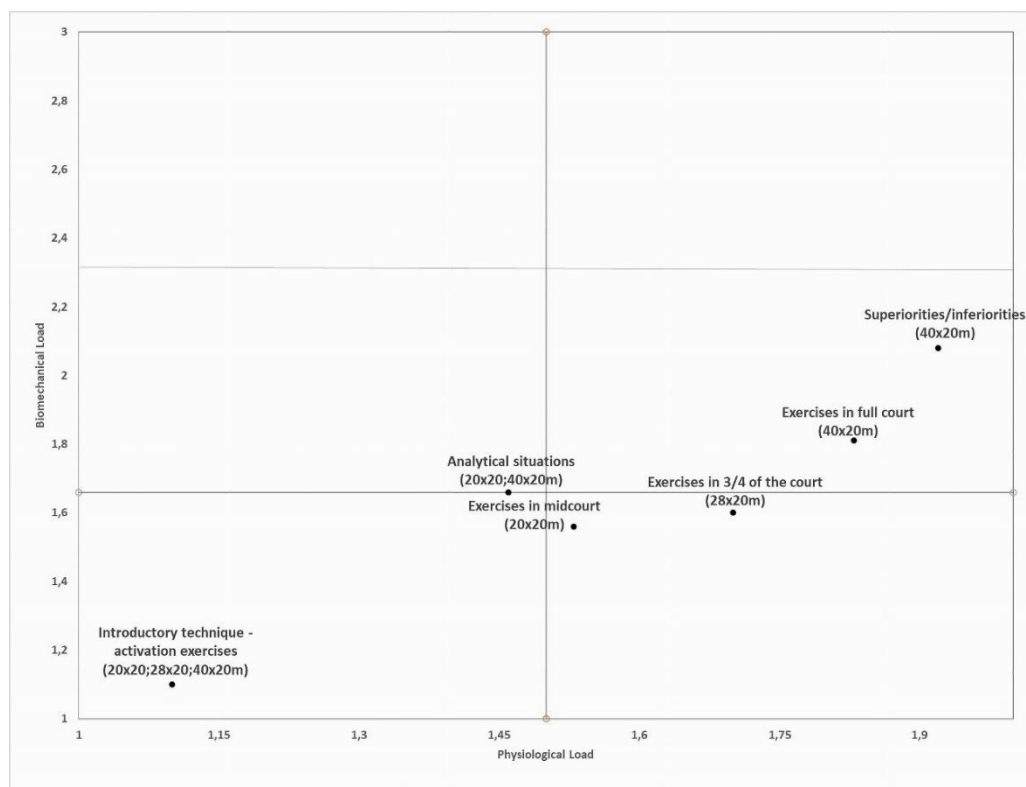


Figure 1. The physiological and biomechanical requirements of training demands are distributed across the quadrants.

Acknowledgments

Our thanks to the Erasmus+ For Teaching scholarships for promoting the relationship and possibility of collaboration between the authors.

Does video-based priming affect youth players' performance during small-sided games?

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Small-sided games (SSGs) can be manipulated to emphasise tactical and creative performance, yet the influence of external stimuli, such as video priming, on these behaviours remains unclear. This study examined the effects of video-based priming on tactical and creative performance in SSGs among youth football players. Twenty-four U14 players (age: 13.8 ± 0.4 years) participated in three experimental conditions: (i) CONTROL condition (standard 6-a-side SSG); (ii) OFFENSIVE priming, where players were exposed to a 4-minute video emphasising possession-based play before the SSG; (iii) CREATIVE priming, in which players' were exposed to a 4-minute video showcasing innovative individual actions before the SSG. Tactical and physical performance were assessed using GPS data, while technical and creative performance were evaluated through video analysis. Results showed that in the OFFENSIVE

priming condition, players demonstrated reduced variability in distances to teammates ($p = .008$, $ES = -0.42$), increased physical workload, and improved passing decision-making and execution ($p < .001$). Additionally, players in this condition displayed better body orientation and dribbling deception ($p < .001$). These findings suggest that maintaining ball possession requires effective space utilization, leading to increased physical demands. The CREATIVE priming condition significantly enhanced spatial exploration compared to both the CONTROL ($p = .024$, $ES = 1.14$) and OFFENSIVE ($p = .036$, $ES = 0.90$) conditions. Players also showed greater fluency and versatility in dribbling actions ($p < .001$), reflecting an increased emphasis on individual creativity. Players' creative performance during SSG seems to improve when exposed to creativity-focused stimuli, leading them to explore novel solutions during SSG (Santos et al., 2023). However, creative passing and shooting did not significantly improve, possibly due to the complexity of SSGs and the need for better task alignment to foster creative play. Despite that, creative passing and shooting were not significantly improved, possibly due to the complexity of contextualised SSGs and the need for task alignment to enhance individual creative behaviours (Furley & Memmert, 2018). These findings indicate that pre-task instructional videos influence players' tactical and creative behaviours during SSGs, suggesting that coaches can integrate video-based priming as a strategic tool to modify players' performance. From a practical perspective, coaches may use OFFENSIVE priming to reinforce structured play, enhancing passing accuracy and decision-making, while CREATIVE priming may encourage players to experiment with unconventional shooting techniques and expand their spatial awareness on the field.

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3RM vs 6RM back squat protocols impacts brain oxygenation responses to exercise

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., project number UIDB/04045/2020.

Sports athletes are required to execute complex technical movements with precision and efficiency during both training and competitions, often involving challenging multi-joint actions. The brain plays a crucial role in managing and coordinating muscle contractions to enhance overall performance. Literature reveals that the availability of oxygen in the brain significantly impacts cognitive abilities, thereby affecting athletic performance directly. Strength training is a popular exercise to boost performance and health, with high-load workouts inducing changes in cerebral haemoglobin consumption. Therefore, the aim of this study was to analyse the brain oxygenation responses to two strength back squat protocols. Eleven physically active individuals (30.1 ± 4.6 years; 77.6 ± 4.8 kg; 172 ± 3.1 cm) performed 3 (3RM) and 6 (RM) repetitions until failure in back squat, with 72h of rest between. Brain oxygenation response was analysed by NIRS to measure the concentration of oxygenated haemoglobin (O₂Hb), deoxygenated haemoglobin (HHb), and tissue oxygenation index (TOI) in the prefrontal cortex (PFC). The first, third and last repetitions were analysed in both protocols to understand the PFC responses at failure (last repetition of 3RM and 6RM) and non-failure (first repetition of both tests and third repetition of 6RM) efforts. O₂Hb was higher in 3RM than in 6RM in the first repetition (12.75 ± 4.76 vs 7.85 ± 4.67 μ mol/L), in the third repetition (16.45 ± 3.88 vs

9.88±3.12µmol/L) and in the last repetition (16.45±3.88 vs 11.35±4.45). No changes in HHb and TOI between tests. In both tests, O2Hb was higher in the last than the first repetition ($p<0.05$). The magnitude of the oxygenation response in the PFC is influenced by the loads used during exercise. These findings emphasise the impact of higher exercise intensities in inducing central changes in the activity of the brain.

Anthropometric Characteristics and Physical Fitness in Trained/Developmental Women Football Players: Normative Values Across Three Age Groups

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Conflict of interest: nothing to declare. **Funding:** 2023.01085.BDANA.

Performance measurement is key for optimising training and competition planning, providing essential data to improve athletic development (Bilge, 2012). Establishing sport-specific normative values based on age, gender, and background provides reliable and objective comparisons of an individual's values with their peers (Risberg et al., 2018). However, studies on female football players across different age groups remain limited compared to those on male players (Saavedra et al., 2017). This study aimed to compare anthropometric and physical fitness levels in trained/developmental women's football players across three age groups (U15, U19, and senior), providing normative values for each group. Eighty-seven female football players from amateur Portuguese clubs participated in the study, divided into two senior teams (n = 29, 21.5 ± 3.1 years), two under-19 (U19) teams (n = 30, 17.1 ± 1.1 years) and two under-15 (U15) teams (n = 28, 13.8 ± 0.9 years). Anthropometry measurements (height, weight, body

mass index (BMI)) and physical fitness tests (knee extension and flexion maximum isometric strength, countermovement jump (CMJ) and T-Test) were conducted. A Bayesian 1-way ANOVA was used to assess differences between groups. The results showed that (a) no considerable differences between the senior and U19 players in any variable, (b) strong evidence of differences between senior and U15 players in BMI, CMJ power, T-test and dominant leg knee flexion strength, (c) decisive evidence of differences between U19 and U15 players in knee flexion strength of both legs, and (d) no considerable differences in the knee extension strength across groups. These results suggest that U15 players are in a distinct developmental phase, requiring tailored training approaches. The normative values provided can serve as a reference for coaches and sports scientists working with female players in similar contexts. Limitations include the small sample size and lack of biological maturation data, which should be addressed in future research.

Acknowledgments

We sincerely appreciate the football teams and their athletes who generously volunteered their time for this study.

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Longitudinal study of executive function domains in early childhood: gym4petiz program

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Conflict of interest: Nothing to declare. **Funding:** This study was funded by the Foundation for Science and Technology, included in the scholarship with reference number 2023.03652.BD, by the Portuguese Football Federation and supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

In early childhood, an active lifestyle is associated with a healthier cardiometabolic, physical, and psychosocial profile, as well as improved motor and cognitive development, particularly in terms of executive function (EF). The Gym4PETIZ- Physical Exercise for Toddlers and Infants in Family is a gymnastics program for infants and toddlers that focuses on physical literacy to promote motor development, enhancing movement behaviours, motor competence, and creativity through movement. The main objective of the present study was to verify the variation of the 3 domains of EF over time in Gym4PETIZ program participants. The sample consists of 58 toddlers (4.03 ± 0.86 years), of whom 45% are girls and 55% are boys. The program was implemented 1 time a week for 12 weeks. EF was assessed through the Early Years Toolbox test. For the descriptive analysis, the percentages of relative changes (% Δ) were calculated as a function of the baseline (TP0) and the second assessment (TP1) [(TP1-

TP0)/TP0] *100. Analysis was carried out to compare means using the t-test for paired variables.

The means were higher at the TP1 (CI: 2.17±0.56 - %Δ 18.52±46.09; WM: 2.76±0.95- %Δ 29.72±64.77; CF: 9.31±2.87 - %Δ 12.01±60.27) compared to the TP0 (CI: 1.99±0.59; WM: 2.38±0.81; CF: 9.12±2.57), demonstrating favorable variations in all three domains. However, paired samples t-test revealed significant differences in 2 EF domains: IC (t = 2.112, p = 0.039); WM (t = 2.960, p = 0.004). Children participating in Gym4PETIZ showed significant improvements in EF over time, highlighting the importance of stimulating the different domains of EF through movement intervention, as well as the need for increased focus on the CF domain with activities that encourage alternative thinking strategies. This intervention should consider including more tasks that challenge children to shift perspectives, adapt to new rules, and explore multiple solutions. This approach can improve not only cognitive development but also problem-solving skills and adaptability, promoting a more holistic developmental trajectory in early childhood. The next step will be to conduct a longitudinal study with a control group in order to study the effect of the Gym4PETIZ intervention on EF domains.

Table 1. Descriptive analysis of TP0 vs TP1 performance values in Executive Function domains (inhibitory control, working memory and cognitive flexibility).

	TP0 M±SD	TP1 M±SD	T-Test	% Δ
IC	1.99±0.59	2.17±0.55	2.112*	18.52
WM	2.38±0.81	2.76±0.95	2.960*	29.72
CF	9.12±2.57	9.31±2.87	0.509	12.01

Legend: TP: Intervention over time; M – mean; SD – standard deviation; IC – inhibitory control; WM – working memory; CF – cognitive flexibility; TP0 – pre-test; TP1 – post -test.

The application of Storytelling and Aucouturier Method for the stimulation of movement and motor competence in preschool children: preliminary results of a systematic review.

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Conflict of interest: nothing to declare. **Funding:** This study was funded by the Foundation for Science and Technology, included in the scholarship with reference number 2024.01344.BD, by the Portuguese Football Federation and supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Aucouturier's method allows the child to express himself and learn through a "guided discovery", promoting movement and psychomotricity (Aucouturier, 2007). This discovery can be guided through Storytelling, which can be defined by the process of narrating a story that evokes the stimulation of creative body movements through 'acting out' the story (Duncan et al., 2019). With the increase of concern about issues related to the health and well-being of children and with the increase in research regarding how to stimulate movement through the day in schools, it becomes essential to understand what is already known about these methodologies and their effect on Physical Activity (PA) and Motor Competence (MC). Thus, the main objective of this systematic review was to verify what is known about the effect of storytelling and Aucouturier method interventions to promote PA or MC in preschoolers. An automated search was carried out in EBSCO (academic search complete, sportdiscus with full text), Scopus, Pubmed, ERIC and Web of Science, with key words: (storytelling OR "telling story" OR stor* OR "cuent* motor*" OR "Aucouturier Method" OR Aucouturier) AND ("motor skills"

OR "Motor competence" OR "fundamental motor skills*" OR "motor performance" OR "fine motor skills" OR "gross motor skills" OR psychomot* OR "physical activity" OR "physical exercise" OR movement) AND (Preschool* OR Kindergarten* OR "early childhood" OR "young child*"). Review studies, not empirical studies and articles where participants have some disorder or pathology were excluded. Only interventions focused on the promotion of physical activity or motor competence through storytelling or Aucouturier method in children aged between 3 to 5 years were included. From initial searches of electronic databases, 2939 studies that were exported to EndNote20. Duplicate articles were removed (n= 705), making a total of 2234 articles. After title, abstract and full article screening, 2206 were removed: i) not related to study focus (n=1041); ii) related with pathologies (n=672); iii) participants age group (n=59); iv) not empirical articles (n=253); v) reviews (n=180); vi) language (n=1). From a global child development perspective, only 28 articles included Storytelling or Aucouturier with a movement variable (PA or MC) (Figure 1). Of these 28 articles included, 25 only include Storytelling, 3 the Aucouturier method, but no study includes both simultaneously. For future studies and interventions focused on preschoolers' movement, the application of Storytelling and the Aucouturier method is suggested. Furthermore, the possibility of applying a combined method including Aucouturier and storytelling to promote PA and CM in early childhood is added, considering that no article applies these 2 methods simultaneously.

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Does environmental heat stress affect the locomotor activity of beach soccer players?

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology to Thiago Carvalho (2021.05.601.BD) and CIFI₂D, funded by the same foundation under the DOI <https://doi.org/10.54499/UIDB/05913/2020>.

Heat stress is a persistent concern in sports, mainly when the wet bulb globe temperature (WBGT) is > 28°C (Racinais et al., 2015). In soccer, for example, it can affect athletes' locomotor activity, including total distance covered (TD), high-speed running (HSR), sprints, and maximum speed ($V_{\max}$) (Nassis et al., 2015); however, in some cases, performance may remain unaltered (Loxton et al., 2019). Beach soccer, where championships commonly occur during summer, remains understudied (Scarfone & Ammendolia, 2017), and the effects of heat stress on players' locomotor demands remain unexplored. Thus, we examined the effect of environmental conditions on the locomotor activity of 60 beach soccer players in five official matches during the 2023 Portuguese elite championship season. TD, HSR (13.0 - 17.9 km·h⁻¹) distance and number, sprint (> 18 km·h⁻¹) distance and number, $V_{\max}$, distance accelerations (> 3.0 m·s⁻²), and decelerations (< - 3.0 m·s⁻²) were recorded using a 10-Hz wearable global

positioning system with a 100-Hz accelerometer integrated. WBGT parameters were measured continuously every two minutes during each match using the portable Kestrel 5400 Heat Stress Tracker. A one-way ANOVA for independent samples was conducted to compare the mean values of players' locomotor activity across the five environmental conditions. Locomotor variables were not different between environmental conditions ($p > 0.05$; Table 1).

Table 1. Mean $\pm$ Standard deviation of locomotor activity of the players and the effect of environmental conditions.

Locomotor activity	WBGT (°C)					p
	24	25	27	29	31	
DT (m)	1940 $\pm$ 468	1755 $\pm$ 644	1829 $\pm$ 711	1871 $\pm$ 505	2361 $\pm$ 705	0.21
HSR (m)	213 $\pm$ 75	134 $\pm$ 70	193 $\pm$ 105	160 $\pm$ 105	189 $\pm$ 114	0.27
HSR (n)	29 $\pm$ 11	19 $\pm$ 10	26 $\pm$ 15	21 $\pm$ 12	26 $\pm$ 17	0.27
Sprint (m)	30 $\pm$ 26	20 $\pm$ 21	35 $\pm$ 31	22 $\pm$ 29	34 $\pm$ 41	0.67
Sprint (n)	4.5 $\pm$ 3.4	2.8 $\pm$ 2.6	4.5 $\pm$ 3.3	3.3 $\pm$ 3.7	4.4 $\pm$ 1.5	0.69
V _{max} (Km/h)	20 $\pm$ 1.7	20 $\pm$ 1.7	20 $\pm$ 1.7	20 $\pm$ 2.4	20 $\pm$ 2.7	0.98
Accelerations(m·s ⁻²)	88 $\pm$ 46	79 $\pm$ 44	109 $\pm$ 61	76 $\pm$ 53	87 $\pm$ 52	0.53
Decelerations(m·s ⁻²)	104 $\pm$ 54	81 $\pm$ 43	112 $\pm$ 56	92 $\pm$ 53	103 $\pm$ 60	0.70

Elite beach soccer players seem to undergo similar locomotor demands even under environmental conditions with WBGT reaching 31°C. These findings suggest that beach sports athletes may be more heat-adapted due to frequent exposure to heat stress, which is characteristic of the competitive environment in these sports. Furthermore, frequent player substitutions and shorter match duration may facilitate the maintenance of locomotor performance under heat-stress conditions. Further research should consider each sport's specific context to understand better the effects of heat stress and possible athlete responses to different environmental conditions.

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Impact of different game-day priming strategies in physical and technical performance female basketball players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Basketball is a complex team sport that fuses explosive movement structures with various technical skills, such as rebounding, passing or basket shooting (Erculj et al., 2010). Game-day priming strategies may play an important role in match-day preparation and readiness. Although load dynamics and timing may vary, morning priming routines may promote delayed potentiation effect and enhance physical performance later in the day (Harrison et al., 2019). This study aimed to investigate the effects of various priming strategies (strength, STR; power, POW; and plyometric with change of direction, PLY+COD) on the physical and technical-tactical performances of female basketball players. Eighteen highly trained players (age: 19.66 ± 2.09 years; height: 176.11 ± 9.42 cm; body mass: 72.38 ± 12.03 kg) competing in the Spanish third division, who had a minimum of 3 years of experience with strength training, participated in the study. This study was conducted during the pre-season over a four-week period, with all sessions performed on the same day of the week. On each testing day, players completed one of four priming conditions: control (CON), STR, POW, and PLY+COD. Priming and afternoon assessment were separated by a 5-hour interval. In the CON group, participants remained seated and inactive for the entire priming period. The STR condition consisted of a high-load low-volume protocol, including the bench press ($3 \times 4-6$ repetitions at 80% 1RM) and the squat ($3 \times 4-6$ repetitions at 80% 1RM)

exercises. All repetitions were performed with maximal concentric velocity intent, with a two-minute rest interval between sets. The POW condition involved a low-load low-volume protocol, including also the bench press ($3 \times 4\text{--}6$ repetitions at 40% 1RM) and the squat ($3 \times 4\text{--}6$ repetitions at 40% 1RM). Players' performance was assessed using countermovement jump (CMJ), drop jump (DJ), the 5-0-5 test (CODs) test, and the modified medium and long-range shots test (TT). The statistical analyses were conducted using JASP software, with statistical significance set at $p < 0.05$. Our results indicate that the potentiation effects are dependent on the type of exercise, load dynamics, and the players' strength experience. While the CON group maintained physical and technical readiness, the POW was the only condition that elicited positive effects on physical (CMJ, COD and TT, $p < 0.05$). Interestingly, the STR and PLY+COD conditions impaired performance later in the day. This may be attributed to the players' low experience with high-load strength training and/or high-impact exercises, as well as the fact that the evaluation was performed during the pre-season, which may have also affected the results.

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Effects of a detraining period after a bench press training program with different velocity loss thresholds on strength gains

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Velocity loss (VL) is recognised as a metric that determines the level of effort attained during resistance training (Sánchez-Medina & González-Badillo, 2011). Prescribing a low-to-moderate VL should be sufficient for inducing strength gains in the bench press (BP) exercise (Pareja-Blanco et al., 2020). However, the residual effects of VL on strength gains after a detraining period have not been studied yet. Therefore, the aim of this study was to analyse the effects of two BP training programs with different VL thresholds (i.e., 25% vs. 50%) on strength gains after the intervention and a detraining period. Forty-nine strength-trained men followed an 8-week BP training program (16 sessions). Subjects were randomly allocated into two intervention groups that differed in the VL attained within the set (VL25: 25%; VL50: 50%). Both groups were matched in relative intensity (65-80% of one-repetition maximum, 1RM), inter-set recovery (4 minutes), and number of sets (3) in each training session. Performance was evaluated on three occasions: pre-training (PRE), post-training (POST), and after a 3-week detraining period (DET). The following tests were conducted within the same session: 1) progressive loading test and 2) fatigue test, both in the BP exercise. The following

variables were analysed: 1) 1RM; 2) mean propulsive velocity (MPV) achieved with the common absolute loads performed at PRE (AV); 3) MPV achieved with the common absolute loads lifted faster than $0.8 \text{ m}\cdot\text{s}^{-1}$ at PRE ($\text{AV}\geq 0.8$), 4) MPV achieved with the absolute loads lifted slower than $0.8 \text{ m}\cdot\text{s}^{-1}$ at PRE ($\text{AV}<0.8$) and 5) number of repetitions completed in the fatigue test (MNR). No significant ‘group $\times$ time’ interactions were observed. However, significant ‘time’ effects were found for all analysed variables. Both groups significantly improved strength performance (i.e., 1RM, AV, $\text{AV}\geq 0.8$, and $\text{AV}<0.8$) with no significant differences between groups at POST. After DET, both groups showed a decreased performance compared to POST but maintained significantly higher performance than at PRE. Despite the VL50 achieving a higher level of effort within the set and performing more repetitions than VL25, both groups obtained similar strength-derived adaptations after the training intervention. Although both groups declined BP performance after the detraining period, strength levels remained higher than pre-training values. These suggest that both low and high VL thresholds can induce BP strength gains, which are partially retained after short-term detraining.

Table 1. Changes in strength-derived variables from pre- to post-training for each group

	VL25			VL50			Time Effect <i>p</i> -value	group $\times$ time Interaction <i>p</i> -value
	Pre	Post	ReTest	Pre	Post	ReTest		
RM (kg)	67.4 $\pm$ 14.2	76.0 $\pm$ 12.0***	72.4 $\pm$ 11.2*** ^P	69.1 $\pm$ 14.8	79.2 $\pm$ 14.0***	76.0 $\pm$ 14.5*** ^P	< 0.001	0.55
AV ($\text{m}\cdot\text{s}^{-1}$)	0.73 $\pm$ 0.08	0.86 $\pm$ 0.10***	0.81 $\pm$ 0.09*** ^P	0.73 $\pm$ 0.09	0.89 $\pm$ 0.08***	0.84 $\pm$ 0.08*** ^P	< 0.001	0.30
$\text{AV}\geq 0.8$ ($\text{m}\cdot\text{s}^{-1}$)	1.09 $\pm$ 0.08	1.18 $\pm$ 0.09***	1.14 $\pm$ 0.10*** ^P	1.08 $\pm$ 0.08	1.22 $\pm$ 0.08***	1.19 $\pm$ 0.08*** ^P	< 0.001	0.10
$\text{AV}<0.8$ ($\text{m}\cdot\text{s}^{-1}$)	0.45 $\pm$ 0.08	0.61 $\pm$ 0.12***	0.55 $\pm$ 0.12*** ^P	0.44 $\pm$ 0.06	0.63 $\pm$ 0.08***	0.58 $\pm$ 0.09*** ^P	< 0.001	0.51
MNR (n)	11.1 $\pm$ 1.8	15.8 $\pm$ 2.9***	13.4 $\pm$ 2.9*** ^P	12.0 $\pm$ 2.6	17.3 $\pm$ 3.8***	15.0 $\pm$ 3.6*** ^P	< 0.001	0.75

P= significant differences between post and retest; 20= significant differences at this time between VL25 and VL50; Intra-group significant differences from pretraining: * $P\leq 0.05$, ** $P\leq 0.01$ *** $P\leq 0.001$

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Training-load response analysis for U16 women's basketball players in U18 training sessions

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Basketball is a high-intensity team sport which demands continuous accelerations and decelerations to create and maintain advantages (García et al., 2021). New technology micro-sensors have emerged to better assess physical demands and training load at different levels. However, there is still little knowledge about the influence of training with a higher age category for women's basketball players. This study aimed to analyse training load response for U16 women's basketball players in a micro-cycle with the U18 team. We analysed 12 U16 and 6 U18 women's basketball players in two U18-team consecutive training sessions of 90 minutes length for MD-3 and MD-1. Training load response was assessed through Polar Team Pro sensors and software (Kempele, Finland). Normality assumptions were tested using the Shapiro-Wilk test. Differences between the U16 and U18 groups were analysed with a T-test. The Effect Size (ES) was tested by Cohen's D. Jamovi 2.5.4 for Windows (Jamovi Project, Sydney, Australia) was used. Figure 1 shows box and violin plots for the U16 and U18 categories. There were no significant differences ($p < 0.05$) between categories. We found higher values for U16 in the autonomous nervous system load (RMSSD, 14.87 ± 6.79 vs 11.80 ± 3.26 , ES = 0.511), cardiovascular load (131.8 ± 31.13 vs 127.9 ± 59.9 , ES = 0.096), muscular load (327.9 ± 59.2 vs 303.1 ± 72.5 , ES = 0.393), and lower values for the training load (114.5 ± 28.5 vs 118.8 ± 42.9 , ES = -0.129). The U16 and U18 players had similar autonomous nervous systems, training, cardiovascular, and muscular loads. Training load

differences have been previously detected for the U18 and U16 categories (Vázquez-Guerrero et al., 2019). Still, many players of U16 categories are usually encouraged to train with U18 teams in Portugal, both because of competitive reasons or because of a need for resources (Forte et al., 2019). These results suggest that U16 players can manage U18 training sessions from a mechanical and physiological perspective. Future studies should consider larger samples and psychological load.

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Game-load response analysis for U16 women's basketball players in U18 competition

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Basketball requires continuous physical demands to create and maintain advantages (García et al., 2021), which could be difficult to manage by players of lower age categories when required to play in a higher age category due to a lack of human resources or because of competitive reasons, what usually happens in Portuguese women's basketball, especially in towns (Figueira et al., 2018; Forte et al., 2019). To evaluate these demands, new micro-sensors have emerged to make it more comfortable for players to use wearables in game-time situations at U18 men's levels (Vázquez-Guerrero et al., 2019). However, there is still little knowledge about the influence of playing competitive games with a higher age category for women's basketball players. This study aimed to analyse game load response for U16 women's basketball players with the U18 team. We analysed 4 U16 and 7 U18 women's basketball players in a U18 game in which both age categories played a similar amount of minutes. Training load response was assessed through Polar Team Pro sensors and software (Kempele, Finland). Normality assumptions were tested using the Shapiro-Wilk test. Differences between U16 and U18 groups were analysed with a T-test. The Effect Size (ES) was tested by Cohen's D. Jamovi 2.5.4 for Windows (Jamovi Project, Sydney, Australia) was used. There were no significant differences ($p < 0.05$) between categories. We found higher values for U16 in the RMSSD values (16.3 ± 7.27 vs 13.1 ± 5.21 , $ES = 0.519$) with a medium effect, and lower values for the cardiovascular load (211.3 ± 44.59 vs 231.1 ± 97.23 , $ES = -0.238$), muscular load (503.8 ± 247.73 vs 559.9 ± 535.0 , $ES = -0.207$), and training load ($167.8.5 \pm 45.00$ vs 186.7 ± 94.23 , $ES = -0.233$), with a small effect-size. We did not find significant differences ($p < 0.05$)

between minutes played for U16 and U18 groups (18.3 ± 15.55 vs 18.1 ± 12.85 , ES = 0.018, $p=0.512$). The U16 and U18 players had similar autonomous nervous systems, training, cardiovascular, and muscular loads. Since many players of U16 categories are usually encouraged to play with U18 teams in Portugal, both because of competitive reasons or because of a need for resources (Figueira et al., 2018; Forte et al., 2019), these results suggest that U16 players can manage U18 competitive games from a mechanical and physiological perspective. Future studies should consider larger samples and psychological load.

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The impact of high altitude on position-specific peak speed dynamics during soccer matches: a comparison with sea level performance

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While altitude can benefit sprint performances due to lower barometric air density (Girard et al., 2017), soccer players may experience performance decrements during 90-min matches at altitude due to reduced oxygen availability (hypoxia) (Wachsmuth et al., 2013), thereby impacting sprint performances. Therefore, this study compared peak match speeds in soccer played at sea level and high altitude (≥ 3000 m) over a 20-second window. Twenty-nine elite players were monitored across twenty matches using global navigation satellite systems. Raw speed (km/h) and time (milliseconds) data were collected to determine peak speeds, along with speeds recorded 10 and 5 seconds before and after peak efforts. Additionally, acceleration and deceleration data closest to peak speed were analysed. Cohen's d (with 95% confidence intervals) was calculated from independent mean differences to compare performances between the two playing environments. Significantly higher speeds were observed at sea level, both 5 seconds before ($d=0.26$ [0.02, 0.51], $p=0.034$) and at peak ($d=0.32$ [0.08, 0.57], $p=0.010$). Central defenders demonstrated higher speeds 10 seconds after peak efforts at sea level ($d=0.65$ [0.12, 1.24],

p=0.018) and greater deceleration magnitudes at high altitude ($d=-0.72$ [-1.31, -0.19], $p=0.010$). Fullbacks showed higher speeds 10 seconds before ($d=0.73$ [0.04, 1.54], $p=0.041$) and at peak ($d=0.72$ [0.03, 1.52], $p=0.045$) at sea level. Central midfielders experienced higher deceleration magnitudes at altitude ($d=-0.53$ [-0.97, -0.13], $p=0.011$), while forwards achieved higher peak speeds at sea level ($d=0.87$ [0.21, 1.66], $p=0.012$). These findings underscore the influence of altitude on soccer performance, particularly in how peak speeds are reached. Moreover, the varying effects across playing positions emphasise the need for position-specific strategies to optimise preparation and performance at high altitude.

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A novel approach to analyse agility tasks: highlighting the practical importance of identifying reaction time and movement time to improve training programs

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Agility is a critical component in team sports, encompassing rapid whole-body movements in response to stimuli. While different testing and training protocols have been provided regarding agility, practitioners need to identify specific challenges to develop specific strategies. Therefore, rather than viewing agility as a single entity, breaking it down into two distinct components – reaction time and movement time – can provide deeper insight into an athlete's performance. This narrative review intends to enhance the knowledge regarding reaction and movement times, providing testing and training strategies to specifically address each component. Reaction time refers to the interval between the presentation of a stimulus and the initiation of movement in response to it. Movement time, on the other hand, represents the duration between the start and the completion of the action. While reaction time is influenced by the type of stimulus and an athlete's anticipatory skills, movement time is determined by

neuromuscular coordination and the rate of force development. Understanding these differences is essential for designing effective training programs.

Moreover, by ecologically assessing these agility components, practitioners can classify athletes based on their performance. Those who struggle with reaction time (slow responders) may find it difficult to process and react to stimuli efficiently, while those with slow movement time (slow movers) may lack the necessary neuromuscular speed to execute their responses effectively. This classification allows for targeted training interventions. For a slow responder, incorporating drills that use sport-specific video stimuli can enhance decision-making and reaction efficiency. Meanwhile, a slow mover may benefit from a neuromuscular training program aimed at improving movement execution, though further research is needed to refine these methods. By segmenting agility into its fundamental components, practitioners can better identify athletes' specific needs and implement tailored training strategies to enhance performance in competitive settings.

The effect of CrossFit on Body Composition, Physical Fitness and Neural Efficiency – Study Protocol

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under project number UI/04045.

Nowadays, CrossFit is for anyone who wants to exercise and to improve their health, as well as in a more competitive aspect (Butcher et al., 2015). The training is based on functional movement, and all these are relevant to the daily lives of the athletes. Research into the practice of CrossFit shows positive results in several health parameters such as reduction in waist circumference, body composition (lean mass and fat), oxygen consumption and strength production (Eather et al., 2015). Besides physical and physiological components, there is the psychological part. So, it's important to investigate brain function, which, according to Cheron et al. (2016) brain activity is the basis of high-performance sports. Oscillations in the thalamocortical and hippocampal circuits, encompassing place cell physiology, provide a frame of reference for analysing delta, theta, beta, alpha, and gamma oscillations marked in the spatial field of human performance. This investigation aims to analyse the effects of the CrossFit training methodology on the variable body composition, physical fitness and neural efficiency, in physically active people who participate in the modality. In the body composition, the purpose is to analyse lean mass, fat mass, fat-free mass and visceral fat. In physical fitness, research will focus on maximum strength (1RM) and cardiorespiratory endurance (VO₂ max). Improvements in body composition and cardiorespiratory capacity at different levels of physical fitness are also highlighted by Glassman (2007). Finally, we will look at the variable of neural efficiency, analysing brain activity

(EEG). In this one, we intend to investigate neural behaviour during the execution of movements through electroencephalography, and this type of instrument has proven to be very useful for researchers in the field of sports psychology, offering important data for athletes' performance. The study involves implementing a training program 3 times a week, based on the CrossFit methodology, lasting 16 weeks of training, followed by 4 weeks of detraining. The sample will consist of male and female elements, aged between 18 and 60, and with experience in the modality. Body composition, physical fitness and neural efficiency of 2 groups will be assessed, before, after 12 and 16 weeks. The goal of this research is to determine whether with the application of the training methodology, there are changes in body composition parameters, physical fitness levels and understanding which brain areas are most active during the execution of a movement.

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Physical and Physiological Determinants of Motorcycling Performance: A Systematic Review

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the Portuguese Foundation for Science and Technology, I.P., under grant number BIPD/UTAD/7/2023 and project number UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>)

Competitive motorcycling demands exceptional physical and physiological capabilities to manage extreme conditions during racing (D'Artibale et al., 2018). While several studies have explored specific aspects of these demands, a comprehensive understanding of the interplay between physical and physiological determinants remains incomplete. Consequently, optimising training programs and recovery strategies necessitates an in-depth analysis of these variables. This systematic review aimed to identify the key determinants of motorcycling performance by analysing anthropometric, muscular, cardiovascular, and metabolic variables. A comprehensive search was conducted in accordance with PRISMA guidelines using PubMed, Web of Science, and Scopus, identifying 15 studies that met the inclusion criteria and focused on male riders engaged in competitive motorcycling. The variables analysed included anthropometry and body composition, muscular strength, cardiovascular fitness, and metabolic responses, such as blood lactate and heart rate. The results revealed that i) riders exhibit higher muscle mass and lower body fat percentages compared to active control groups (e.g., motocross riders demonstrated an average muscle mass percentage of 41.6% compared to 38.7% in national-level riders, while body fat ranged from 12.5% to 15.1% in elite athletes, significantly lower than in other active groups), optimising their power-to-weight ratios for performance; ii) handgrip strength seems critical

for maintaining control and performance on the bike and significantly decreases post-race; iii) cardiorespiratory fitness emerges as a key determinant, with maximal oxygen uptake ($\text{VO}_{2\text{max}}$) values often exceeding 50 ml/kg/min and heart rates regularly surpassing 90% of HR_{max} during races; and iv) high metabolic demands were highlighted by blood lactate levels ranging from 4.0 to 6.5 mmol/L post-race, emphasising the sport's reliance on anaerobic metabolism during high-intensity actions. This review highlights the importance of tailored training regimens to enhance competitive riders' strength, power, endurance, and recovery strategies. Research gaps remain in understanding the influence of strength and conditioning training programs on acute and long-term physical and physiological adaptations in motorcycling athletes. Future research should explore these aspects to refine training methodologies and improve outcomes for competitive riders.

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Injury Risk Prevention and Monitoring and Well-Being in Young Sub-Elite Football Players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Despite advancements in sports science, research on performance optimisation and injury prevention in football has mainly focused on elite athletes, leaving a gap in the study of sub-elite players. These athletes face similar demands but often lack access to high-level resources, increasing their susceptibility to inadequate training loads and injury risks. Additionally, sub-elite football environments frequently present inconsistent coaching, inadequate recovery protocols, and limited sports science support, widening the gap in player development (Nässi et al., 2017). Traditional performance metrics emphasise physical parameters but often fail to integrate tactical and technical factors. Small-sided games (SSG) improve decision-making, tactical awareness, and technical execution while addressing sub-elite training constraints (Matos et al., 2023). Sub-elite players endure high match and training loads without proper monitoring. Unlike elite athletes, who benefit from personalised workload management, sub-elite players often follow generic programs that neglect individual physiological responses. Structured periodisation is crucial, as excessive load accumulation without adequate recovery increases injury risk and compromises performance. Artificial Intelligence (AI) and Virtual Reality (VR) offer opportunities to enhance performance analysis and injury prevention. AI-

driven models optimise training loads and assist in workload distribution. VR-based interventions create controlled environments where players engage in decision-making and tactical execution with minimal physical strain. However, the effectiveness of these technologies in sub-elite football remains underexplored, requiring further research.

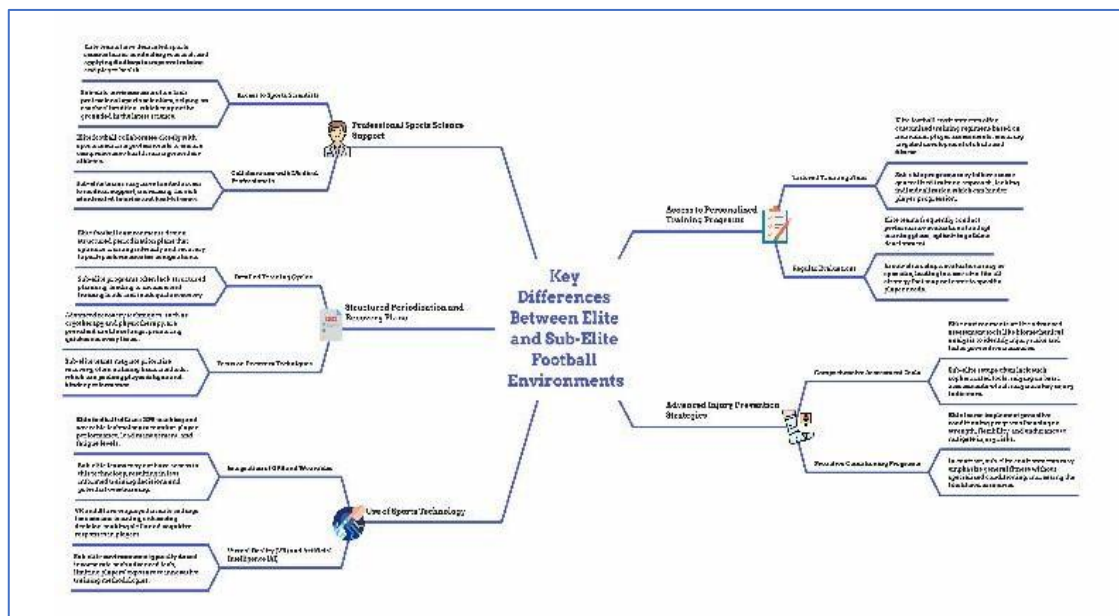


Figure 1. Key differences between elite and sub-elite football.

A mixed-methods approach will integrate quantitative and qualitative data collection. Player performance will be analysed using GPS tracking, wellness questionnaires (Hooper Index, TQR), and tactical assessments (Fut-Sat). AI-driven analytics will help predict injury risks and optimise training load distribution. Additionally, a subgroup of players will engage in VR-based tactical training interventions, assessed through game performance metrics and qualitative feedback from athletes and coaches. This study will explore how these technologies influence cognitive processing and adaptability in real-game scenarios.

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Effects of Different Velocity Loss Thresholds in Full Squats With and Without Blood Flow Restriction on Muscle Hypertrophy

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Conflict of interest: nothing to declare. **Funding:** This study was funded by the Ministerio Español de Innovación y Ciencia (AEI/10.13039/501100011033; grant reference PID2020-117915RA-I00) and by the Ministerio de Universidades [MCIN/AEI/10.12039/501100011033] through the grant [FPU19/00891] for University Professor Training.

Blood flow restriction resistance exercise (BFR-RE) has gained attention for its ability to enhance muscular adaptations by accelerating fatigue mechanisms (Hughes et al., 2017). Recent research suggests that velocity loss (VL) can help standardise effort levels among athletes, regardless of blood flow conditions [free flow (FF) vs. restricted (BFR)] (Sanchez-Valdepeñas et al., 2025). However, no prior studies have investigated the long-term effects of a specific VL threshold in BFR-RE compared to FF-RE. Therefore, this study aimed to examine the effects of four full-squat (SQ) training programs that varied in blood flow condition (FF vs. BFR) and VL per set (20% vs. 40%) on muscle hypertrophy. Fifty-two strength-trained men completed an 8-week (16-session) SQ program, progressing from 55% to 70% of their 1-repetition maximum (1RM) (FF20: n=14; BFR20: n=13; FF40: n=12; BFR40: n=13). All groups performed three sets per session with a 2-minute inter-set recovery period. In the BFR condition, a 50% arterial occlusion pressure was applied and maintained during rest intervals. To assess the intervention's effects, the cross-sectional area (ACSA) of the vastus lateralis was measured at 75% of femur length. While no significant BFR×VL×time interaction was found, a significant BFR×time

interaction ($p = 0.02$) favoured the BFR condition for ACSA. Except for FF20, all groups showed significant ACSA increases. Thus, under equivalent training conditions, BFR-RE enhanced muscle hypertrophy more effectively than FF.

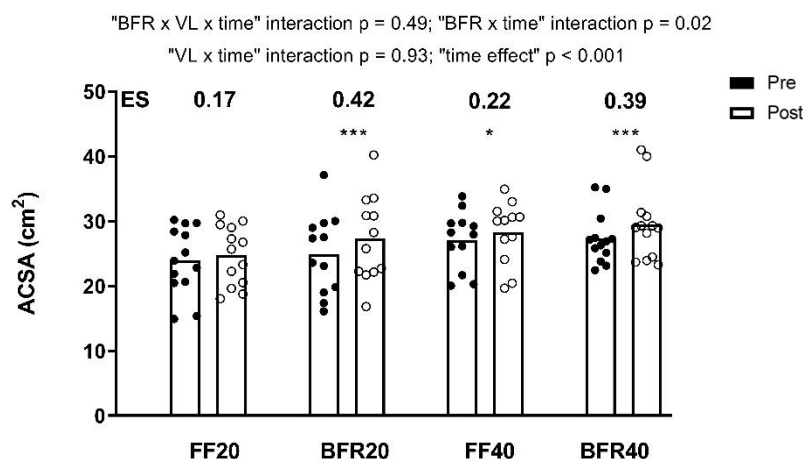


Figure 1. Changes in vastus lateralis cross-sectional area (ACSA) after full-squat training under different blood flow conditions and velocity loss thresholds. ES: effect size; FF20: 20% velocity loss (VL) per set with free flow (FF); BFR20: 20% VL per set with blood flow restriction (BFR); FF40: 40% VL per set with FF; BFR40: 40% VL per set with BFR. Intra-group differences from Pre- to Post-intervention: * $p \leq 0.05$, *** $p \leq 0.001$.

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Weekly Training External Load and Match Demands in Female Futsal Players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

While women's futsal has grown significantly in recent years, the weekly training external load and match demands in female futsal players remain underexplored in the literature (Lago-Fuentes, 2020; Armendáriz, 2024; Barreira, 2024). This study aimed to analyse the weekly training external load and match demands in female futsal players during the season. A retrospective descriptive study was designed. Training and match load data, including, acceleration (ACC), decelerations (DEC), and changes of direction (COD) (i.e., all the data was analysed per minute of the effective time), of eight female players (age: 24±4 years old, body mass: 59.9±6.9 kg, body fat: 24.7±4.1%), competing in the 2nd Division of Spain, were collected using an accelerometer device (model: Catapult S7 Vector; Catapult; Melbourne, Australia) during the season 2022-2023. Pre-season period, in-season microcycles without an official competition, and non-official games were excluded from the analysis. All the training

and match sessions included warm-up, technical, passing, and finishing drills, small-, medium-, and large-sided futsal games, and physical conditioning training. Throughout the analysed period, players had one official game during the week (e.g., Saturday [N=51 observations] match day [MD]) at “home” or “away” and trained 3 times per week: Monday (+2 MD) (N=30 observations), Tuesday (-4 MD) (N=38 observations) and Thursday (-2 MD) (N=43 observations) and all the procedures were approved by the Local Ethics Committee with the registration number CE072008 and conducted according to the Declaration of Helsinki. A statistical package (Jamovi, version 1.8, 2021) and linear mixed model was used for the statistical analysis. Players performed significantly more ACC and COD (total and across all intensities) as well as total and low-intensity DEC actions on MD when compared to +2 MD ($p=0.001$). In addition, players performed significantly more ACC and COD (total and across all intensities) and total and low-intensity DEC on -4 ($p=0.001$) and -2 MD ($p=0.004$) when compared to +2 MD. Non-significant differences were found between MD and -4 MD, however, players performed significantly more total ACC ($p=0.021$) as well as total ($p=0.014$) and low-intensity ($p=0.017$) DEC on MD when compared to -2 MD. Lastly, player did more total DEC ($p=0.17$), and total ($p=0.002$) and low- ($p=0.008$) and high-intensity ($p=0.001$) COD on -4 MD when compared to -2 MD. In summary, MD, -4 and -2 MD had a significant higher external load when compared to +2 MD. Interestingly, MD did not have any difference with -4 MD, nevertheless when compared to -2 MD players did more ACC and DEC. Furthermore, -4 MD seems to have more DEC and COD when compared to -2 MD.

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Optimal Weekly Training Load for Peak In-Game Performance in Elite Brazilian Soccer

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This study aimed to determine the optimal training load during periods of fixture congestion, ensuring a proper dose-response effect to maintain performance levels. Data on match performance and preceding training loads (both N = 498 cases) were gathered using the Catapult VECTOR7 system from 36 male professional soccer players (23.5 ± 5.2 years; 178 ± 4 cm; 75.5 ± 6.0 kg) of a Brazilian First Division

team during the 2022 season. Performance metrics included jump, acceleration, deceleration, change of direction (COD), metabolic power-related running distances at various intensities (>20 , $>20\text{--}35$, $>35\text{--}45$, $>45\text{--}55$, and $>55\text{ W kg}^{-1}$), total distance (m), relative distance (m/min), running distances at different speeds (>20 , >25 , and $>30\text{ km/h}$), number of sprints ($>25\text{ km/h}$), and maximum speed (km/h). A combination of mixed linear models (MLM), decision tree regression (DTR), and K-means clustering (SPSS v.26) was applied to identify key training load variables influencing match performance. The results indicated that training load significantly affects game performance in a specific manner. The analysis using MLM and DTR revealed that an interference effect occurs when high loads of different skills, such as straight-line running, changes of direction, accelerations, and decelerations, are applied within the same training block. Additionally, cluster analysis indicated a dose-dependent relationship between training load and game performance, with high-intensity running loads ($>55\text{ W/kg}$) being associated with better speed and sprint indicators ($>25\text{ km/h}$ and $>30\text{ km/h}$), while excessive deceleration loads negatively impacted the total distance covered. Furthermore, the clustering approach combined with chi-squared tests revealed significant dose-dependent associations between training loads and performance outcomes. Despite the observed interference effect between certain training stimuli, elevated training loads positively influenced match performance. The study presents an optimal training approach during congested schedules, highlighting how high-intensity physical preparation can be structured to maximise performance while mitigating adverse interactions between different physical demands.

Effects of progressive or stable velocity loss programming in the bench press exercise on muscle hypertrophy

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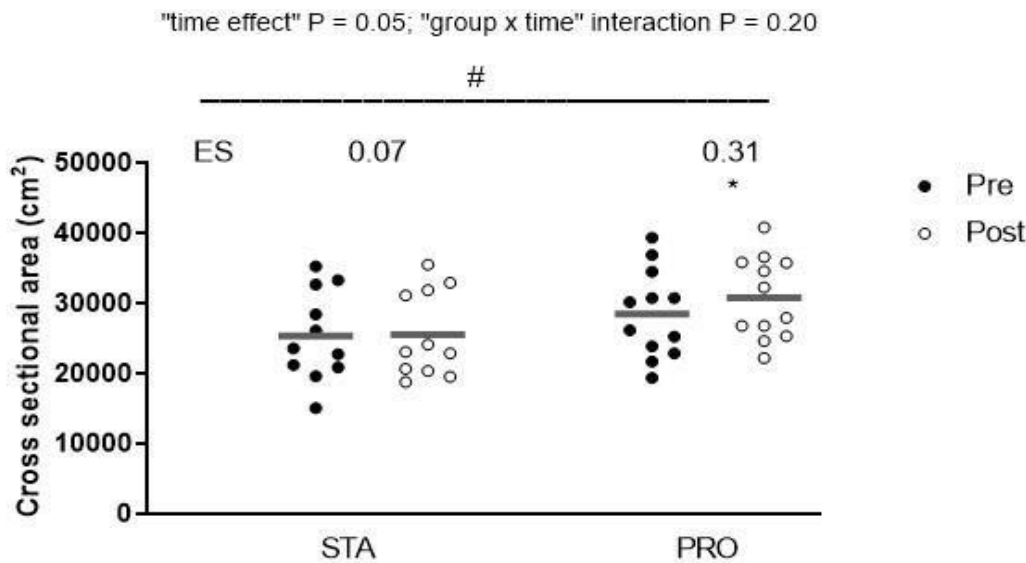
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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Velocity loss (VL) is considered a key variable to determine the adaptations on strength and muscle size during resistance training (RT) programs (Pareja-Blanco et al., 2017; Rodríguez-Rosell et al., 2020). In this sense, the effects of manipulating different VL thresholds during RT have received research attention (Myrholm et al., 2023; Pareja-Blanco et al., 2020; Rodiles-Guerrero et al., 2022). These studies have prescribed a constant VL threshold within the set throughout RT interventions. However, how variations in VL during the RT programs would affect muscle hypertrophy has not been studied. Therefore, the aim of this study was to compare the effects of programming a stable VL threshold compared to progressive VL thresholds for each relative load on muscle hypertrophy. Twenty-three resistance-trained men were randomly assigned to two training programs that differed in the VL evolution for each relative intensity (STA: stable VL; PRO: progressive VL). Subjects followed 15 bench press sessions during 8 weeks with matched intensity (65%-75% 1-RM), sets (3), average VL (25%), and resting time (4 minutes). STA performed all RT sessions with a 25% VL, and PRO performed the following progression with every relative intensity: 0%, 12.5%, 25%, 37.5% and 50%VL. Before and after the RT program, the pectoralis major's cross-sectional area (CSA) was assessed. After the training program, a “time effect” was observed ($p < 0.05$). Despite no “group x time” interaction being found ($p > 0.05$), only the PRO intervention obtained significant increases in muscle hypertrophy ($p = 0.02$). Although no significant differences were observed

between groups, only the PRO intervention was effective in inducing muscle hypertrophy.



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Effect of Three Rewarming-up Protocols on 100m Freestyle Turning Times in Competitive Swimmers

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Conflict of interest: nothing to declare. **Funding:** Foundation for Science and Technology (FCT), I.P. (2022.14676.BD: UIDB/04045/2020)

INTRODUCTION

Sports warming up is a well-recognised and researched practice that can benefit athletes' performance and prevent injuries. Many coaches point out the transition phase between warm-up and competition as one of the moments that pose obstacles to the performance of athletes, and a rewarm-up may be one of the strategies to mitigate the loss of the benefits achieved during the warm-up. The present study investigated the effects of three rewarming-up protocols (Control, Water and Dryland) on the swimming turns during a 100m Freestyle time trial.

METHODS

The study included 20 male volunteer swimmers, aged between 16 and 27 years (Mean = 18.30 ± 2.77 yrs). The sessions were conducted with a 24-hour interval between them. The athletes started the sessions with a Dryland warm-up (10 min) and a 1200m warm-up in the pool (25 min). During the

Transition Phase, athletes had 15 minutes to change into their swimming suits and began the rewarm-up that was randomly assigned to them. Then, they wore their uniforms (t-shirt and shorts) and went to the call room (20 min). The athletes did not rewarm-up in the Control session, remaining seated and equipped for 5 minutes. In the Water session, athletes performed a warm-up in the pool (50m Build-up, 20m Build-up, 20m Race Pace, 10m A1, 25m A1, 15m Build-up, 10m Race Pace, 50m A1) @1.30. In the Dry session, athletes performed 3 sets of: 3x medicine ball (4kg) throw downs + 3x tuck jumps @1 min. Turn time was calculated considering the 5 meters approaching the wall and the following 10 meters. Differences between variables were determined by repeated measures ANOVA test ($p \leq 0.05$), and differences between groups were calculated using Post Hoc, applying the Bonferroni correction.

RESULTS

We observed a tendency for a progressive increase in the average values of turning times in the three protocols over the distance. In the Water protocol, times present a minor variation and lower values, while higher values are presented in the Control protocol. No differences were shown between conditions in turning times. However, as the distance increases, the comparison effect also appears to increase, although in the first and second turning times (TT1, TT2) the effect was small ($\eta^2=0.026$, $\eta^2=0.027$) and in the third turning time (TT3) the effect was medium ($\eta^2=0.055$). The effect would be demonstrated by comparing Control vs. Water (TT1 $p=1$, TT2 $p=0.700$ and TT3 $p=0.602$).

Table 1. Mean values and respective standard deviations of the recorded turning times, as well as ANOVA and post-hoc test results.

95% Interval de Confidence			ANOVA			Post-hoc	
		(Mean $\pm$ DP)	F	P	η^2	Comparison	p
TT1	Control	8.18 $\pm$ 0.41	0,510	0,604	0,026	Control vs. Water	1,000
	Water	8.15 $\pm$ 0.38				Control vs. Dryland	1,000
	Dryland	8.15 $\pm$ 0.43				Dryland vs. Water	1,000
TT2	Control	8.34 $\pm$ 0.48	0,521	0,598	0,027	Control vs. Water	0,700
	Water	8.29 $\pm$ 0.48				Control vs. Dryland	1,000
	Dryland	8.31 $\pm$ 0.54				Dryland vs. Water	1,000
TT3	Control	8.84 $\pm$ 0.52	1,114	0,339	0,055	Control vs. Water	0,602
	Water	8.76 $\pm$ 0.47				Control vs. Dryland	0,913
	Dryland	8.78 $\pm$ 0.50				Dryland vs. Water	1,000

Note: TT, Turning Time

CONCLUSION

The results show that the turning times increase as the distance increases, probably due to fatigue. Performing a rewarm-up seems to contribute to better performances in turns, with the water rewarm-up seeming to bring more advantages, since times were lower, probably due to better technical balance during the race, which may have resulted from the specific technical work carried out during the protocol.

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Characterisation of Jumping Performance in Young Female Volleyball Players Across Age Groups

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Conflict of interest: nothing to declare. **Funding:** This work was supported by national funds (FCT–Portuguese Foundation for Science and Technology) under the project UIDB/DTP/04045/2020.

Volleyball performance is influenced by multiple physical and maturational factors (Lidor & Ziv, 2010), yet how these characteristics differentiate between competition levels remains unclear. Therefore, this study aimed to compare anthropometric characteristics and lower limb strength and power between two groups of young female volleyball players. A total of 30 players were assessed and divided into two age groups: U13 (n=15, age: 12.23 ± 0.23) and U18 (n=15, age: 17.22 ± 0.18). Body mass, height, and sitting height were measured, while maturity offset, and peak height velocity were estimated. Countermovement jump, squat jump, drop jump (reactive strength index) were used as lower limb strength and power tests (figure 1). All anthropometric measures and tests were recorded in the same day, prior to their major competition, in the same order as they are described. Statistical analyses were conducted using SPSS v29. Normality was assessed with the Shapiro-Wilk test. Independent samples t-tests were applied to normally distributed variables, while the Mann-Whitney U test was used for non-normal distributions. Effect sizes were calculated using Cohen's d and interpreted according to standard guidelines (Hopkins, 2002). Results indicate that although significant anthropometric differences exist, they do not necessarily translate into superior lower limb strength, power, or jumping ability in this sample. Given that the study was conducted on athletes from a single club, caution is needed when generalising these results to a broader population. The lack of significant differences in the jumping tests indicates that maturation alone is not sufficient for increasing jumping ability. Coaches should

implement targeted training programs to enhance key performance attributes in young female volleyball players.

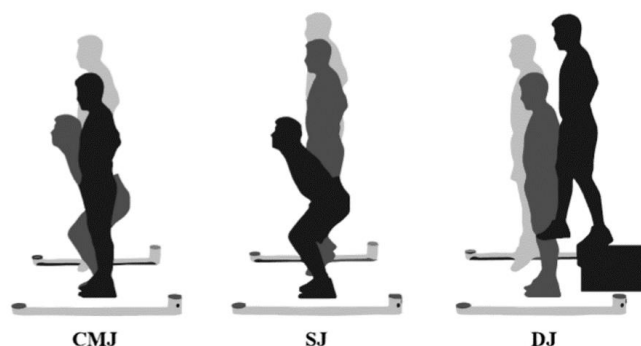


Figure 1. Illustration of the lower limb strength and power tests

Table 1. Independent Samples t-tests and Mann-Whitney U Tests

Variable	Test Used	Statistic	p-value	Effect Size [descriptor]
Body Mass	t-test	-3.412	0.003*	0.85 [Large]
Height	t-test	-8.844	<0.001*	0.67 [Moderate]
Sitting Height	t-test	-5.000	<0.001*	0.68 [Moderate]
Maturity Offset	t-test	-11.492	<0.001*	0.85 [Large]
Peak Height Velocity	t-test	-10.824	<0.001*	0.39 [Small]
CMJ Height	t-test	-1.531	0.136	0.26 [Small]
SJ Height	t-test	-0.839	0.408	0.15 [Trivial]
Decimal Age	Mann-Whitney U	240.000	<0.001*	2.72 [Very Large]
DJ Height	Mann-Whitney U	155.000	0.166	0.52 [Moderate]
Power	Mann-Whitney U	140.000	0.429	0.29 [Small]
RSI	Mann-Whitney U	134.000	0.580	0.20 [Small]

Note: CMJ=Countermovement jump; SJ=squat jump; DJ=drop jump; RSI=reactive strength index; *statistically significant differences ($p<0.005$).

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Clustered Lifestyle Profiles of Adolescent Football Players: Unpacking the Relationship between Off-Training Lifestyle and Training Performance

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Globally, a significant proportion of adolescents fail to meet the recommended physical activity (PA) guidelines, spending excessive time in sedentary behaviours (SB) (Guthold et al., 2020). Despite engaging in structured training, youth athletes are not exempt from this issue, particularly during off-training periods (Exel et al., 2018), which may negatively impact their physical and technical-tactical performance. Therefore, this study aimed to classify young football players based on their off-training PA and SB profiles and assess their impact on performance during small-sided games (SSG). Thirty-four adolescent male football players (14.2 ± 0.8 years) competing in the under-15 category were monitored over one week using tri-axial accelerometers to quantify PA and SB. Based on their movement profiles, players were classified into two groups: Active (higher moderate-to-vigorous PA and lower SB) and Sedentary (higher SB and lower PA). Two teams were formed from the Active group

(ACT), while two teams were formed from the Sedentary group (SED). These teams competed in SSG under three conditions: I_{ACTvsACT}, II_{ACTvsSED}, and III_{SEDvsSED}. Cumming estimation plots revealed that ACT players in I_{ACTvsACT} covered greater distances at jogging ($d=-0.69$), running ($d=-1.33$), and sprinting speeds ($d=-1.26$), with a higher player load ($d=-1.28$), but exhibited reduced walking distances ($d=0.79$) and fewer decelerations ($d=-0.44$), successful shots ($d=0.87$), passes ($d=1.17$), and dribbles ($d=0.89$) compared to the other conditions. SED players in III_{SEDvsSED} demonstrated increased running distances ($d=0.76$) and more decelerations ($d=0.7$) but completed fewer passes. Bayesian ANOVA confirmed significantly higher total distances and sprint occurrences in I_{ACTvsACT} compared to III_{SEDvsSED}, with Bayes factors of 6.50 and 9.48, respectively. These findings suggest that classifying young players based on their off-training PA and SB profiles influences SSG performance, with lower PA and higher SB associated with compromised physical and technical-tactical outcomes. Coaches should recognise the (un)conscious impact of off-training PA and SB profiles on players' football performance and integrate their monitoring into training strategies, as an exclusive focus on physical and technical-tactical skill development may compromise training effectiveness and overall player development.

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Daily Self-reported Sleep Duration Does Not Reflect Actigraphy-Measured Sleep Duration in Youth Male Soccer Players

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Conflict of interest: nothing to declare. **Funding:** João Barreira was supported by the Portuguese Foundation for Science and Technology through a doctoral grant [2022.09446.BD].

The monitoring of athletes' sleep has received considerable interest in the last few years, and it is seen as an important preventive and educational tool. While objectively monitoring sleep (through actigraphy or wearable devices) is still expensive for most sporting organisations, self-reported sleep is often included in daily wellness assessment. However, there is a need to understand whether self-reported sleep indices are accurate and thus useful as part of a wellness monitoring system. This study aimed to compare the agreement between daily self-reported sleep duration and actigraphy-based measurements in youth male soccer players. Forty-eight male youth male soccer players (mean $\pm$ SD, age: 16.7 ± 0.9 years) reported their perceived sleep duration every morning after waking up while also using an actigraphy device for five consecutive weeks. Agreement between the two measurements was assessed using Bland-Altman limits of agreement, with acceptable limits of agreement set at <30 minutes. A total of 1,118 individual observations were collected for actigraphy and 914 for self-reported sleep duration. Objective sleep duration was $06:43 \pm 01:11$ hours with a coefficient of variation (CV) of 17.8%. The

self-reported sleep duration was $07:53 \pm 01:09$ hours with a CV of 14.8%. Results indicated a clear disagreement between the two methods, with a mean bias of -01:09 hours (95% Confidence Interval: -00:59 to -01:19 hours), indicating a tendency for participants to overestimate their self-reported sleep duration by approximately one hour (01:19 h). The 95% limits of agreement (LoA) ranged from -00:46 to 03:07 hours (95% CI: lower -00:59 to -00:36 h and upper 02:56 to 03:20 h), suggesting considerable individual variability in agreement. Therefore, current results suggest that coaches and practitioners working with youth soccer players should interpret self-reported sleep indices with caution. When possible, other methods for sleep monitoring should be considered, either alone or in combination with self-reported measures.

The effect of sleep extension and sleep hygiene on isometric mid-thigh pull peak force in male football players: an exploratory analysis

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Conflict of interest: Nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology [<https://sciproj.ptcris.pt/83683DFA>].

Background

Sleep is recognised as a key factor in athletic performance. While it is well established that a single night of six or fewer hours of sleep may impair performance, little is known about the beneficial impacts of sleep extension on performance. In addition to sleep extension, sleep hygiene is a set of behaviours before bedtime that may improve sleep quality and, consequently, lead to longer sleep duration [2]. Therefore, the purpose of this study was to examine the effect of a sleep extension and sleep hygiene protocol on sleep and performance in football players.

Methods

Six male football players, with a mean age of 21.7 ± 3.1 years, were recruited for the study. The study consisted of two phases: a baseline period of 2 weeks, followed by a 2-week intervention period. Players'

sleep was monitored using wrist actigraphy and self-report sleep diaries. Players had their time in bed extended by ~20%, based on average baseline time in bed and adopted a sleep hygiene protocol. A sleep education session was provided, in addition to an individual session to discuss the practical application of the sleep extension and sleep hygiene protocol. The isometric mid-thigh pull (IMTP) peak force was assessed in 2 moments: at the end of the baseline and intervention periods. All IMTP assessments were conducted between 11 a.m. and 4 p.m. on matchday-4 or matchday-3, and the fatigue/delayed onset of muscle soreness (DOMS) was assessed prior to tests using a Likert scale (1 –very, very low to 7 – very, very high). Differences between baseline and intervention periods for sleep, fatigue, DOMS, and IMTP peak force were analysed using linear mixed models.

Results

The results showed that the players significantly increased the time in bed (8.7h vs 9.8h, $p<0.001$, $d=1.1$) and sleep duration (7.4h vs 7.9h, $p<0.01$, $d=0.83$) during the intervention period, compared to baseline, while no differences were found for efficiency (83.1% vs 81.9%, $p>0.05$). There were no differences in the levels of fatigue or DOMS between test days in either group ($p>0.05$). There was a 4.9% increase in IMTP peak force between baseline and intervention periods (1921N vs 2021N, $p<0.001$, $d=0.44$).

Conclusion

Increasing the time in bed by ~20% and adopting a sleep hygiene protocol was effective in increasing sleep duration by 30 minutes but had no effect on sleep efficiency. It appears that increasing the sleep duration had a positive effect on IMTP peak force, although these results should be further explored in studies with large sample sizes and compared to a control group.

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Analysis of upper limb thrust in assisted front-crawl swimming using statistical parametric mapping

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Conflict of interest: nothing to declare. **Funding:** JSPS KAKENHI 21K11360, 24K14576 and FCT UID04045.

Introduction

Tethered swimming is a traditional training method used in competitive swimming, in which swimming speed is artificially controlled. It is classified into two types: assisted (the swimmer is pulled in the direction of propulsion) and resisted (the swimmer is pulled in the opposite direction of propulsion). Despite its popularity, there are few studies of assisted swimming compared to the resisted type (Girolid et al., 2006). Although assisted swimming can increase speed, it has been reported that it can alter the swimmer's stroke mechanics and increase the stroke frequency (Williams et al., 2006). However, no study has quantified upper limb thrust during assisted swimming. The aim of this study is to clarify the impact of different towing loads on thrust during assisted towing with front-crawl swimming.

Methods

Eleven male competitive swimmers from a university (height, 1.71 ± 5.7 m; weight, 64.3 ± 6.0 kg; 487 World Aquatics Points) performed assisted swimming with front crawl under five different loads (0, 5, 9, 14, and 18 kg) using a specific apparatus. There was a 5-min rest period between trials and the towing load was applied randomly. Thrust was measured using a pressure sensor system (Morais et al., 2020), and the data for three stroke cycles after the middle of the pool were analysed. Time-series thrust data were analysed using statistical parametric mapping, with the significance level set at 5%.

Results and Discussion

Swimming speed significantly increased for all towing loads except the 14 to 18 kg conditions. Typically, assisted swimming with a load greater than the swimmer's own propulsive force results in higher speed compared to swimming without towing. Considering that the resistance to propulsion is proportional to the square or cube of speed (Narita et al., 2017), it is likely that in the present participants, the water drag generated during strong assisted towing at loads greater than 14 kg hindered forward propulsion. However, there was no significant difference in thrust among the towing loads except for a single stroke of the non-dominant hand at 14 kg. Concerns about a decrease in propulsion in semi-tethered swimming (Moriyama et al., 2022) do not appear to apply to assisted swimming at maximum effort.

Conclusion

During maximum-effort assisted swimming, thrust is not affected by variation in the towing load.

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Impact of International Tournament Absences on Team Performance: A Comparative Analysis of Offensive Indicators

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The absence of key players due to international tournaments may disrupt team performance in professional football (Pérez, 2021). This study analysed offensive performance indicators in 522 matches played by 58 professional teams across the top divisions of England, Spain, Germany, Italy, and France during the 2023-2024 season. Matches were divided into three conditions: before players left for international duties (PRE), during their absence (TOURNMT), and after their return (POST). Data were collected from Wyscout and analysed using ANOVA and Cohen's *d* for effect size estimation. Findings revealed significant tactical shifts during TOURNMT. Teams exhibited increased total passes ($p < .001$), successful passes ($p < .001$), progressive passes ($p = .005$), and deep completed passes ($p = .031$) compared to PRE, suggesting an adaptation toward a possession-oriented style. In contrast, long passes ($p < .05$) decreased, aligning with prior research that links high long-pass frequency to loss of possession (dos Reis et al., 2017). This shift likely reflects an attempt to control possession and optimise offensive sequences, as seen in teams prioritising shorter, high-frequency passing patterns to enhance offensive efficiency (Zani et al., 2021). Additionally, TOURNMT saw higher total shots ($p = .008$), shots on target ($p = .025$), and goals ($p = .003$) than PRE, reinforcing the effectiveness of adjusted offensive strategies to compensate for the absence of key players. Interestingly, teams' performance metrics largely reverted to PRE levels in the POST phase, with long passes ($p = .007$) and successful

crosses ($p = .015$) increasing. This suggests that while player absences necessitate temporary adjustments, teams ultimately return to their pre-tournament playing styles upon their return. However, the transient increase in possession-based metrics during TOURNMT highlights the adaptability of teams and the potential for alternative tactical approaches to optimise offensive play during key player absences (Deb et al., 2024). These findings provide valuable insights for coaches, suggesting that emphasising short passing, controlled ball circulation, and structured positional attacks can help mitigate performance fluctuations when key players are absent. This study expands on football performance literature by illustrating how international tournament absences influence in-game tactical adaptations, offering practical applications for squad management and strategic planning.

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Study protocol for observation and technical analysis in inline speed skating - curve

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Inline speed skating is a very technical sport, and therefore behavioural patterns are a very important subject to analyse. There are several types of curves, and this study proposes to compare skaters' performance on 2 types of curves: i) banked direct curve and ii) parabolic banked curve. To register skaters' motor patterns, an observation system was used. This study focused on registered skaters (aged between 17 and 25 years) performance when skating the 2nd curve of a 200-meter flying lap. Image capture will be done with 3 cameras shooting simultaneously. Existing patterns will be detected using the Theme 5.0 software (Magnusson, 2000; Magnusson et al., 2004). We observed different alphanumeric codes and different numbers of codes in the 6 moments of observation as in Medeiros et al (2025). Behavioural patterns were not similar when compared between tracks.

Variable-Cam Resistance Training Machines: Insights into Force Production

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under project number UIDP/04045/2020.

Variable resistance refers to weight training systems that provide varying resistance throughout the range of motion (Wallace et al., 2018). Suggesting that muscles work at maximum capacity during specific parts of a dynamic repetition, requiring adjustments in resistance to optimise muscle engagement. This variation in resistance, known as Machine Resistance Torque (MRT), is graphically represented by changes in force, torque, or CAM moment arm length during the lifting stroke (McMillin et al., 2024), which is compared with the human torque capability (HTC) patterns that describe the strength curve developed by a subject. This review aimed to synthesise the available evidence on studies comparing force production patterns during exercises performed in variable-cam machines and other resistance machines (e.g., isokinetic devices). Johnson et al. (1990) showed better alignment between MRT and HTC up to 100° for knee extension, suggesting that minor CAM modifications could improve this relationship. However, these studies also highlighted that significant changes to the cam shapes were still necessary for better overall alignment. In 1999, a dynamometer-based study confirmed that high torque values were consistent across conditions but decreased with increasing angular velocity, as expected from the muscle force-velocity relationship. However, the Nautilus Multi-Biceps Machine failed to match the strength curves of elbow flexors, revealing a mismatch in accommodating MRT across the range of motion (Cabell & Zebas, 1999). In 2005, a study developed by Folland et al. (2005) comparing isometric and dynamic training found that isometric training at specific angles, particularly

90°, resulted in greater strength gains. This research reinforced that variable-cam machines do not adequately match human strength curves, especially at the beginning and end of movements, due to issues like inertia and changes in HTC. Folland and Morris (2008) research on knee extensors using variable-cam machines further emphasised that these machines did not align with natural HTC patterns, particularly in the ascending and descending limbs of the strength curve. The current review concluded that the design of variable-cam machines needed to be improved to better accommodate joint angle-torque relationships and inertial profiles. Overall, these findings suggest that resistance machine designs need significant refinement to align more closely with human torque capabilities throughout the entire range of motion.

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Evaluation of the front crawl technique: comparative acceleration analysis between two different paces, using inertial measurement units (IMU).

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Incorporating IMU in swimming enables near real-time kinematic analysis, assessing stroke-generated acceleration along all three axes. This approach provides coaches with prompt, valuable feedback during practice, allowing rapid evaluation of each swimmer's technique and performance, an advantage over traditional video analysis or stopwatches. Moreover, AI advancements enhance the ability to find individual swimming patterns, offering significant information without overwhelming coaches. This pilot study explored swimming dynamics at different paces in sprinters and long-distance swimmers, analysing their acceleration pattern. Six swimmers (four boys (B) and two girls (G), 14.15±0.79-year-old) were divided into two groups: three sprinters (BS1, BS2, BS3) and three long-distance swimmers (GL1, BL2, GL3). All participants had consent for free and informed participation signed by responsible caretakers. They performed 2x (3x50 m) front crawl, the first series at a maximal pace (1:5 of work/rest time), and the second at a 1500 m pace (1:1 of work/rest time). Between series, they actively recovered for 200 m plus 3 min. Swimmers wore a belt designed by Janga® in thin and light neoprene, ensuring that it did not alter their natural movements and caused negligible drag, with the IMU (Wimu Pro Device, WIMU®) positioned next to L5. The first two repetitions were considered adaptation, and the last was recorded and analysed. For data confirmation, a video analysis on Kinovea® software was

performed. Acceleration was analysed with a MATLAB® routine, providing speed (AS), stroke rate (SR), peak acceleration per stroke (PA) and percentage peak difference between 0-25 and 25-50 m (PD). The two series were compared based on SR, PA, and PD using the Wilcoxon test, conducted in SPSS. The results are presented in Table 1. Athletes showed higher SR in maximal series, as expected, and statistical differences were found ($p=0.01$). PA was generally higher in the maximal pace, with significant differences ($p=0.01$). PD was closer to 0 at the 1500 m pace, but deviated more at maximal pace due to fatigue, without statistical significance.

Table 1. Comparison between maximal and 1500 m pace series.

S	First series (maximal pace)						PD (%)
	0-25 m			25-50 m			
	AS (m.s ⁻¹)	SR (CPM)	PA (m.s ⁻²)	AS (m.s ⁻¹)	SR (CPM)	PA (m.s ⁻²)	
BS1	1.96	50.32	1.83	1.77	46.55	1.62	11.21
BS2	2.21	60.01	1.46	1.97	53.51	1.46	-0.09
BS3	2.03	49.74	1.14	1.69	47.51	1.01	11.34
GL1	1.81	50.70	1.01	1.57	49.40	0.93	8.26
BL2	1.88	47.98	1.32	1.78	47.24	1.32	-0.08
GL3	1.78	52.88	1.20	1.60	49.28	1.16	3.61
Avg ± std	1.95 ± 0.13	51.94 ± 3.60*	1.33 ± 0.25*	1.73 ± 0.12	48.92 ± 2.13*	1.25 ± 0.22*	5.71 ± 4.47
S	Second series (1500 m pace)						PD (%)
	0-25 m			25-50 m			
	AS (m.s ⁻¹)	SR (CPM)	PA (m.s-2)	AS (m.s-1)	SR (Hz)	PA (m.s-2)	
BS1	1.51	34.98	1.47	1.52	35.43	1.45	1.31
BS2	1.62	39.18	1.35	1.56	40.40	1.35	0.17
BS3	1.58	30.98	1.10	1.40	29.18	1.30	-17.40
GL1	1.51	40.47	0.96	1.40	40.79	0.96	0.03
BL2	1.61	39.35	1.13	1.47	39.31	1.13	0.54
GL3	1.54	37.91	1.17	1.37	35.79	1.20	2.56
Avg ± std	1.56± 0.04	37.15 ± 3.25*	1.20 ± 0.17*	1.45 ± 0.07	36.82 ± 4.00*	1.23 ± 0.16*	-2.13 ± 6.68

* - The pairs have statistically significant differences between max and 1500 m pace ($p=0.05$).

In conclusion, this analysis can provide coaches with essential data to better understand athlete performance and progression over a season. Future studies should expand the range of paces and include a larger sample to refine the analysis and better quantify the differences. These findings can help coaches understand the impact of different paces on stroke rate and acceleration, and how to adjust training strategies accordingly.

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Matching Human Torque Capability: Design of a Modifiable Variable CAM System

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under project number UIDP/04045/2020.

Variable resistance is the concept utilised to describe a weight training system that provides a resistance that changes to match the joint's ability to produce force throughout the range of motion (Foran, 1985). This variation in resistance, referred to as Machine Resistive Torque (MRT), is graphically depicted through changes in force, torque, or CAM moment arm length during the lifting stroke (McMillin et al., 2024). This is then compared with the human torque capability (HTC) patterns, which illustrate the strength curve generated by a subject. Currently, no machine described in the literature properly accommodates the MRT with the HTC, which reflects the necessity to develop new equipment that guarantees this accommodation. This study aimed to develop a new CAM in which MRT accommodates the HTC in the leg extension exercise. For the HTC determination, fifteen active students (20.9 ± 1.7 years, 179.2 ± 7.0 cm, 73.6 ± 8.5 kg) performed one concentric strength assessment of knee extensors using a Humac NORM isokinetic dynamometer (Computer Sports Medicine, Inc., Massachusetts, USA). Peak torque was assessed at 60°/s by performing twelve concentric repetitions. For the MRT calculation, the beginning and final position for the leg extension was defined (0-100°) and equated by measuring the moment arm length of the CAM (Johnson, 1990) at each angle (0°, 20°, 40°, 60°, 80°, and 100°). Data from the HTC and the moment arm lengths were normalised to a percentage of their maximum values for each of the six positions. The mean HTC curves were superimposed onto MRT

curves using computer graphics. A qualitative analysis was then performed. The results suggest an accommodation of the MRT to the HTC (Figure 1). The HTC curve is matched at the evaluated angles by the MRT. This study concludes that the proposed model accommodates the HTC well.

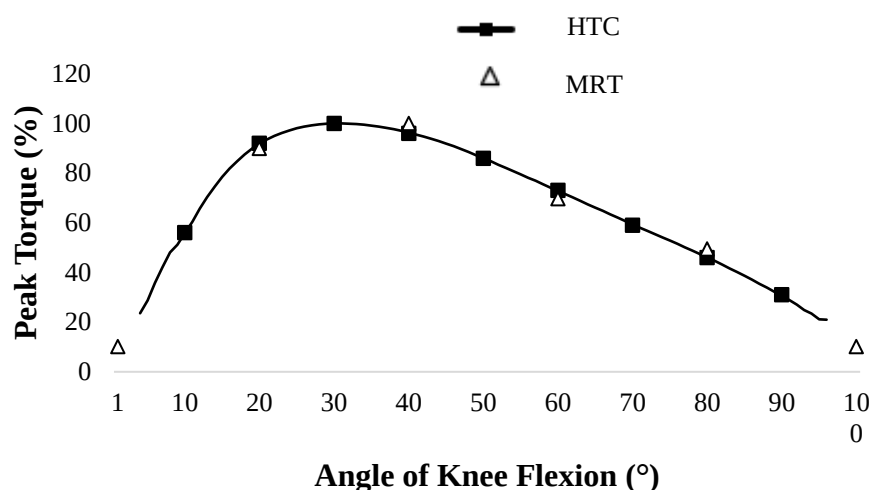


Figure 1. Angle-torque relationship for the knee extensor muscle group.

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Profiling Top Youth Paddlers: Associations between Years of Practice, Training Volume, Physical Fitness and Paddle Characteristics

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Canoe Sprint is a physically demanding sport that engages the entire body (Akca & Muniroglu, 2008). Recent studies suggest that kayakers with more years of specific practice are the ones who achieve better performances, and anthropometric and maturity characteristics have a greater influence on equipment selection at earlier ages (Fernandes, 2023). This study aims to characterise the top Under 14 (U14) Portuguese paddlers and explore the associations between their training volume, physical fitness, and paddle characteristics. Data were collected on the top twenty-seven male, aged 13.80 ± 0.6 years, and twenty-three female, aged 13.87 ± 0.6 years, during a Training Camp organised by the Portuguese Canoe Federation for the best kayak and canoe U14 paddlers, selected from the national ranking. Ethical approval was obtained, and parents or legal guardians provided informed consent. The variables assessed were years of practice in canoeing, number of practice sessions per week and time per session, pull-ups, push-ups, sit-ups, overhead medicine ball throw, handgrip strength, paddle and blade length, blade width, handgrip distance, angle between blades, and vertical water-shoulder distance. Descriptive statistics were assessed, and Spearman's correlation coefficients (r_s) were calculated and classified as very high (0.9–1), high (0.7–0.9), moderate (0.5–0.7), low (0.3–0.5), and negligible (0–0.3) (Mukaka, 2012). The level of significance was set as $p < 0.05$. SPSS Statistics 29.0 (SPSS Inc., Chicago, IL, USA) was applied to perform the statistical analysis. Upon characterising the group, the following indicators

were obtained, height: 171.4 ± 7.5 and 161.0 ± 5.2 cm, seated height: 88.1 ± 5 and 85.6 ± 2.7 cm, arm span: 177.3 ± 9.7 and 164.8 ± 6.2 cm, weight: 59 ± 9.1 and 55.8 ± 7.5 kg, years of practice: 8.8 ± 1.5 and 4.5 ± 1.4 years, PAH: 92.2 ± 3.1 and 94.3 ± 2 %, for male and female athletes, respectively. For the female kayakers, sit-ups correlate moderately with the number of practice sessions per week ($r_s = 0.674$, $p < 0.05$) and strongly correlate with time per session ($r_s = 0.723$, $p < 0.05$), emphasising the crucial role of abdominal strength in kayaking performance. Vertical water-shoulder distance shows a strong correlation with handgrip strength in both male and female kayakers ($r_s = 0.756$ and $r_s = 0.747$, $p < 0.05$), reinforcing these variables as potential early success indicators in young athletes. For the male kayakers, training frequency is associated with upper body endurance, since the number of weekly training sessions is moderately correlated with pull-ups and push-ups ($r_s = 0.577$ and $r_s = 0.618$, $p < 0.05$) and overhead medicine ball throw strongly correlates with vertical water-shoulder distance ($r_s = 0.673$, $p < 0.05$). As for male canoe athletes, handgrip strength correlates moderately with paddle length, blade width, and handgrip distance ($r_s = 0.660$, $r_s = 0.609$, and $r_s = 0.677$, $p < 0.05$, respectively), meaning forearm strength and endurance capacity actively interfere with the paddle size. The associations between these variables underscore the need for tailored training programs and proper equipment selection to maximise performance and support early talent identification in young paddlers.

Acknowledgements

We sincerely thank the Portuguese Canoe Federation and all the athletes involved.

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Evaluating Spin Rate and Axis of Rotation in Basketball Shooting using Tri-dimensional Motion Capture

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Conflict of interest: nothing to declare. **Funding:** FCT - Fundação para a Ciência e a Tecnologia funded this work under grant 2024.00524.BD.

In basketball, the players' objective is to score points by passing the ball through the hoop. To accomplish this, players must be capable of controlling the ball's trajectory by adjusting its release velocity, height and angle. In any kinematic analysis, these variables are measured and correlated to the shot or the player's execution of the shot. However, expert players impart spin to the ball through wrist flexion (Okazaki *et al.*, 2015) as a strategy to lower the release velocity, while the resulting backspin enhances the rebound effect off the backboard. Although players shoot the ball with backspin, generally it is not measured (Whiteside *et al.*, 2013). This study aims to propose a method to evaluate the spin rate and axis of rotation in basketball shots using the same 3D motion capture systems (MoCap) that have become the reference method for analysing technical gestures in sport. Different marker sets have been used to measure the ball's release variables and spin. The market set proposed by Slegers and Love (2022) with 26 equidistant markers and by Mullineaux and Uhl (2010) with 5 markers, two at opposite points of the ball and the remaining forming a triangle. However, the marker set presents some data missing by not allowing the total coverage of the surface by the cameras. Therefore, we propose placing 8 flat, tape-based reflective markers on the ball's surface to enhance its overall coverage while ensuring

all markers remain visible. This setup enables accurate determination of the ball's centre of mass. An experimental study was conducted, analysing 20 basketball jump shots performed by two professional basketball players. The data was collected with 10 infrared cameras at 100 Hz (OptiTrack). All data were processed using a custom MATLAB routine that measures the ball's release variables - velocity, height, and angle – and computes its spin rate and axis of rotation. The spin rate was computed using the relative position of the surface markers, and the axis of rotation was considered with respect to the horizontal plane. The release variables are measured from the centre of mass of the ball, estimated by the position of all the surface markers. This anticipated result will provide information regarding the ball's trajectory and how the player controls its trajectory, contributing to a better understanding of the factors underlying shot success.

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Technical, Creative, and Physical Performance in Female Youth Soccer: A Comparison of Under-14 and Under-16 Players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Small-sided games (SSGs) are widely used in football training to enhance player development across different ages, skill levels, and genders. Most existing research on SSGs in female players has predominantly examined physical performance, with limited attention given to technical and creative aspects. Since both technical execution and creative play have been identified as key contributors to long-term success in football (Santos et al., 2016), further investigation into their role within SSGs is warranted. Additionally, SSGs have been used as an observational tool for talent identification, assisting regional coaches in evaluating players for higher levels of competition (King et al., 2024). Despite this, no study has examined differences in female players' technical, creative, and physical performances during SSGs when considering different age groups. Thus, this study aimed to explore performance variations between under-14 (U14) and under-16 (U16) female players during 6-a-side SSGs with goalkeepers. Forty elite female youth players (U14, n = 20; U16, n = 20) from regional selection squads participated in the study. Each participant engaged in three 6-a-side SSGs on a 50×40m artificial turf pitch. Physical performance was assessed using GPS devices, individual tactical performance was measured with the Game Performance Evaluation Tool (GPET), and creative behaviour was analysed using the Creative Behaviour Assessment in Team Sports (CBATS). Data were analysed using independent t-tests for parametric variables and Mann-Whitney U tests for non-parametric variables. Results indicated no statistically significant differences ($p > .05$) between U14 and U16 players in technical performance nor in creative performance. These findings suggest a comparable technical and

creative profile between the two age groups, reinforcing the idea that SSGs provide a stable and equitable environment for skill execution irrespective of developmental stage. Despite the absence of significant differences, U14 players demonstrated slightly higher dribbling decision-making ability ($ES = 0.23$) and superior change-of-direction while dribbling ($ES = 0.24$), aligning with previous findings that younger players tend to rely more on individual skill expression, particularly dribbling, before shifting toward collective team-based play in later developmental stages (Travassos et al., 2018). Additionally, U16 players exhibited higher maximum sprinting speeds ($t = -2.01, p = .052$), likely due to greater physical maturation and increased power output, consistent with studies showing that older adolescent players achieve greater sprint capacity due to age-related physiological development (Smalley et al., 2022). Overall, the study highlights the potential of SSGs as a valuable tool for talent identification in female football. Given the largely similar technical and creative profiles across age groups, coaches and scouts may use SSGs as an effective assessment framework to evaluate players' adaptability, decision-making, and technical execution under game-like conditions, independent of age.

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Offensive Strategies and Running Performance: Insights from the FIFA Women's World Cup 2023

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Conflict of interest: nothing to declare. **Funding:** This research was supported by the Portuguese Foundation for Science and Technology, I.P., under grant number UID/CED/04748/2020 and UID04045/2020, and national funding through the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP - Grant number: 2021/03601-1)

Football teams employ different offensive strategies to maximise their chances of success, but these tactical choices can directly impact match-running performance (Andrzejewski et al., 2022; Morgans et al., 2024). This study aimed to explore the relationship between key offensive performance indicators

and running performance during the FIFA Women's World Cup 2023 (2023-WC). Data from 64 matches, involving 32 national teams, were collected using a multi-camera optical tracking system (TRACAB Gen5, ChyronHego). Thirteen offensive performance indicators were analysed, revealing distinct patterns in relation to running distance. Ball possession, completed line breaks, receptions in the final third, and ball progressions were negatively associated with total distance covered. Conversely, goals scored, total passes, and defensive line breaks showed a positive relationship with running performance. A K-means cluster analysis identified that the team excelling in these variables was ultimately the most successful in the tournament. The findings suggest that higher possession and ball progression reduce the physical demand of covering long distances, while teams relying on frequent passing sequences and breaking defensive lines tend to engage in more high intensity running. These insights highlight specific offensive indicators linked to match-running performance, providing valuable information for coaches when designing tactical strategies.

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Effect of *Tetraselmis chuii* supplementation on swimming performance.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Oxidative stress can impact performance and recovery in well-trained people. The microalga *Tetraselmis chuii*, rich in superoxide dismutase (SOD), has been shown to enhance antioxidant defence and reduce post-exercise muscle damage, with possibility to enhance performance. The aim of this study was to evaluate whether *Tetraselmis chuii* chronic supplementation before competition could improve performance in swimmers in 50 m, 100 m, and 400 m events.

Methodology

This study was conducted as a randomised controlled trial (RCT) with 10 swimmers (4 males, 6 females, 15±1 years, 1.69±0.1 m, 64.64±5 kg) from a Regional High-Performance Sports Centre. Participants were randomly assigned to an experimental group (250 mg/day of *Tetraselmis chuii* for six weeks) or a placebo group, both following the same training and nutrition program. Performance times (50 m, 100 m, and 400 m) and capillary blood lactate peak concentrations were assessed before and after supplementation in an official competition. Group differences were analysed using the Wilcoxon test.

Results

Table 1. Swimming performance values

Variable	Pre (A)		Post (B)		Δ (B-A)	
	PLA	EXP	PLA	EXP	PLA	EXP
Lactate 50m (mmol/L)	7.3 $\pm$ 1.3	6.8 $\pm$ 1.0	7.1 $\pm$ 2.5	6.2 $\pm$ 1.0	-0.2	-0.5
Lactate 100m (mmol/L)	10.4 $\pm$ 1.0	11.4 $\pm$ 1.9	7.1 $\pm$ 2.5	6.2 $\pm$ 1.0	-3.3	-5.2
Lactate 400m (mmol/L)	7.6 $\pm$ 0.7	8.1 $\pm$ 1.9	8.1 $\pm$ 2.2	7.3 $\pm$ 2.2	0.5	-0.8
Time 50m (s)	28.0 $\pm$ 1.4	27.6 $\pm$ 1.3	27.7 $\pm$ 1.6	27.3 $\pm$ 1.4	-0.3	-0.3
Time 100m (s)	61.3 $\pm$ 3.3	59.8 $\pm$ 2.2	60.6 $\pm$ 3.4	60.3 $\pm$ 2.6	-0.7	0.5
Time 400m (s)	279 $\pm$ 10.4	275 $\pm$ 5.1	275 $\pm$ 9.8	276 $\pm$ 4.6	-3.5	0.8

Note : (PLA) placebo group, (EXP) experimental group. Mean $\pm$ standard deviation values of values derived from 50m, 100m and 400m swimming trials. *Indicates differences with respect to baseline (Wilcoxon test * P<0.05).

Conclusion

The results of this study suggest that 6 weeks of chronic supplementation with *Tetraselmis chuii* is not useful to improve swimming performance.

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Video Feedback as a Pedagogical Tool in Volleyball: A Case Study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Feedback is a fundamental component of the learning process in sports training, as it enhances motor skill acquisition and performance improvement. Video Feedback (VF) has become a widely used pedagogical tool, enabling athletes to observe and analyse their actions, self-assess their technique and reduce errors (Mödinger et al., 2021). Literature supports VF's effectiveness in sports training (Mödinger et al., 2021; van der Meer et al., 2023), with studies indicating benefits in skill learning and performance. However, existing evidence lacks a detailed analysis of underlying mechanisms, relying mainly on experimental designs and cross-sectional analyses within a positivistic paradigm. This case study aims to gain an in-depth understanding of how VF is used in professional volleyball. We opted to conduct a case study, focusing on a volleyball coach with seven years of experience, from youth development to high-performance competition, in both male and female teams, with a well-established practice using VF. The coach has worked as both a head and an assistant coach and holds a Level III coaching certification, along with a degree in Sports Science. Additionally, he has led teams to national championship titles. A qualitative approach was adopted through a semi-structured interview, conducted in person, which explored topics such as the integration of VF in volleyball training, implementation strategies, perceived benefits and challenges, athlete engagement, and coaching adaptations. Data analysis was carried out using thematic analysis, following an inductive approach, allowing for the identification of patterns and key insights. Findings indicate that the coach initially introduced VF to help athletes develop a better awareness of their movements, particularly in younger players, who often struggle to perceive their actions accurately. According to the coach, the use of VF evolved over time,

shifting from real-time technical corrections during training to a predominant focus on post-training match analysis and game planning. Key benefits include improved self-perception, accelerated learning, better focus on critical aspects of performance, and enhanced communication between coach and athletes. Additionally, VF fosters self-regulation, enabling athletes to independently recognise and correct mistakes. However, challenges such as time constraints, logistical limitations, and varying levels of athlete engagement were identified. The coach emphasised that VF implementation depends on contextual factors, including team experience and available resources. This research contributes to a better understanding of how VF can optimise training methodologies, providing valuable insights for coaches and researchers in sports performance. However, as a single case study, its findings are limited in generalizability. Future research should explore how VF is applied in real-time training contexts, and its impact on skill retention, athlete autonomy, and the effectiveness of different VF implementation strategies across various training contexts.

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The Use of Video in Volleyball Training: Perceptions and Practices of National Volleyball Coaches

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Video has been widely recognised as an effective pedagogical tool in sports training, enabling detailed analysis of athletes' performance (Pearson et al., 2023). This tool allows athletes to observe and analyse their actions, enhance self-regulation and minimise errors (van der Meer et al., 2024). Literature has demonstrated its potential and reinforces its benefits, especially for skill learning and performance (Pearson et al., 2023; van der Meer et al., 2024). However, its use varies among coaches and is influenced by factors such as access to technology, training, and beliefs about its effectiveness. This study aims to investigate the practices and perceptions of volleyball coaches working in Portugal regarding the use of video in training. An online questionnaire was administered to a sample of 88 coaches, addressing aspects such as the frequency of video use, context of application, challenges faced, and perceived benefits. The data were analysed quantitatively and qualitatively, providing a comprehensive insight into the topic. To our surprise, results indicated that few coaches routinely use video in their practices (n=7 regularly and n=6 always). The majority of coaches who participated in our questionnaire rarely (n=34) or never use (n=25). These results were even more unexpected when almost all coaches indicated benefits of using video, such as the improvements in technical and tactical understanding of individual and collective performance (n=56), the identification and correction of specific errors (n=57), and enhanced athlete self-reflection and active participation in the learning process (n=52). A possible explanation for these results is the constraints highlighted by the coaches

when using video. The most prominent was the lack of time for video analysis during training sessions (n=44), followed by difficulties in recording and reproducing video content (n=18), and a lack of financial resources for acquiring the necessary technology (n=22). The study highlights that despite the appreciation of video as a training tool, there are still barriers to its full implementation, particularly due to time constraints and financial limitations. However, the reliance on self-reported data may introduce biases, and the exclusive focus on Portuguese coaches limits the broader applicability of the findings. Future research could explore longitudinal studies to assess the long-term impact of video use in training or investigate strategies to overcome the identified barriers.

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Effect of a half-time re-warm-up protocol on high-intensity demands of male soccer players in the first 15 minutes of the second half: an exploratory study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The initial minutes of the second half are critical, as players exhibit their highest frequency of high-intensity actions, irrespective of position (Oliva-Lozano et al., 2023). However, passive recovery during the half-time interval reduces core and muscle temperature by 1.1 - 2.0 °C (Mohr et al., 2004), negatively impacting physical performance such as high-intensity running (HSR), sprints, and jump, during the first 15 minutes of the second half (Russell et al., 2015). Re-warm-up strategies can counteract the effects of passive recovery, facilitating the transition to activity, but are constrained by the brief interval (Towlson et al., 2013). The present study investigated the effect of a 3-minute re-warm-up protocol on high-intensity actions of soccer players during the first 15 minutes of the match's second half. Ten players from a club in the 2024/2025 Portuguese National Football Championship season were randomised and allocated into the Control Group (G1) and the Experimental Group (G2). The re-warm-up protocol consisted of continuously performing (i) a strength, plyometrics, and balance protocol (11+ Protocol Part 2: (i) squats with toe raise jumping, (ii) walking lunges squats, (iii) one-leg squats jumping, (iv) vertical jumps, (v) lateral jumps squats and (vi) box jumps) for 1.5-minutes, and (ii) a soccer-specific protocol a (small-sided game: 5 vs. 5 + Floater) for 1.5-minutes. After completing the re-warm-up protocol, the players immediately positioned themselves to start the match's second half. To analyse the

protocol's effect on high-intensity physical demands, the t-test for independent samples and the Mann-Whitney test were conducted to compare G1 with G2. Effect size for independent t-tests was assessed using Cohen's *d* (small = 0.2, medium = 0.5, large > 0.8). The significance level adopted was 5% ($p < 0.05$). The G1 covered greater distances during accelerations in comparison to the group that underwent the re-warm-up protocol ($p < 0.05$), with a large effect size ($d = 1.54$) (Table 1).

Table 1. High-intensity demands of the control and experimental groups.

Variable	G1 (n=5)	G2 (n=5)	<i>p</i> -value	Effect Size
	Md [IQR] / M±SD	Md [IQR] / M±SD		
Speed _{max} (Km/h)	25.5[3.9]	26.0[4.9]	0.624	0.16
HSR (m)	87.9[77]	101.9[39]	0.624	0.16
Number of sprints	2.0±2.7	1.8±1.4	0.891	0.18
Accelerations (>3.0 m.s ⁻²)	138±45.7	78.6±29.9	0.049*	1.58

Abbreviation: G1: control group; G2: experimental group; M±SD: Mean ± standard deviation; Md [IQR]: Median and Interquartile Range; Speed_{max}: maximum speed; HSR: high-intensity running.

We observed that the re-warm-up protocol impaired the players' acceleration capacity (>3.0 m.s⁻²) during the first 15 minutes of the second half, without influencing other performance metrics compared to G1. This suggests that our protocol may not be optimal. However, these findings are limited by the small sample size and the potential variability in individual response to re-warm-up, influenced by factors such as fitness level, position, contextual match factors, and possibly demands made by the opponent during the third of the second half evaluated. Future research, including studies with passive control groups, is warranted to elucidate further the effects of different re-warm-up protocols on performance in competitive matches, considering variables such as duration, intensity, and specificity of the interventions.

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Effect of *Tetraselmis chuii* supplementation on maximal aerobic and anaerobic power in swimmers.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Swimmers resort to supplementation to optimise their performance in events ranging from 50 to 1500 m. Oxidative stress can affect their recovery and performance, making compounds with antioxidant properties potentially beneficial. The microalga *Tetraselmis chuii*, rich in superoxide dismutase (SOD), has shown positive effects on antioxidant defense and the reduction of post-exercise muscle damage. This study aims to analyse whether chronic supplementation with *Tetraselmis chuii* improves aerobic and anaerobic performance in swimmers.

Methodology

This study was designed as a randomised controlled trial (RCT) involving 10 swimmers (4 males and 6 females, 15±1 years, 1.69±0.1 m, 64.64±5 kg) from a Regional High-Performance Sports Centre. Participants were randomly assigned to either an experimental group (250 mg/day of *Tetraselmis chuii* for six weeks) or a placebo group, both of which followed the same training and nutrition program. Before and after the intervention, three all-out tests were performed on a swim-specific ergometer (VASA *trainer*): 30'' (anaerobic power), 90'' (anaerobic capacity), and 3' (maximal aerobic power), recording average power (W). In the 3'

test, absolute (L/min) and relative (ml/kg/min) VO_2 were measured using a gas analyser (*Metamax Cortex*). Group differences were analysed using the Wilcoxon test.

Results

Table 1. Performance and physiological parameters

Variable	Pre (A)		Post (B)		Δ (B-A)	
	PLA	EXP	PLA	EXP	PLA	EXP
Power 30" (W)	188±42.1	186±21.7	195±44.5	8±6.1	5.0	-3.6
Power 90" (W)	173±41.3	168±14.4	187±49.5	167±16.6	14.5	-0.6
MAP 3' (W)	131±36.8	122±9.5	169±13.5	168±7.1	37.5	46.4
VO_2 (ml/Kg/min)	45±1.7	50±6.0	52±5.0	48±8.6	6.2	-2.0
VO_2 (L/min)	3.0±0.5	3.1±0.5	3.4±0.7	3.0±0.7	0.4	-0.1

Note : (PLA) placebo group, (EXP) experimental group. Mean $\pm$ standard deviation values of the values derived from the 30", 90", and 3' all-out power tests on the VASA ergometer.

Conclusion

The results of this study suggest that six weeks of chronic supplementation with *Tetraselmis chuii* may not be beneficial for improving aerobic and anaerobic performance in swimmers under laboratory conditions. However more research is needed about this topic.

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Profiling Physical Fitness Variables Across Different Age Groups in Artistic Female Skaters

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Physical fitness plays a crucial role in children's health (Alves et al., 2018). The development of motor competence in a logical and progressive manner is of particular importance, in harmony with children's growth and well-being (Radnor et al., 2020). Participation in training programs is essential to the enhancement of physical fitness levels (Moeskops et al., 2023). Artistic skating has gained prominence as a potential sport for improving various physical components, both in school settings (Howard-Shaughnessy & Sluder, 2015) and competitive contexts (Rebelo et al., 2022). The aim of this study was to compare physical fitness variables [flexibility, agility, speed, balance, simple reaction time, upper limb strength (ULS), and lower limb strength (LLS)] among skaters of different age groups. A total of 33 female skaters participated, divided into four age groups: G1: 8 to 10 years, n = 5 (9.00±0.45 years; 1.30±0.06 m; 31.10±3.22 Kg); G2: 11 to 13 years, n= 10 (11.00±0.42 years; 1.44±0.07 m; 34.85±6.44 Kg); G3: 14 to 16 years, n= 8 (15.00±0.99 years; 1.58±0.06 m; 52.4±6.35 Kg); G4: 17 to 19 years, n= 10 (17.00±0.99 years; 1.63±0.08 m; 56.90±6.20 Kg). Anthropometric assessments (weight and height) were conducted, along with tests for simple reaction time (ruler drop test), lower limb explosive strength (countermovement jump), upper limb explosive strength (medicine ball throw with 1 kg and 3 kg), balance (Y-balance test), change of direction ability (T-test), speed (30 m sprint on skates), and flexibility (sit-and-reach test). Data analysis was performed using SPSS software, applying a one-way ANOVA for independent samples ($\alpha = 0.05$) and Tukey's test to identify differences between groups. No significant differences were found in reaction time ($p = 0.710$) and balance (left leg $p = 0.405$; right leg $p = 0.588$) across groups. Significant differences in lower limb explosive strength

were observed between G1 and G3 ($p < 0.001$, 23.93%), G1 and G4 ($p < 0.001$, 25.35%), G2 and G3 ($p = 0.011$, 11.90%), and G2 and G4 ($p = 0.029$, 13.33%). Speed showed differences between G1 and G3 ($p = 0.005$, 14.77%) and G1 and G4 ($p = 0.009$, 14.23%). The sit-and-reach test revealed differences between G1 and G3 ($p = 0.037$, 45.46%) only for the left leg. In upper limb explosive strength, differences were found between G2 and G3 ($p = 0.002$, 35.29%) and G2 and G4 ($p < 0.001$, 41.51%). Agility differed across all groups: G1 and G2 ($p = 0.005$, 36.06%), G1 and G3 ($p = 0.005$, 20.76%), and G1 and G4 ($p = 0.004$, 24.23%). On the upper and lower explosive strength, speed and agility, older girls reported better results than younger girls. Given the characteristics of the studied population, professionals in the field, such as coaches and physical education teachers, should consider age-related differences to optimise motor competence development. However, further testing is needed to determine whether these differences result from natural developmental changes in these age groups or from the practice of skating.

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Comparison of Portuguese national records with the times of the semi-finals and finals of the Olympic Games in simultaneous swimming techniques

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Conflict of interest: nothing to declare. **Funding:** This work is supported by national funds (FCT) with the project CIDESD-UBI UIDB/04045/2020.

Butterfly and breaststroke require high technical proficiency. Comparing national records with Olympic times helps assess competitiveness and set realistic goals (Trewin et al., 2004). This study compared Portuguese men's national records (NPR) with the eighth and sixteenth-place times in the semi-finals and finals of the 100m and 200m butterfly and breaststroke events at the Olympic Games from Sydney 2000 to Paris 2024. Data was collected from Swimrankings and the Portuguese Swimming Federation, and the percentage differences between NPR and Olympic times were calculated in Excel. Results showed that NPRs improved over time, progressively closing the gap to Olympic performance. For the 200m butterfly, the NPR improved from 121.21s (2000) to 116.17s (2024), with a 1.15% difference to finals (FOG) in 2024. The 100m butterfly NPR improved from 54.91s (2000) to 51.17s (2024), with a negligible 0.12% difference to FOG. In the 200m breaststroke, the NPR improved from 134.90s (2000) to 131.92s (2024), showing a 0.37% difference to FOG. Similarly, the 100m breaststroke NPR improved from 62.50s (2000) to 61.01s (2024), with a 1.72% difference to FOG. Portuguese men's swimming has shown significant technical progress, approaching Olympic standards (Costa et al., 2010; Lopes et al.,

2022). The greatest improvements occurred between 2000 and 2016, followed by stabilisation at a high level (Trewin et al., 2004). By 2024, differences between national and Olympic times were historically small, reinforcing continuous progress while emphasising the need for further advancements to secure a stronger presence in elite competitions.

Table 1. Comparison in percentage between NPR vs FOG and NPR vs SFOG and time variation in seconds from 2000 to 2024 for 100m and 200m Butterfly; 100m and 200m Breaststroke.

Year	Men's 100m Butterfly					Men's 200m Butterfly				
	NPR	FOG	SFOG	%*	%**	NPR	FOG	SFOG	%*	%**
2000	54,91	53,13	53,81	3,35%	2,04%	121,21	118,39	119,03	2,38%	1,83%
2004	53,69	52,56	53,12	2,15%	1,07%	119,99	117,48	119,78	2,14%	0,18%
2008	53,14	51,86	52,94	2,47%	0,38%	119,00	115,14	117,48	3,35%	1,29%
2012	52,42	52,05	52,71	0,71%	-0,55%	116,17	115,18	118,56	0,86%	-2,02%
2016	52,42	51,84	52,50	1,12%	-0,15%	116,17	117,04	117,62	-0,74%	-1,23%
2020	52,42	51,49	52,27	1,81%	0,29%	116,17	115,88	116,67	0,25%	-0,43%
2024	51,17	51,11	52,22	0,12%	-2,01%	116,17	114,85	116,26	1,15%	-0,08%

Year	Men's 100m Breaststroke					Men's 200m Breaststroke				
	NPR	FOG	SFOG	%*	%**	NPR	FOG	SFOG	%*	%**
2000	62,50	61,88	62,89	1,00%	-0,62%	134,90	134,00	136,90	0,67%	-1,46%
2004	62,17	62,42	62,36	-0,40%	-0,30%	134,90	131,80	132,34	2,35%	1,93%
2008	62,17	60,24	60,92	3,20%	2,05%	134,90	131,48	132,07	2,60%	2,14%
2012	61,19	60,84	60,16	0,58%	1,71%	133,34	129,44	131,71	3,01%	1,24%
2016	61,01	59,95	60,81	1,77%	0,33%	133,21	128,34	132,99	3,79%	0,17%
2020	61,01	59,36	59,93	2,78%	1,80%	133,21	128,88	130,69	3,36%	1,93%
2024	61,01	59,98	60,37	1,72%	1,06%	131,92	131,44	131,28	0,37%	0,49%

NPR - Portuguese national record time; FOG - time of 8th place in the Olympic Games (final); SFOG - time of the 16th placed in the Olympic Games (semi-final); %* - NPR vs FOG time variance; %** - NPR vs SFOG time variance

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The Effect of Resistance Training Proximity-to-Failure on Quadriceps and Biceps Repetition Maximum Strength in Resistance-Trained Males and Females

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Conflict of interest: nothing to declare. **Funding:** This work is supported by the National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Resistance training (RT) performed to momentary muscular failure might recruit all possible motor units (MU). Biological differences in absolute strength are more evident in the upper body than the lower body. While both males and females can increase muscle strength and size, it is uncertain whether RT should be performed to failure due to reduced total overload compared with nonfailure sets (Refalo et al., 2023). This study aims to determine i) the effect of proximity-to-failure on quadriceps and biceps 1 repetition maximum (1-RM), and ii) whether these effects are influenced by participant sex. A within-participant design intervention was conducted over 8 weeks of unilateral RT, with repetition maximum strength test for each limb. Nineteen participants (11 males, 8 females; age: 20.4 ± 1.7 and 24.8 ± 4.8

years; body mass: 74.9 ± 7.2 and 62.9 ± 9.9 kg) were included. Limbs were randomised to perform unilateral Scott curl and leg extension exercises either to i) momentary muscular failure (FAIL), or ii) a perceived 3-1 Repetitions-in-reserve (RIR, aiming for 2-RIR). To evaluate muscle strength, the 1-RM was determined using a standardised protocol (Dohoney et al., 2002). Participants performed 5 repetitions at 50% estimated 1-RM, 3 repetitions at 75%, and 1 repetition at 90%. Weight was then progressively increased (1-2 kg for Scott curl, 2.5-5 kg for leg extension) with 3-5 minutes rest between attempts. The 1-RM was recorded as the final successful lift, within four attempts. Data was analysed using Bayesian linear mixed-effect models. Marginal mean effects were calculated with the probability that an estimate exceeded zero (pd). In male participants, between-protocol estimates showed similar changes in quadriceps maximum strength [-0.37 kg (95% HDI: -3.51 to 2.62 ; pd = 59%)] and indicated a likely increase in biceps maximum strength [0.738 kg (95% HDI: -0.55 to 2.1 ; pd = 87%)] favoring FAIL. In female participants, estimates suggested a possible increase in quadriceps maximum strength [0.98 kg (95% HDI: -2.61 to 4.44 ; pd = 71%)] favoring FAIL and showed similar changes in biceps maximum strength [0.23 kg (95% HDI: -1.31 to 1.83 ; pd = 62%)]. The results suggest that intervention effects on maximum strength differed between muscle groups and sexes. Male participants showed a likely increase in biceps strength, but only a weak trend towards decreased quadriceps strength. Female participants showed a possible increase in quadriceps strength, with little change in biceps strength. These findings suggest proximity to failure may influence strength outcomes differently based on muscle group and sex.

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The Effect of Resistance Training Proximity-to-Failure on Quadriceps and Biceps Hypertrophy in Resistance-Trained Males and Females

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the Portuguese Foundation for Science and Technology, I.P., Grant/Award Number UI/04045. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

To stimulate muscle hypertrophy, resistance training (RT) should reach a certain proximity-to-failure. As sets approach momentary muscular failure, muscle hypertrophy increases, but similar results may occur with close proximities-to-failure. Biological sex may influence neuromuscular fatigue following RT. While both males and females can increase muscle strength and size with RT, it is unclear if the response to proximity-to-failure differs within each sex (Refalo et al., 2024). This study aims to determine i) the effect of proximities-to-failure on quadriceps and biceps muscle hypertrophy, and ii) whether these effects are influenced by participant sex. A within-participant design intervention was

conducted over 8 weeks of unilateral RT, with muscle thickness measurements for each limb. Nineteen participants (11 males, 8 females; age: 20.4 ± 1.7 and 24.8 ± 4.8 years; body mass: 74.9 ± 7.2 and 62.9 ± 9.9 kg) were included. Limbs were randomised to perform unilateral Scott curl and leg extension exercises either to i) momentary muscular failure (FAIL), or ii) a perceived 3-1 Repetitions-in-reserve (RIR) (aiming for 2-RIR). Muscle thickness of the biceps brachii (three sites: 50%, 60%, 70% distal between acromion and lateral epicondyle) and quadriceps (rectus femoris: 50% distal between anterior superior iliac spine and patella; vastus lateralis: 50% distal between greater trochanter and lateral femoral condyle) was measured using B-mode ultrasound. Participants rested for 72 hours prior and post intervention. We analysed data with Bayesian linear mixed-effect models. Marginal mean effects were calculated for interpretation along with the probability that an estimate exceeded either zero (*pd*) or the region of practical equivalence (*pdROPE*). In male participants, the between-protocol estimate suggested similar increases in quadriceps [-0.033 cm (95% HDI: -0.122 to 0.060 ; *pd* = 74%, *pdROPE* = 55%)] and biceps thickness [0.025 cm (95% HDI: -0.060 to 0.110 ; *pd* = 73%, *pdROPE* = 40%)]. In female participants, the between-protocol estimate suggested a negligible difference [0.000 cm (95% HDI: -0.106 to 0.109 ; *pd* = 50%, *pdROPE* = 30%)] for quadriceps and similar increases [0.033 cm (95% HDI: -0.066 to 0.137 ; *pd* = 75%, *pdROPE* = 48%)] for biceps thickness. The interventions increased muscle thickness for both muscle groups, and different proximities-to-failure may have similar effects within each sex. The research results seem to support the idea that training to failure or within a specific RIR range is a viable strategy for increasing muscle thickness, with minimal sex-based differences observed in resistance training.

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Comparison of Training Load Between A and B Teams Across Three Microcycles

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Training load monitoring is fundamental in professional football to optimise performance and minimise injury risk. Structured microcycles allow teams to regulate training intensity across the week, typically increasing loads early and tapering before match day (MD) (Coutinho et al., 2024). While first teams often follow well-defined periodisation strategies, the training load distribution in B teams, which serve as developmental squads for future first-team players, remains less understood. Thus, this study aimed to analyse and compare the training load of a professional football A team and its corresponding B team across three full microcycles. A total of 30 outfield B team players and 25 outfield A team players were monitored during training sessions. External load metrics, including total distance covered, number of accelerations, and decelerations, were collected for each session (from MD-5 to MD-1). A linear mixed model was used to compare training loads across microcycle days, considering fixed effects for team (A vs. B), training day, and their interaction. Interestingly, no statistically significant effects were found between the A and B teams for the variables studied, suggesting a similar overall training design. Despite this, an analysis of each microcycle within each team revealed distinct training load patterns. The A team followed a structured tapering model, progressively reducing workload from MD-5 to MD-1, with significant differences observed across days ($p < 0.001$). Lower distances covered were found on MD-1 when compared to MD-3 ($p = .036$). Additionally, MD-1 and MD-2 showed a lower number of

accelerations compared to both MD-4 ($p = .004$ and $p = .001$, respectively) and MD-5 ($p = .005$ and $p = .002$, respectively), while MD-3 also showed fewer accelerations than MD-5 ($p = .022$). A similar profile was observed for decelerations, with MD-1 and MD-2 showing lower values than both MD-4 ($p = .004$ and $p = .006$, respectively) and MD-5 ($p = .011$ and $p = .018$, respectively). In the B team, a similar pattern of reduced workload on MD-1 was observed. Lower distances covered were found on MD-1 compared to MD-3 ($p = .010$) and MD-5 ($p = .040$). MD-1 also recorded the lowest number of accelerations when compared to MD-3 ($p = .049$) and MD-5 ($p = .035$), while decelerations were significantly lower on MD-1 compared to MD-3 ($p = .034$). As expected in structured periodisation, the lowest loads across all variables were consistently recorded on MD-1 for both teams. These findings indicate that while both teams exhibit a tapering strategy leading up to MD-1, the A team demonstrates a more structured and progressive reduction in workload, which is aligned with results from Portuguese A teams (Clemente et al., 2019). The B team, despite showing some similarities, exhibited more fluctuations across training days, suggesting a less consistent approach to tapering. This inconsistency may be influenced by factors such as greater squad rotation, individualised player development plans, or differences in training objectives. Given that B teams function as feeder squads for first-team players, ensuring greater alignment in training methodology between squads is critical for facilitating player transitions.

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Relationship between Swimming Speed and Propulsive Force in Butterfly Swim Stroke

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant number 2024.06359.BDANA.

Swimming performance is influenced by various biomechanical factors, with propulsive force playing a crucial role in determining swim velocity. Studies have demonstrated that higher propulsive forces are associated with increased swimming speeds (Lopes et al., 2023; Morais et al., 2021). Although some research has addressed this relationship in front crawl (Marinho et al., 2022), there is still a need for further investigation across different swimming strokes, including butterfly stroke. Understanding the interaction between propulsive force and swimming speed in butterfly swimming stroke is essential for optimising performance and developing targeted training interventions. This study aimed to understand the relationship between swimming speed and propulsive force in the butterfly swim stroke. Eight competitive male swimmers (18.58 ± 2.69 years, 77.14 ± 9.80 Kg of body mass, 184.38 ± 9.72 cm of height, 188.25 ± 7.78 cm of arm span, 612.14 ± 60.22 of WAPS) who regularly participate in national and international level competitions were analysed. Swimming speed was measured with a speedometer (SpeedRT, ApLab, Rome, Italy). Propulsive force was measured with SmartPaddles (Trainsense, Tampere, Finland). A simple linear regression analysis was performed to determine the relationship between swimming speed and propulsive force. The regression analysis between swimming speed (1.58 ± 0.10) and propulsive force (42.81 ± 5.30) revealed a significant positive correlation ($R^2 = 0.63$, $p =$

0.018). Propulsive force explained 63% of the swimming speed variance, indicating that it is a strong predictor of the latter. This highlights the crucial role of propulsive force application in enhancing performance.

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Game On: Decoding Internal and External Load During Small-Sided Games (1v1 and 2v2) Among Female Athletes of Different Maturity Status

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INTRODUCTION

The development of young athletes is not only influenced by skill level and training but also by their biological maturity (Albaladejo-Saura et al., 2021; Malina, 2014). In basketball, where physical demand and technical execution are key, understanding how maturity levels affect a player's internal load, external load, and technical behavior (Guimarães et al., 2019; Johnson et al., 2022; Towlson et al., 2021) can provide insights that help tailoring training programs and talent identification processes. Small-sided games (SSGs) are widely recognised as an effective training modality to develop technical, tactical, and physical capacities in soccer (Arede et al., 2021; Clemente et al., 2019). Previous literature has predominantly focused on male players or larger group formats (e.g., 4v4, 5v5). However, limited research has been dedicated to female players and, in particular, to smaller formats such as 1v1 and 2v2 competitions. Importantly, maturity status significantly influences physical performance, physiological responses, and injury risk in younger athletes. Thus, understanding how maturity level interacts with internal and external load in female soccer players during small-format games is crucial for the optimisation of training programs. This study aims to investigate these relationships by testing U14, U15, and U16 athletes in 1v1 and 2v2 game scenarios. The general aim of the scientific study is to investigate the internal and external loads experienced by female soccer players of

different maturity levels during 1v1 and 2v2 small-sided games, in comparison to performance outcomes driven by technological methods or random-based approaches.

METHODS

Eighteen female soccer players between the ages of 13 and 17 were tested. PHV categories were determined using biological maturity to classify them into different maturity groups. This approach helps to address the influence of maturation status on performance.

After participating in each game scenario, players recorded their perceived exertion using the Borg scale, providing insight into subjective performance differences between the groups

Table 1. Training schedule based on Biological Age groups and Random groups

Week	Week1		Week2	
Session←	Session 1	Session 2	Session 3	Session 4
	1V1 SSG	1V1 SSG	2V2 SSG	2V2 SSG
	Based on BA	Random Group	Based on BA	Random Group
Format	Each round 5min, 2 mins rest;	Each round 5min, 2 mins rest;	Each round 5min, 2 mins rest;	Each round 5min, 2 mins rest;
	Repeat 3 rounds	Repeat 3 rounds	Repeat 3 rounds	Repeat 3 rounds

Each player will have 6 games, 3 based on BA, 3 based on random Group

RESULTS AND DISCUSSION

Group C (eldest BA group) exhibited the highest maximum heart rate (204 ± 11.0 bpm, CV = 5.4%), though its elevated standard deviation suggested potential outlier interference. Group B (middle BA age) demonstrated superior locomotor efficiency, achieving the greatest mean distance per minute (40.5 ± 21.2 m/min) and peak velocity (24.6 ± 2.51 km/h), yet displayed substantial intra-group heterogeneity (CV = 52.3%), indicative of functional role specialisation or training load disparities. Despite showing the lowest performance outputs (distance/min: 19.5 ± 3.54 ; velocity: 24.4 ± 0.07 km/h), Group A (youngest BA group) maintained exceptional data consistency (velocity CV = 0.3%).

Table 2. Metrics among different Biology Age groups in female basketball players.

Metric	Group A	Group B	Group C

Max Heart Rate (bpm)	202 ± 4.95	191 ± 5.12	204 ± 11.0
Distance per Minute (m/min)	19.5 ± 3.54	40.5 ± 21.2	29.0 ± 6.93
Max Speed (km/h)	24.4 ± 0.07	24.6 ± 2.51	24.4 ± 2.80

CONCLUSIONS

These findings underscore the necessity of age-stratified, data-driven training frameworks to address biological maturation.

ACKNOWLEDGEMENTS

Ximing Shang was Funded by the China Scholarship Council.

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Fatigue in Open Water Swimming: A Systematic Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Open water swimming (OWS) is a distinctive discipline within competitive swimming, presenting unique environmental challenges compared to pool swimming (Puce et al., 2021). This systematic review aims to analyse the existing scientific literature on the effects of fatigue in OWS and the methodologies employed to measure and evaluate it, with a particular focus on electromyography.

Methods

A comprehensive search was conducted across Web of Science, PubMed, and Scopus databases to identify relevant studies published between 2001 and 2025. Inclusion criteria encompassed peer-reviewed articles written in English, involving human subjects, and specifically addressing OWS. The search strategy adhered to the PI(E)CO framework, focusing on athletes, biomechanics, and performance outcomes. Data extraction and synthesis were performed independently by reviewers, and quality assessment was conducted using the Down and Blacks checklist. For the inclusion and exclusion criteria, a specific research question was formulated, guiding the subsequent steps to extract relevant studies. We considered original research articles with full text available, specifically involving adult

open water swimmers, to discuss experimental approaches for fatigue and EMG evaluation in an open water swimming context. Exclusion criteria encompassed articles without full text, book chapters, letters, opinions, and abstract-only documents. Additionally, the research was concentrated on studies within the context of swimming, where the primary method discussed was not related to open water.

Results

The review incorporated 16 studies that met the inclusion criteria. The findings reveal that most research on fatigue in OWS comprises guidelines, position statements, and case studies, commonly employed in OWS events, and factors like breathing techniques, kinematic parameters, training experience, electromyography, environmental conditions significantly impact performance and fatigue.

Discussion

Fatigue in OWS is multifactorial, influenced by physiological, psychological, and environmental factors. (Puce et al., 2023; López-Belmonte Óscar, 2024) EMG can provide valuable insights into neuromuscular activity and fatigue, aiding in the optimisation of training and competition strategies. The review underscores the necessity for standardised research procedures and methods to measure fatigue accurately in OWS.

Conclusion

This systematic review emphasises the importance of understanding fatigue in OWS and the potential of EMG as a tool for its assessment. Future research should focus on addressing the logistical challenges of conducting EMG studies in open water conditions and exploring the relationship between psychological, biomechanics and physiological fatigue. Enhanced knowledge in this area can improve athlete performance and safety during OWS competitions.

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Determinants of Competitive Balance in Youth Competitive Sports: An Analysis Based on Generalised Linear Models

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Competitive Balance (CB) is a crucial indicator of the intensity of competition in sports and significantly influences the fairness of sporting events (Kringstad, 2018). However, research on competitive balance in youth athletics remains relatively underdeveloped. Youth athletes follow distinct developmental pathways, which may significantly influence competitive balance (Waldron & Worsfold, 2010). Differences in competition rules, scoring methods, and technical and tactical characteristics of different sports make the structure of competitive equilibrium vary from sport to sport (Ashford et al., 2020; Quirk & Fort, 2018). In addition, tournament tiers, organisational models and selection mechanisms also affect competitive balance. National events often use standardised selection to ensure a high level of competition, while local events vary widely in participation levels (García-de-Alcaraz & Marcelino, 2017). Differences in physical and technical-tactical between age groups may lead to uneven levels of competition (Kádár et al., 2023). Gender differences may also affect the intensity of the game (Kringstad, 2021). This study aims to analyse the impact of factors such as population density, sport type, competition level, age, and gender on the competitive balance in youth sports, using large-scale competition data.

Materials and methods

This study, based on data from 169,547 youth sports matches, aims to analyse competitive balance, which is measured using point differential (PD). A lower PD value indicates a more balanced match. The independent variables include population density (high, medium, low), sport type (football, basketball, handball), competition level (national, regional, other), age group (Sub 15 for junior, Sub 17 for youth, Sub 19 for senior), and gender (male, female). A generalised linear model was used to evaluate the independent contribution of each factor to competitive balance, while controlling for other variables. Statistical significance was determined using p-values, where $p < 0.05$ indicates a significant effect, and $p > 0.05$ indicates no significant effect.

Results

The results of the analysis indicate that population density affects the balance of competition, with higher population density areas exhibiting greater imbalance in matches ($p < 0.0001$). The type of sport also influences the balance of competition, with handball showing the greatest imbalance, football being the most balanced, and basketball lying in between ($p < 0.0001$). Regarding competition level, national-level competitions were found to be more balanced ($p < 0.0001$), whereas other types of competitions demonstrated higher competitiveness. The analysis of age groups indicates that with increasing age, the balance of competition gradually diminishes, with the senior group showing the highest level of competition ($p < 0.0001$). Lastly, female competitions were generally more balanced ($p < 0.0001$).

Discussion

This study suggests that high population density tends to create a more intense competitive environment in sports. The scoring rules of different sports also impact the balance of the game, with football being a low-scoring sport. Regarding competition level, national competitions typically feature opponents of more similar skill levels compared to local competitions, leading to a more balanced game (García-de-Alcaraz & Marcelino, 2017). The increasing imbalance with age may be related to differences in the biological maturity of the players (Arede et al., 2023). Finally, female competitions generally exhibit a higher level of balance, a finding that aligns with previous studies suggesting that female competitions tend to be more balanced (De Araújo & Mießen, 2017).

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The relationship between training, match load and wellness in professional female soccer players

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Conflict of interest: nothing to declare. **Funding:** this work was funded by National Funds by FCT-Foundation for Science and Technology under the following project UIDP/04748/2020 and UI/04045.

The year 2023 was marked by the exponential growth of women's soccer on a global scale, professionalism increased, and current elite players may be exposed to higher training and competitive demands than before, potentially impacting both performance and health (Datson et al., 2014). The quantification of wellness has become a common practice in football monitoring to assess perceived aspects of the athlete, such as fatigue, stress, muscle soreness, sleep quality, and mood (Gabbett et al., 2017). Load quantification enables coaches to better manage physical demands during training sessions, helping to prevent cumulative fatigue, reduce injury risk, and optimise athletes' physical fitness for upcoming matches (Halperin & Emanuel, 2020; Oliveira et al., 2023). This study aimed to analyse: (i) the relationships between wellness, training and match load demands; (ii) the relationships between match-day (MD) demands and wellness on the following day (MD+2); (iii) the relationships between MD and wellness on the day before match-play (MD-2). Twenty-five players participated in the study (age 25 ± 3.98 years, weight 59.27 ± 6.2 kg, height 1.62 ± 0.04 m) over a 16-week period. The following measures of well-being were used: fatigue, sleep quality, muscle soreness and stress. To quantify well-being, the Hooper Index questionnaire (HI, scale 1-7) was used 30 minutes before each training

session/game. External intensity was measured using high-speed running, sprinting, acceleration, and deceleration metrics, while internal load was assessed through the rating of perceived exertion (RPE) multiplied by session duration to generate session-RPE. The main findings indicated that MD influenced well-being and both internal and external training load intensity, with MD-2 and MD+2 being the most affected. Higher internal and external intensities on MD were associated with lower well-being scores, particularly regarding sleep quality, muscle soreness, and fatigue on MD+2. The high internal and external intensity during match day (MD) can lead to significant physiological and neuromuscular fatigue. The recovery time between MD and MD+2 may not be sufficient for the complete regeneration of the musculoskeletal and metabolic systems, resulting in higher levels of muscle soreness, fatigue, and lower sleep quality. In addition to physical demands, matches impose a high level of psychological and cognitive stress due to competitive pressure, the need for quick decision-making, and the emotional load involved. This factor can negatively affect sleep quality and subjective recovery levels, contributing to a lower well-being state on MD+2.

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Intermittent pneumatic compression does not improve muscle function but might reduce muscle soreness

F

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Conflict of interest: nothing to declare. **Funding:** FCT (2022.09686.BD)

Recovery in sports is a topic gaining increased attention, mostly due to the rising loads imposed on athletes and the denser competitive calendars (Nédélec et al., 2013). In this regard, coaches, athletes and supportive staff strive to reduce physical fatigue in order to allow athletes to perform at their best during competition (Dupuy et al., 2018). Recovery in sports – a multifaceted and time sensitive process, dependent on reducing or refraining from physical stress – relies on four major domains: (i) nutritional practices; (ii) sleeping quality and quantity; (iii) psychological techniques; and (iv) the use of post-exercise recovery practices (Kellmann et al., 2018). Among these, a topic gaining attention in the scientific literature is intermittent pneumatic compression (IPC), due to its portability and affordability. IPC devices contain chambers that apply pressure in a cyclic pattern, typically on the lower limbs, which was demonstrated to enhance transitory blood flow, especially at high pressures (about 200 mmHg) (Maia et al., 2024). In this sense, this study aimed to assess the effectiveness of high-pressure IPC in recovering both neuromuscular function and muscle soreness. Thirty-three male active individuals were included in this study (age: 20.85 ± 2.8 years old; weight: 75.05 ± 7.54 kg; height: 178 ± 5.7 cm). Participants performed 6 sets of 12 repetitions on the flywheel (Desmotec, Biela, Italy), being consecutively assigned to either an IPC (30-minute peristaltic application at 200 mmHg - AirRelax, California, USA) or a placebo group (simulated microcurrent treatment – Compex, Spain). Muscular function was assessed with countermovement jump (Chronojump, Barcelona, Spain), and isometric

knee extension and flexion (VALD, Brisbane, Australia), and perceived muscle soreness was assessed using the 7-point Likert Scale of Muscle Soreness. To analyse the effects of condition, time, and time*condition, a repeated measures ANOVA was computed. Significant time effects were observed for countermovement jump height ($F = 24.887$; $\eta_p^2 = 0.657$; $p < 0.001$), knee extension ($F = 3.967$; $\eta_p^2 = 0.234$; $p < 0.05$), knee flexion ($F = 3.572$; $\eta_p^2 = 0.216$; $p < 0.05$), and muscle soreness ($F = 25.278$; $\eta_p^2 = 0.628$; $p < 0.001$); however, no statistical significant differences were detected for condition or time*condition interactions. Notably, although not statistically significant, a trend towards reduced perceived soreness was observed consistently (small to moderate effect sizes) at every timepoint, suggesting potential benefits from using IPC.

Acknowledgments

We acknowledge SAUSPORT – Saúde e Desporto for the provision of the IPC devices

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Do non-circular chainrings influence cycling performance? A systematic review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare

The differences between winning and losing in competitive sports are increasingly tinier, therefore, marginal additions to athletes' performance may be of capital importance (Maia et al., 2024; Marck et al., 2017). Particularly in road cycling, competitions tend to last long hours or be performed at an “all-out” pace (time trial), but the differences between the first and subsequent athletes tend to last between seconds and a few minutes. In this sense, marginal additions to cycling performance may be important considering the competitive outcome. Non-circular chainrings appeared as a technology to enhance cycling performance, theoretically creating advantages by addressing the “dead spots” in the pedalling, where force production is minimal, by altering the chainring's effective gear ratio throughout the pedal stroke (KoÇAk et al., 2024). This systematic literature review was conducted following the principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Page et al., 2021), covering the databases PubMed, Web of Science, SportDiscus and Scopus. The search was conducted on December 27th, 2024, using the search terms: ("oval chainring*" OR "non-circular chainring*" OR "elliptical chainring*" OR "asymmetric chainring*" OR "Q-Ring*" OR "eccentric chainring*" OR "chainring*") AND (cycl*). The studies' quality was assessed using the Cochrane Risk of Bias tool (Rob2). A total of 316 articles were identified, resulting in 18 after being screened against the exclusion criteria, whose quality was evaluated as “some concerns”. From those, studies were categorised in biomechanical (n = 2), performance (n = 10), and physiological (n = 8).

While results appear to be mixed across studies, non-circular chainrings do not seem to provide additional benefits in mid- to long-duration efforts compared to traditional chainrings. However, they may offer advantages in short, high-intensity efforts, such as sprinting, by optimising force application

during the pedal stroke. Despite these potential benefits, variations in study methodologies, sample characteristics, and testing conditions make it difficult to draw definitive conclusions. Further research is warranted to clarify the specific conditions under which non-circular chainrings may enhance performance and to determine their practical implications for competitive cycling.

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Match analysis in volleyball, differences in female and male and specialisation levels in the Olympic Games 2024

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Volleyball has grown in the last decade, whether in men's or women's volleyball. This study aimed to analyse the effectiveness of game actions (serving, blocking, receiving, distributing, attacking and defending) in volleyball during the 2024 Olympic Games. Using discriminant analysis, we sought to identify which of these actions had the greatest impact on the final result of the matches. The sample consisted of games from the final stages, and the data will be collected and analysed using Data Volley 4 and Data Video 4 software. The results provided valuable insights to optimise team performance and guide training strategies. The results of the bronze medal at the 2024 Paris Olympic Games in men's volleyball state that the players who had the most influence on the result were the outside Hitter Attackers and the Middle Blocker in the attacking, blocking and serving actions related to the United States' victory over Italy. As for the silver and gold medals, in the Polish and French teams, the players who scored the most points were the Opposite player, the Middle Blocker player and the Setter player in the attack, block and serve actions. The highest scorer was the French opposite player Patry with 17 points, and the fastest serve was by the Polish hitter attacker Leon, with 132km/h. In women's volleyball, the bronze medal disputed between Turkey and Brazil was won by Brazil, with the performance of the

outside Hitter Attackers, the Middle Blocker, and the Opposite player in the attacking, blocking and serving actions, where the outside and opposite players scored 28 and 26 points respectively and a serve with a speed of 100 km/h. In the awarding of the silver and gold medals, the teams from Italy and the United States presented the best performances with the players Outside Hitter Attackers, the Middle Blocker, and the Opposite player, where the variables that were responsible for Italy's victory in the attacking, blocking and serving actions. As a result of this 2024 championship, it continues to be the attacking, blocking and serving actions that result in the most points and the scoring players, the outside hitters, the opposing players and the middle blockers. It is important to focus on these game actions and form, and enhance these specialisation positions in volleyball. There seems to be a confirmation in the actions that contribute most to victory, whether in men or women, as well as in the specialisations in volleyball that contribute to these same victories. The opposite fielder, the outside hitter and the middle blocker. Women's volleyball is becoming very similar to men's volleyball, with a very strong physical component, attack and serve speed.

Assessing the impact of the New UEFA Champions League Format on Team Qualification and Competitive Performance

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

In 2024/25, UEFA replaced the Champions League's traditional group stage with a single league-style format. Previous research in elite football has highlighted the influence of competition structure and contextual factors (e.g. match location, tournament stage, opponent quality) on team strategies and match outcomes (García-Rubio et al., 2015). However, the implications of this new format for performance disparities remain unclear. Thus, this study examines the revised format's impact by comparing team performance between the OLD (2023/24) and NEW (2024/25) formats, focusing on differences between qualified and non-qualified teams. Match performance data were collected from Wyscout for the 2023/24 season (OLD; qualified teams, $n = 16$, 96 matches; and non-qualified teams, $n = 16$, 96 matches) and 2024/25 season (NEW; qualified teams, $n = 16$, 144 matches; non-qualified teams, $n = 20$, 176 matches). A Generalised Linear Mixed Model (GLMM) was used to analyse key performance indicators across seasons. Fixed effects included season and qualification status (qualified vs. non-qualified), with match location and opposition quality as random effects. Statistical significance was set at $p < 0.05$, and effect sizes were reported using partial eta squared (η^2p). In the interaction between season and qualification status, only successful dribbles showed a significant interaction ($F =$

6.71, $p = 0.010$, $\eta^2p = 0.02$), with higher values being reported by qualified teams from OLD format. However, no other performance indicators showed significant interaction effects between seasons, suggesting that the overall differences between qualified and non-qualified teams remained stable regardless of the competition format ($p > .05$). When comparing qualified and non-qualified teams according to each format, some effects were identified. Accordingly, qualified teams performed more shots (2.32; $p = .021$), successful passes (109.33; $p < .001$), successful dribbles (3.03; $p = .011$) and final third entries (10.09; $p < .001$) than the non-qualified teams in the OLD format. These results align with previous research that suggests superior shot creation and precise passing have historically been critical determinants of success in the Champions League (Modrić et al., 2022). As regards the NEW format, qualified teams presented a higher number of shots-on-target (1.72; $p < .001$), counterattacks with shots (0.49; $p = .052$), successful passes (85.67; $p < .001$), progressive passes (11.71; $p < .001$), key passes (2.79; $p < .001$) and final third entries (7.90; $p < .001$). These findings suggest that decisive forward play and quick transitions play an even greater role in the new format. Aside from successful dribbles, no significant interaction effects were observed between season and qualification status, indicating that qualified teams in both formats consistently outperformed non-qualified teams in passing and shooting metrics. However, these differences were more pronounced in the NEW format, where qualified teams exhibited a greater reliance on progressive and key passes and final third entries. Thus, the structural changes in the Champions League have intensified offensive demands, meaning teams must adapt by placing greater emphasis on attacking quality. This study provides valuable insights for coaches and performance analysts aiming to optimise tactical strategies under the revised competition structure.

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The Influence of Re-Warm-Up on Power in the Bench Press Exercise

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Conflict of interest: nothing to declare. **Funding:** This work is supported by the National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Warm-up has been considered a relevant practice in introducing the training session to potentiate the performance of resistance exercises, as it prepares the body for intense physical exercise and increases the efficiency of the training session. This phase is essential for maximising performance in force production during strength training (Fradkin et al., 2010; Neves et al., 2024). During strength training, it is usually suggested to include a re-warm-up segment, especially if there are long pauses between sets or exercises. However, there is a lack of studies contributing to understanding the effects of re-warm-up on performance in strength training. In this sense, this study aimed to analyse the influence of re-warm-up on power during the bench press exercise. Ten participants, aged between 19 and 26 years (mean $\pm$ SD: 21.50 $\pm$ 1.84 years, 1.77 $\pm$ 0.07 m of height, 79.80 $\pm$ 16.52 kg of body mass), healthy and active, were enrolled in the study. Each participant performed two protocols (A1: Squat exercise followed by bench press exercise, with no re-warm-up; B2: A squat exercise was performed followed by bench press, with re-warm-up for the bench press exercise) in different sessions, with at least 48 hours of rest between them. Mean propulsive power and the maximum power across three sets of the bench press were analysed using the T-Force Dynamic Measurement System. The results demonstrate that there do not appear to be significant differences in mean propulsive power across all sets (A1 vs.

B2, set 1: 229.18 ± 41.31 W vs. 226.36 ± 58.37 W, p-value= 0.42; set 2: 221.62 ± 45.96 W vs. 210.74 ± 56.15 W, p-value= 0.22; set 3: 211.91 ± 46.52 W vs. 227.62 ± 58.27 W, p-value= 0.14). Also, no significant differences were observed in maximum power across all sets (A1 vs. B2, set 1: 253.50 ± 43.37 W vs. 250.04 ± 54.94 W, p-value= 0.29; set 2: 247.47 ± 50.02 W vs. 238.77 ± 57.65 W, p-value= 0.87; set 3: 237.12 ± 49.16 W vs. 251.35 ± 62.19 W, p-value= 0.95). These results suggested that re-warming-up may not influence power parameters during the bench press exercise, when performed in a training session after squat exercise. It is important to conduct further investigations with a larger number of participants to obtain more detailed and clearer results.

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Load-velocity relationship of young female football players in the full squat exercise

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Full squat (SQ) is a key exercise for improving leg force application, reducing injury risk, and enhancing physical and sports performance. Soccer is featured by high-intensity actions followed by moderate recovery periods. These actions require high force production from the lower limbs, making leg strength a determining factor for players of all levels and ages. The relationship between load and velocity has been identified as an efficient, non-invasive method for estimating 1RM and managing training loads. However, the influence of relative strength and age on this relationship, particularly in female soccer players, remains underexplored. This study aimed to compare the load-velocity curves in young female soccer players and analyse the effect of relative strength and chronological age on the load-velocity relationship in the SQ exercise. Forty female soccer players for the same Club voluntarily participated in this study. The recruited players belonged to teams of different categories: Senior, Under-18 and Under-16. All players had prior experience in resistance training, using the SQ exercise, for at least 6 months. The load-velocity relationship was determined using progressive loading SQ tests up to 1RM. The lifting velocity was measured through a linear velocity transducer, and for each repetition, the variables of mean velocity of the propulsive phase (MPV), mean velocity (MV) and peak velocity (PV) were obtained. Significant correlations ($p < 0.001$) were found between the relative load (%1RM) and MPV ($R^2 = 0.966$; SEE = 0.065), MV ($R^2 = 0.963$; SEE = 0.059) and PV ($R^2 = 0.758$; SEE = 0.142). In addition, an important finding of our research was that there were no statistically significant differences in MPV, MV or PV associated with each relative load based on age or relative strength ratio. Therefore,

these findings offer insight into optimising resistance training in female soccer players. According to our results, it seems that the variables MPV and MV have greater validity and, therefore, are more recommendable to prescribe and control the relative intensity during SQ exercise in female soccer players.

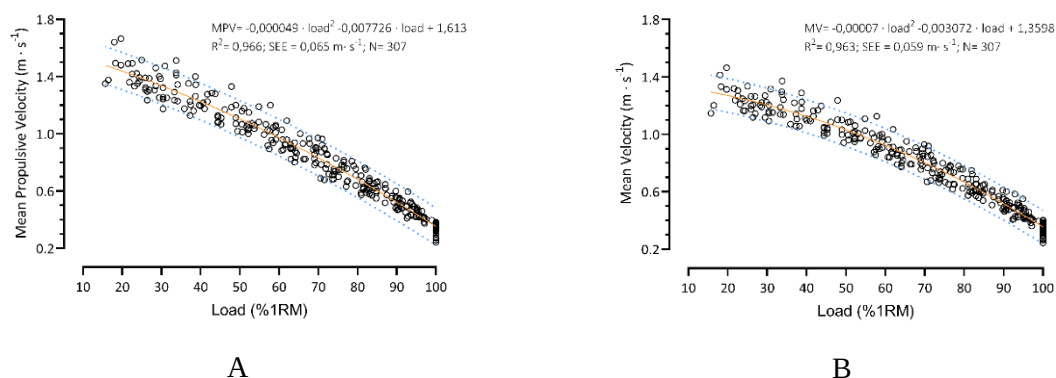


Figure 1. Relationships between %1RM and barbell velocity: A) VMP and B) MV for the full squat exercise. The data have been obtained from the set of velocity values at each load of the incremental test performed by the 40 players. The dashed lines indicate the 95% CI limits.

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Effects of strength training in young female soccer players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This study examined the effects of light-load, high-velocity resistance training (RT) with few repetitions per set, combined with jumps and sprints with and without external load on physical performance in young female soccer players of different chronological ages. A group of 28 female elite youth soccer players belonging to the same academy affiliated with a professional team in Spanish first division teams performed an RT for 8-weeks, in addition to usual soccer field training. For the analysis, the players were divided into 2 groups according to the chronological age ($A < 16$ years, $n = 11$; $A \geq 16$ years, $n = 17$), and 2 groups according to the number of sessions completed ($S100\%$, $n = 17$; $S \leq 75\%$, $n = 11$) during the RT program. Before and after the RT program, participants underwent a battery of tests including a running 20 m-sprint (T020m), countermovement jump (CMJ), a progressive loading test in the full squat exercise (SQ) to estimate the one-repetition maximum (1RM) and the average velocity against the common absolute load using during the Pre and Post-test (MPVc), and a kicking ball test for measuring the ball speed with both legs. In addition, external load was tracked with GPS technology in all training and competitive sessions during the 8-week training period. Significant differences were found at baseline in maturity level (ML) ($p < 0,01$), percentage of fat mass (%FM) ($p < 0,05$), T1020m, T020m and 1RM ($p < 0,05$) between age groups, showing a lower initial level $A < 16$ years compared to $A > 16$ years. No differences were observed at baseline between groups of RT sessions completed during the training program. When data

were pooled, players showed significant improvements in CMJ after the training period. When players were divided by age, younger players ($A < 16$ years) had better results in T1020m and T020m compared to older players, and players who completed 100% of RT sessions (S100%) showed significant improvements in all variables measured during the SQ exercise. Significant pre-post changes ($p < 0.05$) were also detected in leg muscle mass (LMM), FM and %FM for the S75% group. Regarding the load variables quantify during the field training, significant differences were found in total distance (TD), distance over $20 \text{ km} \cdot \text{h}^{-1}$ ($D > 20 \text{ km} \cdot \text{h}^{-1}$), accelerations (ACC), and decelerations (DCC), with players $A \geq 16$ years and those completing 100% of sessions (S100%) showing higher values compared to $A < 16$ years and those completing $\leq 75\%$ (S75%), respectively. A moderate correlation ($r = 0.57$, $p < 0.05$) was observed between $D > 20 \text{ km} \cdot \text{h}^{-1}$ and changes in T020m. Overall, strength training with moderate to low relative load and low volume improved physical performance, especially in younger players ($A < 16$ years) with lower initial performance. Furthermore, completing all training sessions (100%) led to greater improvements than completing fewer sessions, but excessive high-speed distances ($D > 20 \text{ km} \cdot \text{h}^{-1}$) appear to limit performance gains.

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Associations Between Pectoralis Muscle Mass and Load-Velocity Relationship in The Bench Press Exercise

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Evidence suggests that greater muscle size is associated with greater muscle strength, which is one of the main reasons long-term resistance-trained individuals tend to be stronger than their untrained counterparts (1). The load-velocity (L-V) relationship also provides relevant information about the strength production capacity against submaximal loads (2). While one study has examined the relationship between vastus lateralis muscle size and the L-V relationship in a lower limb exercise (3), no research has explored this association in the upper limbs. Therefore, the present study aimed to analyse the relationship between pectoralis major muscle mass and the L-V relationship in the bench press (BP) exercise. Fifty resistance-trained young men (age = 23.3 ± 3.3 y, height = 1.76 ± 0.06 m, body mass = 73.9 ± 10.4 kg; relative BP 1RM = 0.93 ± 0.19 kg·kg⁻¹) participated. The pectoralis major cross-sectional area (CSA) was assessed using B-mode ultrasonography. Mean propulsive velocity (MPV) was recorded during a progressive loading BP test. The following variables were analysed: (1) 1RM strength, (2) maximal unloaded velocity (V_0), and (3) loads lifted at given velocities (1.1, 0.8, 0.5, and 0.2 m·s⁻¹). Associations between CSA and loads lifted at given velocities (from 0.2 to 1.1 m·s⁻¹), V_0 , and 1RM were evaluated.

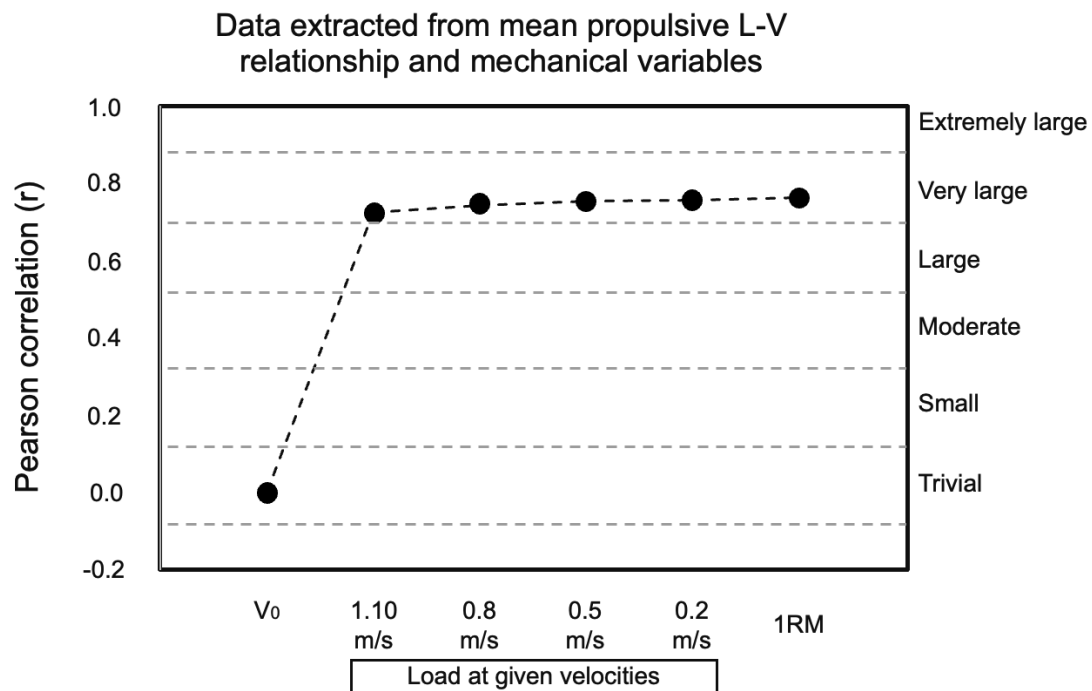


Figure 1. Associations between pectoralis major muscle mass and load at different velocities, 1RM strength and maximal unloaded velocity in the bench press exercise. Dashed lines indicate the limits of each category of association (r assessed as: <0.10 trivial; 0.10 - 0.29 small; 0.30 - 0.49 moderate; 0.50 - 0.69 large; 0.70 - 0.89 very large; and >0.90 extremely large).

Significant relationships were observed between CSA and loads lifted at velocities ranging from 0.2 to $1.1 \text{ m}\cdot\text{s}^{-1}$ ($r=0.73$ – 0.76 , all $p<0.001$). CSA also significantly correlated with 1RM ($r=0.76$, $p<0.001$). However, CSA did not show a significant association with V_0 ($r=0.007$, $p>0.05$). Pectoralis major muscle mass is very largely associated with the force production capacity at different regions of the L-V relationship and 1RM in the BP exercise. In contrast, it does not correlate with maximal unloaded velocity.

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Association between unilateral jump performance and load-velocity relationship in a unilateral exercise

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Numerous studies have analysed the relationship between jumping performance and maximum strength in athletes during bilateral exercises (e.g., deadlift, full-squat). Additionally, loads at different velocities correlate with variables such as muscle size. However, no previous study has analysed the relationship between unilateral vertical jump performance and unilateral resistance exercises at different loads. Therefore, this study aimed to examine the correlation between unilateral countermovement vertical and horizontal jump performance and loads to varying velocities in the unilateral hip extension (HE) exercise. Thirty resistance-trained young men (60 legs) performed the following battery of tests: 1) unilateral countermovement vertical jump (VJ); 2) unilateral countermovement horizontal jump (HJ); 3) incremental loading test in the unilateral HE exercise in a pulley machine. The loads lifted at 0.8, 0.7, 0.6, and 0.5 m·s⁻¹ were calculated from the loading test.

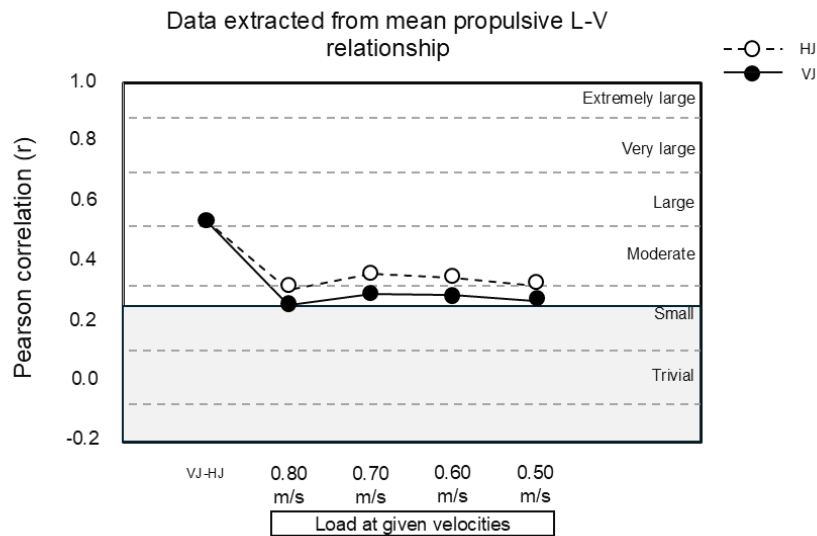


Figure 1. Associations between unilateral vertical and horizontal jump and load at different velocities. The shaded area denotes $p > 0.05$. Dashed lines indicate the limits of each category of association (r assessed as: <0.10 trivial; $0.10-0.29$ small; $0.30-0.49$ moderate; $0.50-0.69$ large; $0.70-0.89$ very large; and >0.90 extremely large).

Significant relationships were observed between VJ and loads lifted at 0.7 ($r = .295$), 0.6 ($r = .290$), and 0.5 ($r = .270$) $\text{m}\cdot\text{s}^{-1}$. Moreover, HJ was correlated with loads lifted at 0.8 ($r = .309$), 0.7 ($r = .360$), 0.6 ($r = .348$), and 0.5 ($r = .270$) $\text{m}\cdot\text{s}^{-1}$. Unilateral vertical and horizontal jumps were correlated with loads lifted at different velocities in the unilateral hip extension exercise, but the horizontal jump exhibited a higher correlation than the vertical jump, with a moderate and small relationship, respectively. This suggests that hip extension plays a greater role in horizontal jump performance than in vertical jump performance.

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Effects of Unilateral Hip Extension Training with a Conic Pulley on Mechanical Performance Under Different Loads

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Flywheel iso-inertial resistance training has been shown to have positive effects on force levels. Different studies have demonstrated that using rotatory inertial training produces beneficial stimuli for injury recovery and performance in recreational and elite sports. All these effects have been analysed over the hypertrophy effects or changes in the generated power before and after a training program, but their impact on muscle strength under different loads remains unknown. Consequently, the aim of this study was to compare the effects of a unilateral hip extension training program using a conic-pulley on mechanical performance under different loads. Twenty-eight resistance-trained males were distributed into two groups: experimental group (TG) and control group (NTG). The subjects belonging to NTG continued with their normal routine (8 subjects, n=16 legs). Subjects belonging to TG trained only one leg (20 subjects, n=20 legs) and followed a training program for 6 weeks (twice weekly) using the unilateral hip extension exercise on a conic-pulley, with 2-4 sets, 8 repetitions per set, and 2 minutes rest between sets. Subjects were told to do it at its maximal velocity, and the resistance of the conic pulley was stable during the program. Before and after the training program, an incremental test of hip extension exercise in an isoinertial pulley machine (Functional Trainer,

Force USA, Barcelona, Spain) was performed to analyse the mean propulsive velocity against: the same absolute loads (AV), the same absolute loads lifted slower than 0.7 m·s⁻¹ (AV<0.7), and the same absolute loads lifted faster than 0.7 m·s⁻¹ (AV>0.7) of the Pre-test.

Table 1. Changes in performance variables

	TG			NTG			P-value time effect	P-value group x time
	Pre	Post	ES	Pre	Post	ES		
AV (m/s)	0.72±0.03	0.77±0.06*** ^{NTG}	0.88	0.71±0.06	0.70±0.06	-0.18	0.02	P<0.001
AV<0.7(m/s)	0.60±0.06	0.67±0.07*** ^{NTG}	0.96	0.57±0.04	0.57±0.04	0.10	P<0.001	P<0.01
AV>0.7(m/s)	0.84±0.08	0.87±0.09	0.29	0.86±0.04	0.83±0.06*	-0.53	0.81	P<0.01

Data are mean ± SD. TG: Training group; NTG: non-training group; Pre: data from pre-training test; Post: data from post-training test; ES: effect size; AV: mean propulsive velocity against same absolute loads; AV<0.7: mean propulsive velocity against same absolute loads lower than 0.7m/s; AV>0.7: mean propulsive velocity against same absolute loads faster than 0.7m/s. Significant differences with respect to Pre-training: P ≤0.05***; ≤0.01**; ≤0.001***. Significant differences with NTG at Post-training: P ≤0.05^{NTG}

Significant “group x time” interactions were found in AV, AV<0.7, and AV>0.7 (p<0.01). A significant “time effect” was observed in AV and AV<0.7 (p<0.05). After the training program, TG showed significantly greater values of AV and AV<0.7 than NTG Post-test (p<0.05). Additionally, NTG significantly decreased AV>0.7 at Post (p<0.05). Resistance training with a conic pulley in the unilateral hip extension exercise increased strength against different loads, with more pronounced effects under heavier loads, that is, slower velocities.

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Effects of different speed loss during resisted sled sprint training on physical performance and muscle thickness in biceps femoris long head

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Conflict of interest: nothing to declare. **Funding:** Manuel Jiménez-Lozano was founded by Pablo de Olavide of Seville through Bridge Grants for Tutored Research based on B2 Modality (reference: PPI2205) and by the Ministry of Science Innovation and Higher Education (grant number: FPU22/04109).

Introduction

During resisted sled sprint training (RSST), the prescription of the training volume through a number of series and meters could induce a high variability in mechanical and metabolic response (Jimenez-Reyes et al., 2019). In this sense, quantify training volume through an increase of sprint time (IST) could be a better alternative to determinate and quantify during RSST (Jimenez-Reyes et al., 2019), however no studies had analysed the effect on physical performance and muscle thickness (MT) in the biceps femoris long head (BF_{lh}) using the IST as a variable to control the training volume with low relative loads.

Objectives

The main aim of the present study was to analyse the effects of two IST (2% vs 4%) against the same relative load on 40 m unloaded sprint (US) and 20 m loaded sprint performance, unloaded and loaded

countermovement jump (CMJ), lower-limb strength in the full back squat (SQ) and muscle thickness in the biceps femoris long head.

Methods

Twenty-two young healthy men were randomly assigned to a training group with an IST of 2% (G2; $n = 10$) or 4% (G4; $n = 12$) over the best sprint of each training session. Participants performed 8 weeks, twice a week, of RSST over 20 m with a relative load of 10% of increased in sprint time compared to the US condition. Three testing sessions separated by 48-72 h were carried out. During the first testing session, anthropometric measurement and muscle thickness measurements of biceps femoris long head using a portable ultrasound device were performed. In the second testing session, a 40 m US condition with splits times every 10 m and progressive loading test in the resisted sled sprint (RSS) exercise over 20 m were carried out. Finally, unloaded CMJ and progressive loading test in the CMJ and SQ exercise were performed in the third testing session.

Results

Significance decreases pre-post values in unloaded sprint times were observed in distances ≥ 10 m in G4 ($p < 0.05$; $\Delta = -2.7$ to -3.5%), whereas significant differences in distances ≥ 20 m were found in G2 ($p < 0.05$; $\Delta = -1.8$ to -2.2%). Significant interactions “group x test” were observed in the RSS exercise against 36, 48 and 66 kg in 10 and 20 m. In addition, significant decreases in sprint times across all loads and distances were observed in the RSS exercise for G4 ($p < 0.05$; $\Delta = -2.5$ to -10.3%), except 30 kg in 10 m sprint time. However, significant decreases in sprint time were also observed for G2 in the RSS exercise in 10 and 20 m, especially in loads ≥ 42 kg ($p < 0.05$; $\Delta = -2.6$ to 5.3%). Only G2 showed significant increase in CMJ ($p < 0.05$; $\Delta = 6.1\%$). In the loaded CMJ, a significant decrease was only observed in G2 for the load that elicited $2 \text{ m} \cdot \text{s}^{-1}$ of peak velocity. The estimated 1RM in the full squat exercise was only significantly improved in the G4. A significant increase in the MT of the BFlh was observed in both groups (G2: $p < 0.05$, $\Delta = 5\%$; G4: $p < 0.05$, $\Delta = 7\%$), without differences between both experimental groups.

Conclusion and practical applications

These results suggest that training volumes that elicited an IST of 2% and 4% (~ 600 m of weekly training volume or ~ 300 m of session training volume) with a low relative load ($\sim 10\%$) could improve physical performance, especially unloaded and loaded sprint performance, and MT in BFlh. However, higher training volumes (4% of IST) with low relative loads could be more beneficial to improve sprint performance and hypertrophy responses during RSST (Alcaraz et al., 2018). The findings of this study

could have important practical applications for the design and prescription of training volume in the RSST.

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Effect of 10% vs. 30% velocity loss during squat training with low-loads on strength and sport-specific performance in professional female basketball players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

The main objective of this study was to determine the effect of different velocity losses (VL10% vs. VL30%) in twice-weekly squat exercise for eight weeks on muscle strength measured in specific actions such as effectiveness and accuracy in free throw, vertical jump, change of direction sprint, the repeat sprint ability and, in general, in the force-velocity curve.

Methodology

Twenty-one basketball players from the departmental basketball team (Antioquia) voluntarily participated in the study. They were divided into two groups (VL10% and VL30%) and completed resistance training twice a week for eight weeks. The training consisted of three sets of squats with loads between 1.21 and 1.00 m·s⁻¹ (45-60% RM). The only difference between groups was the percentage of velocity loss achieved during each training set.

Results

The results indicate statistically significant gains in both groups in the countermovement jump (CMJ), obtaining larger effect sizes in the VL10% group compared to VL30%. In the change of direction sprint (CODS), the VL30% group significantly decreased its performance, while the VL10% group maintained it. In the running anaerobic sprint test (RAST), the results were significant and positive for the VL10% group, while the VL30% group only improved the fatigue index (IF) in this test. In the force-velocity curve, both groups improved significantly and with large effects. The 1-RM squat also increased in both groups. The accuracy and effectiveness of the free throw also improved significantly in both groups, obtaining larger effects in the VL10% group compared to the VL30% group. In addition, there were significant correlations between the change in the CMJ, the change in launch accuracy, the change in the change of direction sprint, and the change in the RAST. There were also correlations between the change in the RAST and the change in the change of direction.

Conclusion

Training with 10% velocity losses in the squat exercise produces greater effectiveness and accuracy in the free throw, vertical jump, change of direction and repeated sprint ability, the force-velocity curve compared to VL30%. Furthermore, these greater or equal changes in performance in the VL10% group were obtained by performing less than half the repetitions of the VL30% group, which implies greater training efficiency.

Acute effect of different resistance exercise protocols on the mechanical response and lactate concentration in the bench-pull exercise

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The aim of this study was to analyse the acute effect of different resistance exercise protocols (REPs), defined by the peak velocity (V_{max}) of the best repetition of the set (usually the first) and the percentage of velocity loss (%VL) over the set, on the mechanical response and lactate contraction in the bench-pull (BP) exercise. Fourteen healthy and physically active men (age: 24.9 ± 4.5 years; height: 1.78 ± 0.05 cm; body mass: 79.6 ± 8.4 kg; 1RM: 76.6 ± 9.1 kg) voluntarily participated in this study. Over a 10-week period, participants attended the laboratory on 20 occasions (twice per week with 72-96h recovery between sessions) to perform the following: 3 familiarisation sessions; a progressive loading test in the BP exercise; and 16 different REPs. For the configuration of the 16 REPs, four relative loads were used (50, 60, 70 y 80% 1RM), and for each of them, four magnitudes of %VL in the set were used (10%, 20%, 30% y 40%), thus, the 16 REPs were configured. The REPs were performed randomly for each subject to avoid possible effects of fatigue or potentiation during the course of the investigation. Sessions were performed at the same time of day for each participant (± 1 hour) and under similar environmental conditions (~ 20 – 22°C and 55–65% humidity). The 16 REPs were always performed using 3 sets and 4-minute interset recovery periods. A target V_{max} to be attained in the first (usually the fastest) repetition of the first set in each REP was used as an estimation of percentage of 1RM, as follows: ~ 1.75 m/s ($\sim 50\%$ 1RM), ~ 1.48 m/s ($\sim 60\%$ 1RM), ~ 1.25 m/s ($\sim 70\%$ 1RM), and ~ 1.05 m/s ($\sim 80\%$ 1RM). Consequently, before starting each REP, adjustments in the proposed load (kg) were made when needed, so that the velocity of the first repetition matched the programmed velocity (± 0.03 m/s). Once the load (kg) was adjusted, it was maintained for the 3 training sets. During each REP, the same

protocol was always carried out: 1) Taking the lactate concentration (LA) after 5 minutes of rest; 2) warm-up consisting of 10 repetitions at progressive intensity and 5 repetitions at maximal intended velocity against 20kg, followed by three isometric repetitions (the first at 80% of the maximum effort, the second at 90% of the maximum effort and the third at maximum effort) with 3-minute interset recovery periods; 3) two maximal isometric repetitions (3-min rest) for determining the isometric peak force (IPF) and maximal rate of force development (RFD); 4) determination of the individual load that elicited a Vmax of ~1.50 m/s (V1.50 load). The mean value of 3 repetitions with the V1.50 load (kg) was thus taken as a pre-exercise reference measure against which to compare the VL experienced after the 3 exercise sets; 5) determination of the load (kg) so that the Vmax of the first repetition matched the programmed target velocity. The 3 sets of the corresponding REP were performed next; 6) immediately after completing the last repetition of the third training set, the participants executed 3 maximal-effort consecutive repetitions against the V1.50 load; 7) 20 seconds later, a maximum isometric activation is performed; 8) finally, 60 seconds after completing the maximal isometric activation, a blood sample is taken to determine LA. The percent loss of Vmax against V1.50 load, IPF, RFD and LA were significantly different from Pre to Post in all REPs. All variables increased as the magnitude of %VL in the set increased for all 4 load magnitudes used. In addition, for the same percentage of VL in the set, all variables were greater as the relative load decreased. Finally, a very strong relationship was found between the effort index and all mechanical and metabolic variables analysed.

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Comparison of the effects of a strength and conditioning training program integrated into physical education classes versus the same program complemented with a self-directed, out-of-school training regimen in high school students

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The increasing prevalence of sedentary lifestyles and limited opportunities for physical activity (PA) within the school setting negatively impact students' health and well-being. Physical Education (PE) aims to enhance physical fitness (PF) and contribute to students' overall development. Schools, as universal institutions equipped with appropriate facilities and qualified professionals, hold significant potential in this regard. However, PA levels tend to decline throughout schooling, necessitating the implementation of new strategies. While PE classes should not be the sole avenue for PA, they must equip students with the knowledge and skills required to engage in regular, enjoyable, and safe PA beyond the school environment. This study examined the effects of a strength and physical conditioning training program delivered, for 9 weeks, within PE classes (Experimental Group – EG) and a similar intervention supplemented with a self-directed, out-of-school program (Special Experimental Group – SEG). The study compared improvements in physical fitness (PF) across these two interventions and a control group (CG). The sample consisted of 58 10th-grade students: 21 in the EG (height 170.5±7.1; weight 60.5±3.6), 24 in the EG (height 169.4±8.1; weight 56.3±4.1) and 13 in the CG (height 168.6±5.9; weight 57.4±2.9). The FITescola® test battery was used to assess PF. The training program included a general warm-up (5-minute choreographed routine with music) followed by a circuit incorporating various exercises (medicine ball throw, burpees, horizontal ladder, unilateral saw, TRX inverted row, abdominal exercises, battle rope, vertical thrust, elastic band press, and kettlebell exercises). Each

exercise was performed for 30 seconds, alternating with 30 seconds of recovery, over a nine-week period. The SEG followed the same program but also completed an additional 20-minute strength and conditioning regimen outside of school, consisting of nine callisthenics exercises, monitored through a training log. Following the intervention, the SEG showed improvements across all assessed fitness components, with statistically significant gains in six out of nine tests: push-ups (+10%, $p=0.043$), left and right lower limb flexibility (+7.7% and +10.3%, $p=0.001$ and $p=0.009$), left- and right-hand grip strength (+6.1% and +3.5%, $p=0.048$ and $p=0.011$), and medicine ball throw (+13.3%, $p=0.001$). The EG also improved in seven tests, with significant increases in some, including abdominal endurance (+8.8%), long jump (+3%), left-hand grip strength (+6.4%), right-hand grip strength (+5.9%), and medicine ball throw (+5.7%). The CG exhibited changes in some tests, but only one was statistically significant (right-hand grip strength, +8.8%), with overall declines observed in more tests than improvements. These findings suggest that implementing a strength and conditioning training program in PE classes effectively enhances PF. The SEG demonstrated greater improvements than the other groups; however, the gains were lower than expected, indicating that additional training beyond regular PE classes did not yield the anticipated level of progress. Future studies should consider implementing more robust monitoring strategies for extracurricular activities, potentially incorporating digital tracking systems to enhance adherence and effectiveness.

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Acute Weight Loss Effects on Energy Expenditure in Boxing Athletes: A Systematic Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Weight loss and energy expenditure control are essential factors in boxing, a sport characterised by high physical and cardiovascular demands. This systematic review arises from the need to gather and analyse the most relevant studies on weight loss strategies and energy metabolism in boxing, contributing to the improvement of training and weight-cutting practices in the sport. This systematic review followed the PRISMA guidelines and included studies retrieved from the following databases: PubMed, Scopus, SPORTDiscus and Web of Science. The search strategy used the terms: ("Boxing" OR "Boxe*") AND ("Weight loss" OR "Rapid weight loss" OR "Weight cut*" OR "Weight management" OR "Body mass" OR "Dehydration" OR "Energy expenditure" OR "Caloric restriction" OR "Body composition" OR "Physiological demands"). A total of 2316 articles were initially identified; after the screening process, 23 studies met the inclusion criteria. The results highlight that the physiology of Olympic boxing is predominantly aerobic, with variable anaerobic contributions depending on the intensity and context of training and competition. During bouts, heart rate exceeds 93% of the maximum, and oxygen consumption approaches VO_2 max, making aerobic recovery between rounds essential for phosphocreatine resynthesis. Exercises such as sparring and pad work demonstrate high energy demands, reinforcing the importance of aerobic conditioning (Davis et al., 2014). Rapid weight loss was shown to have negative effects on both performance and health: increasing heart rate, protein catabolism, and cortisol levels, while reducing strength, neuromuscular capacity, and hydration status. Common

methods such as sauna use and diuretics significantly alter blood lipid and protein profiles. A gradual approach to weight reduction is recommended to mitigate these adverse effects (Ambroży et al., 2020). Physiological differences were observed between junior and senior athletes, with more experienced boxers showing greater height, body mass, and faster cardiovascular recovery. However, aerobic fitness alone did not directly correlate with performance, suggesting that experience and individual traits are key performance determinants. Caffeine supplementation improved anaerobic power, jump height, and reaction speed, without significantly increasing fatigue. A 3% reduction in body mass did not compromise the overall performance of amateur athletes, although a decrease in punch strength was observed. Additionally, iron metabolism, hormonal responses, and hydration were notably affected by rapid weight loss. Hormonal shifts in cortisol, IGF-1, and testosterone reflect the psychophysical stress of training and competition. The IGF-1/cortisol ratio appears to be a promising marker of anabolic state and training load (Nassib et al., 2016). In conclusion, boxing preparation should balance aerobic and anaerobic training, minimise drastic weight loss, and consider physiological and hormonal factors individually to optimise performance and recovery.

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A Qualitative Study on Complementary Training Strategies for Non-Starters in Soccer: Insights from an elite club into men's and women's teams.

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Conflict of interest: nothing to declare. **Funding:** CIFI2D is financed by the Portuguese Foundation for Science and Technology, under the DOI <https://doi.org/10.54499/UIDB/05913/2020>.

This study examined the relationship between theory and practice, analysing strategies used by five professional coaches to balance training loads among players with different playing times and their perceptions of these strategies, including advantages and disadvantages. A qualitative case study design was adopted, emphasising the link between theoretical considerations and practical constraints. Thematic analysis was used to identify patterns in the data, providing a flexible yet structured framework for interpretation. Compensatory training was widely regarded as essential by coaches of both male and female teams across all competitive levels, from amateur to professional. According to the coaches, its primary function was to balance the physical load of players with less playing time, ensuring they maintained an adequate technical-tactical level and remained prepared for future competitive opportunities. Coaches approached this topic either through formal presentations based on scientific evidence or more informal methods, showing how compensatory training enhanced

players' ability to meet match demands. In youth soccer, the primary focus of coaches was not on compensatory training but rather on player rotation, relationship with the ball, and game-oriented activities. Logistical constraints present were significant challenges, particularly the lack of human, material, and structural resources in amateur teams, while in professional contexts, travel and scheduling were the main limitations. To address these issues, two coaching staff members implemented autonomous training programs, such as gym workouts and individualised running sessions at home. The most commonly used criterion among the coaches for including players in compensatory training was 60 minutes of match time, although one coach mentioned 75 minutes as a threshold. Adjustments were made based on cumulative playing time or match intensity. Coaches identified three main compensatory training schedules: 1) Match Day (MD) and 24 hours after the match (MD+1), preferred by professional teams; 2) MD and 48 hours after the match (MD+2), more common in youth and semi-professional teams, incorporating additional exercises to compensate for match load; and 3) 24 hours before the match (MD-1), MD, and MD+1 were applied during congested schedules, where nonstarters engaged in compensatory training across three sessions to minimise physical disparities. The content of compensatory training varied, but it consistently emphasised physical and technical aspects. Only the physical load was individualised and monitored via GPS data. The psychological component was addressed through competitiveness, motivation, and decision-making, while tactical aspects received less emphasis due to the limited number of available players. Nonetheless, small-sided games (SSGs) were frequently employed to reinforce game principles and sub-principles. One coach specifically highlighted the implementation of a 10x0+GR drill on MD+1, designed to enhance offensive movements and defensive recoveries, allowing players to feel more engaged in the collective process. All coaches agreed that friendly matches on MD or MD+1 would be the most effective strategy to compensate for playing time disparities. However, logistical constraints, particularly in women's soccer, often hindered their feasibility. Moreover, despite the recognised benefits of training microdoses throughout the week as a complementary strategy, none of the coaches reported utilising them. Most emphasised the importance of conducting compensatory training on MD to ensure that all players maintained similar physical levels before the first tactical

training session of the week.

Heart

Health and Exercise Sciences

Study Protocol for a Randomised Controlled Trial: Effects of a Land and Aquatic Exercise Program on Chronic Low Back Pain

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Conflict of interest: nothing to declare. **Funding:** This work was funded by the National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

Background

Chronic low back pain (CLBP) is a condition with substantial functional, emotional, and social impacts. Various interventions have been proposed for its management, with either land-based or water-based—being one of the most recommended approaches. This study outlines a randomised controlled trial designed to evaluate the effects of a combined land and aquatic exercise program compared to an exclusively aquatic exercise program on pain, functional disability, and quality of life in adults with CLBP. Additionally, the study will examine the effects of exercise cessation on these outcomes.

Methods and Design

A single-blind randomised controlled trial will be conducted with a 1:1 allocation ratio. Approximately 30 adults with mechanical CLBP will be randomly assigned to one of two groups. The experimental group (ALG) will participate in a combined land and aquatic exercise program, while the control group (AG) will follow an aquatic-only exercise program, both lasting 8 weeks. Assessments will be performed using the Visual Analogue Scale, Oswestry Disability Index, Short-Form 36, Tampa Scale of Kinesiophobia-13, and Modified-Modified Schober Test. Data will be collected at three time points: baseline (M0), post-intervention at 8 weeks (M1), and 4 weeks after intervention cessation (M2).

Discussion

This study aims to provide valuable insights into the potential benefits of a combined land and aquatic exercise program for individuals with CLBP. It will assess the program's impact on pain, functional disability, fear of movement, quality of life, and lumbar mobility. The findings may offer critical information for the management of CLBP and inform future therapeutic approaches.

Trial Registration

The trial is registered at ClinicalTrials.gov (registration number: NCT06641570; registration date: October 14, 2024).

Acknowledgments

The authors would like to thank the organisations that collaborated in the development of the proposed study: ESECS-Polytechnic of Leiria, Department of Sports and Well-Being of Polytechnic Institute of Castelo Branco and Municipal Pool of Paião.

Exposure to moderate normobaric hypoxia as a therapy to improve cardiovascular health in older adults

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Conflict of interest: nothing to declare.

Funding: This research has been supported by Junta de Extremadura (Spain) and the European Regional Development Fund (ref: GR24024).

Ageing is a degenerative process caused by different cellular dysfunctions and tissue damage. The incidence of cardiovascular diseases increases as a function of age (Moturi et al., 2022). Chronic exposure to severe hypoxia leads to hypoxemia, vasoconstrictor activation, systemic inflammation, pulmonary hypertension and myocardial ischemia. However, intermittent exposures to moderate hypoxia could have beneficial health effects in both healthy and diseased individuals (Verges et al., 2015). The aim of this study was to evaluate the effect of moderate normobaric hypoxia exposure on parameters related to cardiovascular health in older adults. Sedentary adults over 65 years voluntarily participated in the study and were randomly divided into two groups: Control Group (CG, n=20) and Hypoxia Group (HG, n=14). A quasi-experimental design with pre-post assessments was performed, and an adherence to the intervention of 75% was required. HG was subjected to 3 weekly sessions of 45 min of normobaric hypoxia (FiO₂: 16.1; equivalent to a simulated altitude of 2500 m) for a period of 24 weeks. Body fat mass, lean mass, blood pressure, total cholesterol, triglycerides and glucose were determined. One-way ANOVA with the difference between pre- and post-values as the dependent variable was used. After intervention, results showed a significant decrease in body fat mass (-1.93 ± 1.35 kg; $p=0.001$; $\eta^2= 0.613$) and systolic blood pressure (-6.57 ± 10.50 mmHg; $p=0.045$; $\eta^2= 0.086$) values in HG compared to CG. No significant differences were observed between groups in metabolic

parameters or lean mass. On the one hand, the increase in nitric oxide caused under hypoxia conditions could lead to a vasodilation of the arteries and a reduction in arterial stiffness (Muangritdech et al., 2020). On the other hand, hypoxia exposure seems to cause an increase in the basal metabolic rate and a reduction in appetite (Kayser & Verges, 2021).

In conclusion, moderate normobaric hypoxia might be a useful therapeutic tool to deal with cardiovascular problems associated with ageing, such as an increase in body fat mass and systolic blood pressure.

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Do former professional rugby players have a significantly higher incidence of neurodegenerative disease than the standard population?

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Conflict of interest: nothing to declare.

A systematic review (Cunningham, Broglio, & Wilson, 2018), which investigated the long-term brain health of retired rugby players, suggested that the decrease in fine motor control may be influenced by a lack of control for evidence of upper limb musculoskeletal injuries. Furthermore, Gallo et al. (2020) and De Beaumont et al. (2009) showed reduced cognitive function among former athletes. However, despite their benefits, reservations concerning their application have been raised, specifically, the fact that they depend on the players' cognitive focus (i.e., data is susceptible to being manipulated and over/underestimated). According to the information mentioned above, the long-term neurocognitive effect of a history of concussion and/or repeated head impact exposure is a subject of increasing

controversy and concern in rugby union. The purpose of this study is to identify if former professional rugby players have a significantly higher incidence of neurodegenerative disease than the standard population. The project selected a multidisciplinary research team (e.g. experts in the field, medical doctors, and research scientists) that agreed to participate. The recruitment, voluntary participation, consent, and right to withdraw will be considered for the study. Male and female former professional rugby players (national and international level) with ages between 30 and 60 will be included. The analysis of the effects according to the player position (forward and back) and the effects on mental health and well-being will be considered. The research outputs from this research project will take an inclusive approach to authorship, acknowledging the contribution of individuals. This will be consistent with the International Committee of Sport and Medical Journals editors' recommendations for the conduct, reporting, editing, and publication of scholarly work in selected journals. This research project has the potential to make rugby union participation safer worldwide. Understanding the implications of rugby's long-term game impact exposure on cognitive functions in former rugby union players in more detail can inform the rugby community worldwide.

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Acute effects of velocity-monitored resistance training with 10% velocity loss in mechanical parameters in older adults.

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the Portuguese Foundation for Science and Technology, I.P., under grant numbers PRT/BD/154534/2022, PRT/BD/154638/2023, and BIPD/UTAD/7/2023 and project number UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

This study aimed to analyse the acute effects of velocity-monitored resistance training with a 10% velocity loss (VL) on mechanical parameters in older adults. The mechanical parameters assessed included maximum peak power (PPmax) and fastest mean velocity (MVbest). Twenty-nine participants (81.0 ± 8.0 years) underwent an adaptation period of 2 weeks to familiarise themselves with the procedures and exercises. The participants performed a progressive loading test in two separate sessions until reaching the one-repetition maximum in the leg press (LP) and chest press (CP). Afterwards, participants performed 3 sets of 10.0 % VL (VL10.0) at 60.0 % 1RM in the CP and LP. Velocity measurements for each repetition were recorded to effectively monitor the intensity and VL throughout the training process. Before and after each exercise, the MVbest and PPmax reached were recorded. No significant differences were observed between the pre-test and post-test in the chest press power (CP-P) and chest press velocity (CP-V) (p=0.34 and 0.39, respectively) or even between the leg press power (LP-P) and leg press velocity (LP-V) (p=0.32 and 0.88, respectively). In the CP-P and LP-P, there was a slight increase between the pre-test and post-test (CP-P: 137.0 W vs. 139.5 W; LP-P: 361.9 W vs.

366.6 W), while the CP-V and LP-V remained almost the same (CP-V: $0.34 \text{ m}\cdot\text{s}^{-1}$ vs. $0.35 \text{ m}\cdot\text{s}^{-1}$; LP-V: $0.44 \text{ m}\cdot\text{s}^{-1}$ vs. $0.44 \text{ m}\cdot\text{s}^{-1}$). This study demonstrated that older adults maintain mechanical performance in CP and LP after a VL10.0 threshold. Therefore, coaches and researchers must consider the implications of prescribing VL10.0, as it appears to positively stimulate muscle power in older populations using resistance machines.

Acknowledgments

We would like to sincerely thank Instituto Politécnico de Setúbal, Santa Casa da Misericórdia do Fundão, and all participants involved in this study.

The pattern of repetition velocity when starting the chest press with flexed and extended joints in older adults

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the Portuguese Foundation for Science and Technology, I.P., under grant numbers PRT/BD/154534/2022, PRT/BD/154638/2023, and BIPD/UTAD/7/2023 and project number UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

We analysed the pattern of the repetition velocity over the set when starting the chest press (CP) with flexed joints (FJ) and extended joints (EJ) in older adults. Eighteen participants (79 ± 10 years) underwent a 6-week intervention. Weeks 1 and 2 were to familiarise with the procedures and determine the individual load-velocity profiles in the CP. Participants were instructed to execute the concentric repetitions at their maximal intended velocity, followed by a controlled eccentric phase. From weeks 3 to 6, two weekly sessions were conducted, each consisting of two sets of ten repetitions at 40, 50, 60, and 70% of the one-repetition maximum (1RM) in the CP. Each relative load was tested separately for each condition, resulting in eight sessions. Each repetition's velocity was recorded in all sessions using a valid and reliable linear position transducer (Chronojump Boscosystem, version 2.3.0, Barcelona, Spain). The results showed that starting with FJ contributed to reaching the fastest mean velocity in the

second repetition more frequently. In contrast, in the EJ condition, the first and second repetitions were equally fast at about 40% of the time. Given the lower velocities in the first repetition with FJ, the associated relative load increased nearly 20% more than the programmed load. Significant differences existed between conditions for the first repetition's velocity across all relative loads, with the EJ condition producing higher values than the FJ condition. Nevertheless, there were no differences between conditions for the subsequent repetitions in the set and when comparing the fastest repetition in the set. A larger sample size and a broader range of age groups would enable us to generalise the results for each condition. This study demonstrates that the design of velocity-monitored resistance training for older adults should consider the initial execution condition in CP, as it affects the velocity of the first repetition and the magnitude of the associated load.

Acknowledgments

We would like to sincerely thank Instituto Politécnico de Setúbal, Santa Casa da Misericórdia do Fundão, and all participants involved in this study.

Acute impact of intense physical exercise to exhaustion on IGF-1 concentration and executive functions in young sedentary women: Effects after 12 weeks of HIIT training and a 12-week follow-up period without intervention

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Conflict of interest: nothing to declare.

Funding: nothing to declare.

Introduction

Physical exercise has well-documented benefits on health, influencing biomarkers like insulin-like growth factor 1 (IGF-1) and cognitive functions, such as executive functions (e.g., inhibitory control, cognitive flexibility). Despite evidence showing high-intensity interval training (HIIT) improves fitness and cognition, the acute effects of maximal effort exercise on IGF-1 and executive functions, especially in sedentary women, remain unclear. This study evaluated these acute effects and the long-term impact of 12 weeks of HIIT, with or without additional daily steps, and a 12-week follow-up without training.

Methods

In this study, the acute effect is analysed at baseline (T1), after 12 weeks of training (T2) and after a follow-up period (T3). For this purpose, a randomised controlled trial was conducted with 111 sedentary university women divided into three groups: HIIT group (HIIT), HIIT + 10,000 daily steps (HIIT+PA) and Control group (no intervention). IGF-1 levels were measured in saliva pre- and post-maximal effort exercise using ELISA. Executive functions—measured with the Stroop Test, Wisconsin Card Sorting Test, and Digit Span Test (Diamond, 2020)—were assessed immediately post-effort in each moment (T1, T2 and T3). A repeated-measures ANOVA was used to evaluate differences ($p \leq 0.05$), with Bonferroni post hoc tests for multiple comparisons.

Results

In relation to the acute effect on IGF-1 concentration, at T1, only the control group showed a significant post-effort IGF-1 increase ($\Delta=21.87\%$, $p=0.043$). At T2, the HIIT+PA group showed the largest IGF-1 increase ($\Delta=50.13\%$), though changes were not statistically significant. Regarding the acute effect on executive functions, at T1, inhibitory control improved significantly in the HIIT+PA group (Stroop Test, $p=0.001$). At T2, the control group demonstrated greater gains in inhibitory control ($p=0.001$), possibly due to baseline differences. No acute or chronic changes were observed in cognitive flexibility or working memory across groups.

Discussion

Acute IGF-1 responses to intense exercise varied, with significant increases observed only in the control group at baseline, possibly linked to fitness level. Training programs had limited effects on acute IGF-1 changes. Executive function improvements were inconsistent; inhibitory control improved acutely in the HIIT+PA group but was not sustained long-term. Cognitive flexibility and working memory showed no significant acute effects, aligning with prior studies (Chang et al., 2012; Haverkamp et al., 2020).

Conclusions

Maximal effort exercise elicits acute changes in IGF-1 and executive functions, particularly in inhibitory control. However, these effects are inconsistent and may depend on training status and baseline fitness. While HIIT combined with daily steps showed promising early results, no long-term effects were observed for cognitive flexibility or working memory. Future research should explore the role of training modalities and timing on these outcomes.

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Acute physiological response and perceived effort of older women while exercising with different limb strategies during water fitness exercises.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Appropriate physiological adaptations during water fitness exercises can be obtained depending on the type of exercise performed (Barbosa et al., 2009). The use of different limb strategies can increase complexity and, as a consequence, the cardiovascular demand (Costa et al., 2019). However, it remains unclear if a distinct combination of limbs may trigger different physiological responses. This study aimed to compare the acute physiological response and perceived effort of older women while exercising with different limb strategies during water fitness exercises. Eight women (61.5 ± 5.98 years, 1.57 ± 0.09 m of height, 65.56 ± 10.16 kg of body mass and 26.63 ± 3.88 kg/m² of body mass index) were randomly assigned to perform horizontal arm abduction (Ab), frontal kick (Fk), and aquatic skiing (Ski). The effort was performed over five minutes at a cadence of 132 beats per minute controlled by a metronome (Korg, MA-30, Tokyo, Japan). The physiological response was characterised by the heart rate (HR), systolic (SBP) and diastolic (DBP) blood pressure, double product (DPr) and blood lactate [La⁻]. The percentage of the predicted maximal theoretical HR (%HR_{max}) was also determined (HR_{max} = $208 - 0.7 * \text{age}$). The Borg's scale assessed perceived effort (RPE). The within-exercise comparison

was tested using repeated measures ANOVA, followed by a Bonferroni post-hoc test, and adding the partial eta squared (η_p^2) as an effect size. The women reached $65.69 \pm 11.00\%$ in Ab, $64.98 \pm 9.19\%$ in the Fk and $64.05 \pm 6.72\%$ in Ski of their %HRmax. While no differences were found in the physiological response between exercises, the women perceived a higher effort when performing the Fk.

Table 1. Comparison of physiological response and perceived effort between the different water-based exercises.

Variable, unit	Exercise			ANOVA		
	Ab	Fk	Ski	F	p	η_p^2
HR, bpm	102.38±6.84	103.50±21.69	105.00±16.67	0.05	0.95	0.00
SBP, mmHg	111.88±11.34	122.88±8.31	119.13±13.97	1.83	0.20	0.21
DBP, mmHg	72.63±14.96	74.00±10.85	71.88±15.50	0.15	0.85	0.02
DPr	11462±1471	12744±2922	12545±2645	0.56	0.59	0.07
[La-], mmol/L	3.63±1.82	3.23±1.42	3.00±1.64	1.35	0.29	0.16
RPE	8.75±1.28*	10.63±1.85	9.38±2.39	4.49	0.03	0.39

*, different from Fk; Ab, horizontal arms abduction; Fk, frontal kick; Ski, aquatic skiing; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; DPr, double product; [La-], blood lactate concentrations; RPE, rating of perceived effort; bpm, beats per minute.

Although some water fitness exercises may not trigger different acute physiological responses, the participants in a water fitness session may perceive intensity differently as it happens when devices are used (Costa et al., 2019). Actions involving only the lower limbs (i.e. kicks) promoted a higher perceived effort, which can be explained by the need to overcome the impulse during the downward phase of the movement, since this does not happen in the remaining exercises. So, water fitness professionals can be advised that the number of limbs in action may not solely determine the acute physiological response. The exercise mechanics should also be considered, even if having a lower number of limbs in action, as it may be perceived as more challenging by people of this age cohort.

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Understanding the women's force transfer from land to water during the alternate elbow extension-flexion

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Previous studies in water fitness focused on applied in-water forces during basic exercises (Santos, Barbosa, Bartolomeu et al., 2020). Although an alternate elbow extension-flexion (EE-F) exercise can be considered a more proper strategy (Santos, Barbosa & Costa, 2020) than a simultaneous action, little is known about the degree of strength transfer from land to water while performing such water fitness movement. This study aimed to analyse the women's relative force transfer from land to water during the EE-F by the elbow in a water fitness session. Ten middle-aged women (age: 58.63 ± 5.03 years old; body mass: 68.77 ± 10.60 kg; height: 161.55 ± 6.68 cm) performed EE-F while undergoing an incremental protocol with four music cadences (105, 120, 135 and 150 bpm). The music cadence was controlled by a metronome (Korg, MA-30, Tokyo, Japan) plugged into a sound system. A 3-minute warm-up, preceded by stationary running at low amplitude and intensity, was considered before the main protocol. In-water forces of dominant (F, in N) were assessed using a differential pressure system composed of one sensor (Aquanex 4.1, STR, USA). Only the flexion peak values were considered for further analysis. Isometric strength (IS, in N) at 90° elbow flexion on land was assessed using the MicroFET®2 hand-

held dynamometer, considering the dominant limb. The relative force transfer was calculated as $RFT = [(100 * FD) / (IS_D)]$. Repeated-measures ANOVA followed by the Bonferroni post-hoc test was used to verify differences in F and RFT throughout the incremental protocol. The partial eta squared (η_p^2) was selected as an effect size measure. Women were able to reach 75.9 ± 11.4 N during IS on land. Table 1 shows the comparison of F and RFT throughout the incremental protocol of EE-F. Differences were found between the four music cadences for F ($F(1.7, 15.1) = 58.4, p < 0.001, \eta_p^2 = 0.9$) and RFT ($F(1.6, 14.4) = 57.7, p < 0.001, \eta_p^2 = 0.9$).

Table 1. Descriptive analysis and comparison of F and RFT during the incremental protocol of EE-F.

Variables, units	Music cadences (bpm)			
	105	120	135	150
F, N	13.7±4.3*	17.6±4.4*	22.5±6.1*	29.5±7.7*
RFT, %	17.9±3.8*	23.1±4.3*	29.6±6.2*	39.1±9.0*

*, different from the all-remaining cadences; F, in-water force; RFT, relative force transfer; bpm, beats per minute.

The understanding of strength transfer into water fitness exercises is a key aspect for fitness professionals to prescribe adequate programs for strength development. Middle-aged women showed a tendency to increase RFT when increasing the music cadence, showing values from ~18 N (105 bpm) to ~39 N (150 bpm). A similar tendency was found by Santos and Costa (2021) while assessing the upper-limb horizontal adduction. Despite this, the authors found a higher RFT (~64%) at the cadence of 150, which can be explained by the mechanics of the movement (e.g., lever length). So, water fitness professionals should be aware that this type of exercise (i.e., EE-F) may not be suitable to achieve the recommended guidelines (~60%–80% of the one repetition maximum) for improving muscular strength during a water fitness session.

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Relationship between Baropodometric Footsteps and Chronic Pain: Effects of a Physical Activity Program on Posture and Chronic Pain Levels

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Assessing postural asymmetries, body composition, plantar pressure distribution and forces is crucial to understanding their interaction with pain levels. Postural asymmetries, such as deviations from ideal alignment, can lead to an increased risk of injuries and musculoskeletal problems (1). The body composition assessment provides information on the distribution of lean mass, fat mass and basal metabolism, which can have an impact on biomechanical functions and general health (2). Analysing the distribution of plantar pressure provides valuable information about foot function during activities such as walking, helping to identify abnormal patterns and potential injury risks (3). Understanding the forces acting on the feet helps to assess load distribution, which is essential for diagnosing gait abnormalities and foot-related pathologies (4)

Methods

This study is an experimental, longitudinal investigation with quantitative data analysis. A convenience sample was recruited to examine the influence of physical exercise, identifying significant variables that can reduce pain levels and improve stepping patterns. Data were observed and recorded at two time points: pre- and post-intervention. This design provided a comprehensive view of the differences and

associations within the sample. The evaluation protocol of APECS AI Posture Evaluation and Correction System was used. This protocol involves positioning the subject barefoot against a neutral background with arms relaxed and feet hip-width apart. Four images were captured from the different views of frontal (anterior and posterior) and sagittal (right and left lateral views) planes. These images were uploaded to the APECS software, where the artificial intelligence technology was employed to automatically identify key anatomical landmarks and evaluate postural alignment and symmetry.

Results

The descriptive analysis is presented in Table 1 regarding body compositions and anthropometrics, pain levels and baropodometric variables. For body composition, the variations between moments were between 0% and 3%. Regarding the pain, the variations were about 41%. The group of plantar pressure distributions changed by 18%. As for the baropodometric variables, the changes were between 1% and 27%.

Table 1. Descriptive statistics

Variables	N	Mean	SD	CV	Δ %
M1_Weight [Kg]	52	70.463	13.222	0.188	0%
M2_Weight [Kg]	52	70.177	12.861	0.183	
M1_BMI [Kg/m ²]	52	25.648	3.699	0.144	0%
M2_BMI [Kg/m ²]	52	25.537	3.414	0.134	
M1_Fat Mass [%]	52	28.248	6.727	0.238	-2%
M2_Fat Mass [%]	52	27.675	6.759	0.244	
M1_H ₂ O [%]	52	50.881	4.649	0.091	1%
M2_H ₂ O [%]	52	51.367	4.443	0.086	
M1_Lean Mass [%]	52	29.298	4.109	0.140	3%
M2_Lean Mass [%]	52	30.044	3.983	0.133	
M1_Basal Metabolism [Kcal]	52	1341.212	227.902	0.170	-1%
M2_Basal Metabolism [Kcal]	52	1325.25	217.533	0.164	
M1_Group	52	2.135	1.597	0.748	-18%
M2_Group	52	1.750	1.064	0.608	
M1_Pain Level	52	6.500	2.356	0.362	-41%
M2_Pain Level	52	3.846	1.903	0.495	
M1_LF_Lateral Load [%]	52	47.502	5.240	0.110	3%
M2_LF_Lateral Load [%]	52	49.025	3.450	0.070	
M1_LF_Maximal Pressure [KPa]	52	234.5	20.163	0.086	2%
M2_LF_Maximal Pressure [KPa]	52	238.898	10.836	0.045	
M1_LF_Area [cm ²]	52	124.154	24.902	0.201	-2%
M2_LF_Area [cm ²]	52	121.375	20.402	0.168	
M1_LF_Podal Axis [°]	52	8.692	9.212	1.060	-27%
M2_LF_Podal Axis [°]	52	6.317	5.221	0.826	
M1_LF_I-C [mm]	52	105.644	23.604	0.223	-5%
M2_LF_I-C [mm]	52	99.885	21.815	0.218	
M1_RF_lateral Lead [%]	52	52.498	5.240	0.100	-3%
M2_RF_lateral Lead [%]	52	51.054	3.420	0.067	
M1_RF_Maximal Pressure [KPa]	52	238.465	11.232	0.047	1%
M2_RF_Maximal Pressure [KPa]	52	240.338	9.606	0.040	
M1_RF_Area [cm ²]	52	130.923	28.776	0.220	-5%
M2_RF_Area [cm ²]	52	124.577	23.868	0.192	
M1_RF_Podal Axis [°]	52	10.442	4.745	0.454	-18%
M2_RF_Podal Axis [°]	52	8.571	4.954	0.578	
M1_RF_C-D [mm]	52	94.473	16.518	0.175	1%
M2_RF_C-D [mm]	52	95.294	17.518	0.184	

Legend: M1 - before, M2 – after, LF (Left Foot); RF (Right Foot); I-C (Distance between left foot COP and body COP); C-D (Distance between right foot COP and body COP).

Conclusion

This study highlights the critical role of posture in human well-being. Even though there is no single standard posture, it is essential for all bodily structures to be balanced to prevent excessive energy expenditure and the onset of pain. The study also concludes that postural assessment using baropodometric analysis enables the development of an effective training plan to correct posture, reduce bodily pain, and alter foot pressure distribution profiles.

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The effect of muscular fitness on the FMS scores in female gym users

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

In addition to physical fitness, dysfunctional movement patterns in fitness practitioners or athletes can increase musculoskeletal injury risk. The quality of movement has been assessed using the Functional Movement Screen (FMS), with some studies associating low FMS scores to higher injury frequency. However, the relationship between physical fitness and movement quality is not well understood. Therefore, this study aims to assess the impact of muscular fitness on FMS scores and asymmetries in healthy female gym practitioners.

The study included 17 women, 26.18 ± 3.23 years, body mass index of 24.76 ± 3.48 kg/m², engaged in physical exercise regularly at the gym, on average 2.8 ± 1.0 days per week. All participants completed FMS test protocol, muscular endurance tests (push-up, squat, and plank) and balance test (Y-balance). The FMS test protocol evaluates an individual's functional movement patterns through seven exercises (Deep Squat, Hurdle-step, In-line Lunge, Shoulder Mobility, Active Straight Leg Raise, Trunk Stability Push-up, and Rotary Stability) that require a balance between mobility and stability. Pearson's bivariate correlation test was carried, after the data normality had been observed with the Shapiro-Wilk test ($p > 0.05$). The coefficient of

determination (r^2) was also calculated as a measure of the proportion of variance. SPSS v.28 was used for all statistical analyses, with significance set at 5%. The average FMS score was 15.18 ± 1.91 , with 64.7% of participants scoring above 14, indicating high-quality movement patterns linked to a low risk of injury. However, the average scores for several functional movements (trunk stability push-up, hurdle-step, in-line lunge, and rotary stability) were below a score of 2. In addition, the results also showed that 94.1% of participants had at least one asymmetry, and 58.8% had two, mainly in pelvic girdle stability and core muscles. Significant positive and strong correlations were found between the FMS total score and muscular endurance, particularly with lower body muscular endurance, Squat Test ($r=0.849$, $p < 0.001$), and upper body muscular endurance, Push-up Test ($r=0.622$, $p=0.008$) (Table 1). In the case of the FMS vs Squat Test correlation, $r^2=0.720$ suggests that 72% of the variance in the FMS Total Score is explained by the Squat Test results, while 39% of the variance in the FMS Total Score is explained by the Push-up Test results ($r^2=0.387$). It can be concluded that the participants' movement patterns are not associated with a high risk of injury. Nevertheless, there are asymmetries and functional deficits in the stability and control of the pelvic girdle and core muscles that should be addressed to prevent possible declines in performance and future injuries resulting from compensatory movement patterns. The results also indicate that lower and upper body muscular fitness must be part of the training to enhance movement patterns.

Table 1- Pearson's bivariate correlation test of muscular fitness measures with FMS.

Variable	FMS® Total Score	
Y-Balance® (right)	$r = 0,398$	$p = 0,114$
Y-Balance® (left)	$r = 0,434$	$p = 0,082$
Push-up Test	$r = 0,622$	$p = 0,008^{**}$
Squat Test	$r = 0,849$	$p = < 0,001^{**}$
%Plankmax (%)	$r = 0,359$	$p = 0,157$

****** $p < 0,01$.

Wall Drop Punt Kick and Catch (Tripela Sports) test as a potential proxy of boys' motor competence

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

Previous work has shown that the Wall Drop Punt Kick and Catch (Tripela Sports) test has a strong correlation with the manipulative component (the two tests) of the Motor Competence Assessment (MCA) battery, especially for boys. In the present study, our aim was to search for a broader spectrum of associations between both instruments. We recruited 36 early adolescent boys (*M* age = 11.44, *SD* = 0.74 years) for assessment. Participants performed the six MCA tasks and the Tripela Sports test. Tripela Sports test significantly correlated with all six MCA tests. More specifically, four moderate correlations emerged, namely with the MCA locomotor component (shuttle-run, $r = -0.568$, and horizontal jumping, $r = 0.431$) and the stability MCA component (shifting platforms, $r = 0.424$, and jumping sideways, $r =$

0.471). With the two tests of the MCA manipulative component, strong correlations were verified (kicking for speed, $r = 0.759$, and throwing for speed, $r = 0.664$). Results suggest that, for boys, the MCA motor competence battery may be substituted, with all instrumental and reduced time-consuming benefits, by the Tripela Sports test, as the latter appears to be a good proxy of motor competence. Future investigations should extend this assessment to girls. Given the well-known differences in the amounts and types of play undertaken by both genders, we may speculate that, compared to boys, some differences will emerge in the previously mentioned correlations.

The Road to Recovery: Managing Barriers to Exercise in Cancer Survivors

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Breast cancer survivors (BCS) frequently face a range of challenges associated with the late effects of cancer treatment (Faithfull & Greenfield, 2024), including fatigue, cognitive impairments, body image concerns, sexual health issues, fear of recurrence, anxiety, and depression (Schmidt et al., 2022). These challenges may impair exercise adherence and participation (Ng et al., 2021). Indeed, the late effects of cancer treatment are a major obstacle to exercise for BCS (Hefferon et al., 2013). This study aims to identify and analyse the predominant late effects of cancer treatment experienced by BCS and their

impact on exercise participation. A validated questionnaire available in the literature (Olsen et al., 2024) was translated into Portuguese by a panel of experts and distributed among BCS between November and December 2024. Thirty-one women BCS completed the questionnaire. The quantitative data collected was analysed using descriptive statistical methods. Major symptoms reported by BCS include fatigue and peripheral neuropathy (e.g., tingling or loss of sensation in the extremities), which impairs exercise adherence, as well as decreased sexual desire and mucosal dryness. Over 50% of BCS surveyed reported inadequate counselling or support to address the late effects of cancer treatment. These factors should be carefully considered when designing exercise programs for this population. Tailored interventions are essential to enhance participation and motivation, mitigate the exacerbation of late effects of cancer treatment, and potentially alleviate symptoms such as fatigue and peripheral neuropathy. The late effects of cancer treatment represent a significant challenge to exercise adherence; hence, the urgent need to acknowledge these challenges in clinical exercise, ensuring the necessary guidance to address their long-term needs effectively.

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Comparison of the effects of water aerobics in different populations

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Conflict of interest: nothing to declare. **Funding:** this work was supported by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

Several studies have explored the acute and chronic effects of water aerobics on health and physical fitness (Andrade et al., 2020; Moreira et al., 2017). However, research comparing its effects on individuals of different ages remains limited. Thus, this research compared the effect of water aerobics on health-related variables in adults vs. older adults. For this, twenty individuals were assigned to two different groups. Each group participated in 45 minutes of water aerobics twice a week for 24 weeks. One group consisted of individuals aged between 18 and 64 years (Adults group; $n = 10$; 50.20 ± 2.70 years), while the other group included individuals aged 65 years or older (Older Adults group; $n = 10$; 73.40 ± 6.48 years). Participants underwent evaluation before and after the program. The assessments included muscle strength (countermovement jump [CMJ], medicine ball throw, chair stand test [CST], arm curl), anthropometric (body mass, body mass index, fat mass, fat-free mass), lipid profile (triglycerides, total cholesterol), and blood pressure (systolic and diastolic blood pressure). The Student's paired t-test was used to conduct a within-group analysis on each variable, and the effect size was calculated to estimate within-subject comparisons, using Cohen's d (ES). CMJ ($p = 0.04$; ES = 0.70) and diastolic blood pressure ($p = 0.03$; ES = -0.74) improved in Older Adults, while CST ($p = 0.04$; ES = 0.68) increased in Adults. Adults ($p = 0.02$; ES = 0.81) and Older Adults ($p = 0.01$; ES = 0.96) also

demonstrated improvements in arm curl. Lipid profile and body composition variables showed no changes in either group. The study's results indicated that participating in water aerobics for 24 weeks improves diastolic blood pressure and explosive strength in the lower limbs of older adults and enhances muscular endurance in the lower limbs for adults. Additionally, adults and older adults can increase their upper limb muscular endurance through a water aerobics program. Overall, water aerobics is an effective way to increase muscle strength in adults and older adults.

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Autonomic Nervous System Adaptations to Combined Training During the COVID-19 Lockdown

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The autonomic nervous system has the ability to maintain cardiovascular homeostasis by making adaptations with regular physical activity. Studies show a global increase in heart rate variability (HRV), a marker of the autonomic nervous system activity, with an increase in parasympathetic modulation due to better regulation by the hypothalamus, mainly related to aerobic exercises. This study aims to analyse the adaptations of the autonomic nervous system after a combined training program during the lockdown due to the COVID-19 pandemic using HRV measurements. It was hypothesised that there would be an

alteration in HRV after the combined training program. Thirty-one sedentary workers ($48,26 \pm 7,89$ years old) were randomly assigned into a combined training group ($n=12$) and a control group ($n=19$). The combined training program was carried out for 16 weeks, involving resistance and aerobic exercises. Heart rate variability was assessed before and after the intervention in both groups. In the frequency domain, very low frequency (ms^2), low frequency (ms^2), high frequency (ms^2), low frequency (n.u.), high frequency (n.u.) and LF/HF ratio variables were assessed. In the time domain, SDNN, RMSSD and Mean RR were evaluated. After the combined training program, the LF/HF ratio showed significant differences ($p = 0,03$) compared to the baseline. No statistical differences were found in the other variables in the combined training group. The findings of the present study suggested that participants who remained physically active demonstrated a lower parasympathetic tone due to the reduction in the LF/HF ratio after the combined training program.

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Strength Training Rest Protocol Proposal Based on %SmO₂

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Conflict of interest: nothing to declare. **Funding:** The author López-Sierra is a grantee of the "FPU 2023" of the Ministry of Science, Innovation and Universities, code FPU23/029.

Strength training involves short sets with rest periods of varying lengths, during which oxygen is crucial for muscle recovery. Fitter individuals recover faster, allowing greater training loads. Monitoring muscle oxygen saturation is gaining relevance as an objective alternative to subjective effort measures like RIR or RPE. This is now possible through non-invasive near-infrared spectroscopy (e.g., MOXY devices). Scientific evidence shows that muscle oxygen saturation declines during strength training (Miranda-Fuentes et al., 2021), contributing to performance reduction if not managed. Research indicates that oxygen saturation varies by muscle, with the vastus lateralis (VL) being the optimal site for measurement in the quadriceps (Azuma et al., 2000; Mavridis et al., 2024). Strength training should be performed at $\leq 75\%$ of RM due to higher oxygen consumption demands (Miranda-Fuentes et al., 2021). However, data on rest periods remains inconclusive. While oxygen saturation cannot be controlled during exercise, rest periods offer an opportunity for coaches to adjust recovery time based on saturation levels. This research aims to propose an intervention to analyse how rest periods at different oxygen saturation levels affect performance in lower-body strength training. The protocol design was approved based on the expert's criteria, selecting a group of experts who met the characteristics established by the researchers: (i) having completed a master's degree or PhD related to strength, (ii) having been a strength coach or strength training teacher previously, and (iii) having conducted scientific research related to the field of study. Six experts were considered after meeting the inclusion criteria. The intervention protocol was based on an experimental methodology based on a quasi-experimental design with replication changed

according to its internal validity. The protocol begins with an initial pre-intervention phase in which participants' informed consent, personal composition data, an assessment of oxygen consumption at rest and during activity, and a measurement of estimated RM using Brzycki's formula are collected. During the intervention phase, two measurements will be performed twice a week for four weeks. In each session, the same warm-up will be performed, based on the approximation of the 1RM. After the warm-up, four sets of Bulgarian squats from 0 to 90 degrees of knee flexion at 75% of 1RM will be performed until muscle failure. The LV oxygen saturation of both legs will be measured with MOXY devices during recovery. Each week, a recovery percentage of oxygen consumption will be established to be reached between sets (60%, 70%, 80% and 90% of oxygen consumption). Once reached, the next set will be started until all four sets have been completed. To avoid biasing the results due to accumulated chronic fatigue, the same process will be repeated for three more months (four months of intervention in total), randomising the distribution of the recovery percentages throughout the four weeks of the month, preventing the accumulated fatigue after weeks of intervention from conditioning the results. At the end of each month, the body composition and 1RM data will be updated, in order to better explain the results and always work with the most updated RM possible.

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Decoding peripheral arterial disease with cluster analysis: near-infrared spectroscopy for microcirculatory assessment

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Foundation for Science and Technology (FCT, Portugal) and European Social Fund (ESF), through a Doctoral grant endorsed to Daniel Santarém (2023.05145.BDANA) under the Human Potential Operating Program (POPH).

Wearable near-infrared spectroscopy (NIRS) technology has gained prominence as a non-invasive tool for assessing skeletal muscle oxygenation (SmO₂) in sports activities (Perrey et al., 2024) and shows promise for understanding peripheral adaptations in patients with peripheral arterial disease (PAD) (Cornelis et al., 2021). This study investigated SmO₂ responses through a cluster analysis in PAD patients during a graded exercise test. A total of 35 PAD patients with intermittent claudication (age, 65.5±7.7 yr; ankle-brachial index, 0.62±0.14 a.u.; Fontaine stage II) completed the graded Gardner-Skinner test. Pain-free walking distance (PFWD) and maximum walking distance (MWD) were registered, and SmO₂ was measured with a NIRS device (MOXY 5, Fortiori Design LLC, Minnesota, USA) placed on the

gastrocnemius medialis muscle of the most affected leg. Endpoints changed (Δ) from rest to 1-min of exercise, specifically ΔSmO_2 , deoxy-haemoglobin (ΔHHb), oxy-haemoglobin ($\Delta\text{O}_2\text{Hb}$), and differential haemoglobin (ΔdHb). A *k*-means clustering algorithm categorised patients into groups based on PFWD and MWD performance, with the optimal number of clusters determined via the silhouette score. Non-parametric tests were applied due to the small sample size, with all analyses conducted in R software (version 4.4.1, R Foundation for Statistical Computing, Vienna, Austria). Two clusters emerged, labelled as "High-Walking" (HW, $n=9$) and "Low-Walking" (LW, $n=26$) groups. The HW group ($Mdn = -29.5\%$, $IQR = -36.7$ to -26.2%) showed a slightly smaller change in ΔSmO_2 compared to LW group ($Mdn = -36.1\%$, $IQR = -40.9$ to -25.4%), despite no significant difference being found, $U=87.0$, $z=-1.13$, $p=0.271$. While ΔdHb did not differ significantly between clusters ($p=0.271$), a slightly lower variation was exhibited in the HW group ($Mdn = -7.4$ g/dL, $IQR = -9.6$ to -6.8 g/dL) compared to the LW group ($Mdn = -9.4$ g/dL, $IQR = -11.6$ to -6.6 g/dL). No differences were observed in both ΔHHb and $\Delta\text{O}_2\text{Hb}$. As ΔdHb reflects both local perfusion and deoxygenation, the slight change in the HW group may suggest that this group of patients achieve a better balance between oxygen supply and consumption. These findings demonstrated that a personalised approach using clustering techniques with PFWD and MWD may enable the identification of potential response patterns in SmO_2 during exercise, which can optimise the dose-response prescription.

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Effects of a 24-week combined aerobic and resistance exercise training on body composition and lower-extremity muscle function in patients with peripheral arterial disease

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Foundation for Science and Technology (FCT, Portugal) and European Social Fund (ESF), through a Doctoral grant endorsed to Daniel Santarém (2023.05145.BDANA) under the Human Potential Operating Program (POPH).

The benefits of supervised exercise on improving walking performance, aerobic capacity, and muscle function in peripheral arterial disease (PAD) patients with intermittent claudication (IC) have been widely explored (Peñín-Grandes et al., 2023). With combined aerobic and resistance exercise training (AET+RT) being a promising strategy to attenuate disease progression and improve walking ability, this study explored the effect of a 24-week AET+RT on body composition and lower-extremity muscle function in PAD patients with IC. Thirty-five patients (age=65.3±7.7 yr; Fontaine stage IIa and IIb) were allocated into AET+RT group (n=20; lower-extremity fat mass [LE-FM]=2.8±0.7 kg) or usual care group (UC; n=15; LE-FM=2.5±0.9 kg).

The AET+RT comprised treadmill walking and lower-extremity resistance training (bodyweight squat, unilateral leg extension, and calf raise) three times per week. The UC was advised about lifestyle modification, including advice to walk regularly. Assessments were conducted at baseline and 24-week, with endpoints including body composition - LE-FM, lower-extremity fat-free mass (LE-FFM), and appendicular skeletal muscle mass index (ASMI) - and lower-extremity muscle function - sit-to-stand (STS) and timed up-and-go (TUG) tests. Statistical analyses were performed using repeated measures ANOVA (2x2) in JASP software. There was a significant time x group interaction in ASMI ($F(1,30)=10.0$, $p=0.004$, $\eta^2=0.250$), with a significant decrease in UC after 24-week (mean difference= -2.8 kg/m^2 , 95% CI [0.8, 4.8], $p=0.003$) and a lightly decrease in AET+RT (mean difference= -0.1 kg/m^2 , 95% CI [-1.6, 1.5], $p=1.000$). Furthermore, a significant effect was found in TUG ($F(1,20)=4.57$, $p=0.045$, $\eta^2=0.186$), with AET+RT reducing the execution time (mean difference= -2.3 s , 95% CI [-3.3, -1.3], $p<0.001$). No time x group interaction differences were found in LE-FM ($p=0.119$), LE-FFM ($p=0.145$) and STS ($p=0.335$). These findings reinforce the efficacy of combined exercise in preserving muscle mass and function, while improving lower-extremity balance and functional capacity. The present study highlights the importance of implementing combined aerobic and resistance training to enhance functional outcomes in PAD patients with IC.

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Exercise in hereditary ATTR (ATTRv) amyloidosis: a narrative review

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Conflict of interests: nothing to declare. **Funding:** Portuguese Foundation for Science and Technology (2023.00324.BD and UID/04045/2020).

Hereditary ATTR (ATTRv) amyloidosis is a rare disease caused by mutations in the gene encoding transthyretin that lead to the accumulation of amyloid fibrils in nerves and organs. For more than two decades, liver transplantation was the only available therapy for ATTRv amyloidosis, but recent pharmacological agents have come to revolutionise the treatment of this disease, inducing a significant improvement in health-related quality of life (HRQoL). Nevertheless, patients experiencing disease progression still face considerable physical and mental health challenges. The purpose of this review was to explore the current state of the art regarding the role of exercise in improving HRQoL in this population. The few existing studies

demonstrated the benefits of an exercise intervention in improving body composition, walking capacity and muscle strength in ATTRv amyloidosis patients post-liver transplantation, with a long-term retention of the benefits acquired with exercise. Nevertheless, the potential benefits of exercise in long-term liver transplanted patients and in those who are currently receiving the new therapies are yet to be explored. Moreover, the role of exercise in reducing the mental burden of living with ATTRv amyloidosis remains to be investigated. Future research should seek to clarify these questions while raising awareness among patients and healthcare professionals about the importance of regular exercise in improving HRQoL in this community.

Evolution of street running events in Rondônia: reality in the Amazon

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The present study approaches, in general, the evolution of street races in Brazil, and, in particular, in the state of Rondônia, examining the significant transformations over the years. Street racing has been consolidated as one of the most popular sports in several regions of Brazil, including the state of Rondônia. In recent years, this sports practice has not only expanded in terms of participation, both male and female, but has also diversified in relation to its modalities and the profile of the participants. The relevance of the research in the search to understand the evolution, the levels of organisation of events and the interest in participating in street races in Brazil and Rondônia is justified. The main objective of the research is to identify the growing movement of street running events in Brazil and in the state of Rondônia, in relation to the number of events, the number of participants, health promotions, in addition to the analysis of its evolution. For this, a descriptive qualitative methodology based on bibliographic research was applied, using the deductive method to interpret secondary data and contextualise them to the specific scenario of Brazil and in the state of Rondônia, in the periods from 2017 to

2024. The press outlet CNN Brasil, published an article on data from the Strava application (physical activity monitoring platform), released the results of the Annual Report on Sports Trends, a survey carried out with its users, in which the global community added up to more than 135 (one hundred and thirty-five) million people in 190 countries, billions of data points regarding the sports practiced by its users are being analysed. One of the results found was that running was the most practised sport in the world in 2024, and, according to the platform, Brazil is the second country with the highest number of athletes, with more than 19 million runners. In Brazil, we have the largest street running event in Latin America, the Rio Marathon, which, in its last edition in 2024, had 45,000 registered participants on the days of the event. The São Silvestre Race had more than 37,000 entries in its last edition, and, not least, the São Paulo Marathon, which in its last edition had 18,000 entries. In Rondônia, the growing increase in street races has been gradually standing out, 23 events were held during the year 2024 by specialised companies. As an example of this growth, Ji-Paraná, a city in Rondônia, will host one of the biggest sporting events in the Amazon region in 2025, the Marco Zero International Race, which will feature the largest prize pool ever paid in all of Brazil, attracting the eyes of many athletes from outside the country to Brazil and, especially, to Rondônia. The results revealed that street running in Brazil and Rondônia has growth trends, given that people are becoming aware of the benefits of physical exercise, in addition to the fact that street running is a sport that caters to all audiences, from beginner to advanced, thus establishing new perspectives that can guarantee the sustainability and growth of this sport in the future. Taking into account the high rate of participants in the events. The study contributes to the understanding of sports dynamics in diverse contexts and spaces and offers insights for the promotion and management of sporting events. According to a Strava report, sports advisories had an increase of 109% in Brazil in 2024.

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Effects of Aerobic and Resistance Training in Metabolic Syndrome Clinical Biomarkers and Secondary Relevant Parameters: An Umbrella Review of Randomised Controlled Trials Meta-Analyses

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Metabolic syndrome (MetS) is characterised by a cluster of metabolic and cardiovascular risk factors, including central obesity, dyslipidemia, hypertension, and hyperglycemia, which significantly increase the risk of cardiovascular disease and Type 2 Diabetes Mellitus. This umbrella review synthesises evidence from meta-analyses of randomised controlled trials to evaluate the effects of aerobic and resistance training on parameters related to Metabolic Syndrome. A systematic search was conducted in PubMed, Web of Science, Cochrane Library, Scopus, SPORTDiscus, and PEDro databases in accordance with PRISMA guidelines, yielding 14 eligible meta-analyses involving 191 randomised controlled trials and 14,114 participants. The AMSTAR-2 tool assessed the methodological quality of the included studies. The primary finding of the present study was that (i) Aerobic Training (AT) and Combined Training (CT) seems to be effective in reducing waist circumference, (ii) AT and Resistance Training (RT) effectively reduces blood pressure, with some nuances observed in systolic blood pressure and diastolic blood pressure, (iii) seems to exist an ambiguous potential of aerobic regimens to reduce triglycerides levels, without apparent differences between interval and continuous stimuli (whereas RT appeared to be limited in improving this parameter), (iv) AT is a

cornerstone intervention for improving lipid profiles in individuals with MetS due to its consistent efficacy in positively influencing HDL cholesterol levels, with neither interval nor continuous stimuli appearing to be clearly superior. Furthermore, RT does not appear to have an impact on this variable, but when combined with aerobic exercise, it seems to provide some beneficial outcomes. (v) Presumably, some contrasts about the role of AT in blood glucose regulation emerged, with more recent research pointing to its relevance. There seems to be a convergence when it comes to interval or continuous training, when no meaningful differences are seen. On the other hand, RT doesn't demonstrate significant decreases in this clinical biomarker (although CT, albeit also displaying some discrepancy in the data given, seems to have its good prospects supported by the current investigations). In addition to MetS-related clinical biomarkers, this umbrella review indicated promising results from AT regarding lipoprotein sub-fractions, lipid and Apo ratios, as well as Apo A1, A2 and B100, which appear to be superior predictors of cardiovascular disease risk compared to the standard lipid profile. Also, exhibited significant reductions in pro-inflammatory markers (TNF- α , CRP, and IL-8), and a significant rise in the anti-inflammatory marker IL-10. AT led to the highest reductions in TNF- α and CRP levels, while CT was more successful in modifying IL-6 and IL-10. RT alone revealed less dramatic effects across most inflammatory indicators. These data underscore the impact of exercise, especially AT and CT, in decreasing systemic inflammation among individuals with MetS. Lastly, this study indicated consistent and significant gains in VO₂peak across diverse exercise regimens, specifically within AT and CT, with notable variations identified between continuous and interval aerobic exercise. These findings encourage the integration of structured exercise routines into the clinical realm to lessen the burden of Metabolic Syndrome. Future high-quality research is essential to refine exercise prescriptions and address gaps in the current literature.

Exercise adherence in fitness. A one-year motivational multi-theoretical approach - Tell me what you've done and I'll tell you what you'll do

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

The main purpose of this study was to test a hierarchical model of motivation that integrates Achievement Goal Theory and Self-Determination Theory to predict exercise adherence. 2180 exercisers (1020 female, 1160 male) aged between 18 and 60 years, from different gyms and

health clubs, completed several scales validated in exercise settings, regarding perceived motivational climate, basic psychological need satisfaction, behavioural regulations, and exercise adherence. For the last measure, the computer access control system over a 6-month period before and after the assessment was consulted. Structural equation models showed: 1) task-involving climate positively predicted basic psychological needs. In turn, the satisfaction of these needs predicted autonomous motivation, which led to a positive prediction of adherence; 2) small variation of exercise adherence was explained by the motivational model under analysis. Nevertheless, the model significantly improved their analytical power when past adherence was inserted in the model. In conclusion, autonomous motivation can predict people's exercise adherence, and past behaviour increases that predictive effect. The present study brings scientific evidence to the popular saying “tell me what you've done and I'll tell you what you'll do”.

The impact of individualised exercise prescription on physical performance and health-related quality of life in older adults

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant number BIPD/UTAD/7/2023 and project number UI/04045.

We analysed the impact of an individualised exercise program on physical performance and health-related quality of life (HRQoL) in institutionalised older adults. Twenty-nine individuals (twenty women and nine men; 81 ± 9 years; 66 ± 15 kg; 160 ± 8 cm) performed an 8-week intervention using the VIVIFRAIL guidelines (Izquierdo, 2020). Participants performed two weekly sessions of individualised strength, balance, flexibility, and cardiovascular endurance exercises based on their baseline physical performance levels (Izquierdo, 2020). Before and after 8-weeks, participants performed a battery of tests, which included the Short Physical Performance Battery (SPPB), Senior Fitness Test, and the HRQoL 36-Item Short Form Survey (SF-36). After 8-weeks, paired samples t-tests revealed significant improvements (all $p < 0.001$) in SPPB (2 ± 2 points; effect size [ES] = 0.53), 30-s chair stand (3 ± 3 repetitions; ES = 0.74), arm curl (7 ± 5 repetitions; ES = 1.11), and 6-minute walking (71 ± 97 meters; ES = 0.61). Furthermore, there were significant HRQoL improvements (all $p < 0.001$) in several SF-36 scales, including role physical (47 ± 50 points; ES = 0.96), role emotional (54 ± 47 points; ES = 1.21), vitality (24 ± 24 points; ES = 0.89), social functioning (32 ± 34 points; ES = 0.85), and bodily pain (31 ± 21 points; ES = 1.01). This study demonstrated that an individualised exercise

prescription effectively induced physical performance gains (lower and upper-body strength and walking benefits) and HRQoL improvements (e.g., increased self-reported vitality and decreased self-reported bodily pain) in institutionalised older adults.

Acknowledgments

We thank the clinical staff of “Centro Social e Paroquial da Freguesia de Cebolais de Cima, Castelo Branco” for their support and all participants included in this study.

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Physical activity, healthy lifestyle, and subjective well-being in people with type 2 diabetes: testing the efficacy of an exercise program

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The World Health Organisation (WHO) recognises that healthy lifestyles are built on five pillars: nutrition, exercise, sleep, stress reduction, and alcohol/tobacco consumption. Type 2 diabetes is strongly linked to unhealthy lifestyles, especially low levels of physical activity, with a negative impact on subjects' quality of life and subjective well-being. This study aims to test the effectiveness of a physical exercise program, designed specifically for people with

type 2 diabetes, on subjective well-being and lifestyle changes, according to the main dimensions of the PANSAS model, which is based on the WHO's global recommendations for physical activity and health. However, we previously proposed (study 1) to validate the Portuguese version of the FANTASTIC questionnaire, which allows the assessment of lifestyle behaviours. Participate in this study 32 subjects (14 males and 17 females) with type 2 diabetes, aged between 58 and 79 years. For nine months, the subjects were involved in the physical exercise program: sessions of 90 minutes each, three times per week, with moderate intensity, which included the combination of aerobic exercise, resistance exercise, agility, balance, and flexibility. The results show us that the implementation of physical exercise is beneficial in improving significantly the positive affect, satisfaction with life, physical activity, sleep, stress, and nutrition behaviours, and significantly diminishing the negative affect. However, these results should be interpreted with some caution, as our study did not have a control group, and the sample was one of convenience. We should therefore continue to carry out further studies in the future to consolidate the results achieved in the present study.

Upper Limb Mobility in Breast Cancer Survivors: Flexion Differences Between Affected and Unaffected Arms

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Conflict of interest: nothing to declare. **Funding:** BII1- Integrated development of clinical exercise- Research Centre Health Sciences and Human Development- Strong Community (CIDESD -UIDB/04045/2020)

Breast cancer diagnoses among women are increasing, and many of these patients develop upper limb disabilities as a result of treatment, which can persist for more than two years post-surgery (McNeely et al., 2010). This study aims to assess the differences in mobility between the arms and compare the limitations of the affected arm with the unaffected arm. A total of twenty-one breast cancer survivors (mean age 56.95 ± 6.58 years) participated in the study. Upper limb flexion was assessed (my rom app) to identify differences between the right and left arms, as well as between the affected and unaffected arms. The independent samples t-test was used to determine significant differences. No significant differences were found in the

flexion of the right upper limb compared to the left ($p=0.87$; $ES=-0.24$), nor in the flexion of the affected upper limb compared to the unaffected side ($p=0.35$; $ES=-0.66$), which contrasts with findings reported in the literature (Redemski et al., 2010; Azeredo-da-Silva et al., 2024). Since the participants in this study had undergone surgery some time ago, this may help explain the lack of significant differences in upper limb flexion. The decrease in upper limb mobility with age is another hypothesis that may justify the results obtained. These findings indicate that upper limb mobility, specifically in terms of flexion, may not be substantially impaired in this population, highlighting the need for further research to explore other aspects of upper limb function and the potential impact of therapeutic interventions on long-term recovery.

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Evaluation of Smartwatch Accuracy in Body Composition Measurement: A Practical and Affordable Alternative to Reference Devices

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Conflict of interest: nothing to declare. **Funding:** BII_3 and BII_4: Integrated development of clinical exercise programs – Research Centre in Sports Sciences, Health Sciences and Human Development – Strong Community (CIDESD - UIDB/04045/2020)

Wearables are valuable resources to assist in healthcare for conditions such as obesity, dementia, cardiovascular disease, frailty and other illnesses (Bennett et al, 2022). This study aims to assess the accuracy of body composition measurements from a smartwatch, comparing its results with those obtained by a scale, which is considered a reference device. A total of 134 participants (45 men and 89 women) with a mean age of 54.58 ± 23.08 years were recruited.

Body composition was simultaneously measured using a smartwatch (Samsung Galaxy Watch 6) and a bioimpedance scale (Tanita BC-418 MA). The T-test and nonparametric tests for independent samples were used to compare variables fat mass (%), fat mass (kg), fat-free mass (kg), and total body water (kg), while the intraclass correlation coefficient (ICC) was calculated to assess correlation. For the body composition variables—fat mass (%), fat mass (kg), fat-free mass (kg), and total body water (kg)—the correlation between the Samsung Galaxy Watch 6 and the Tanita BC-418 MA bioimpedance scale was moderate (ICC = 0.86, ICC = 0.84, ICC = 0.87). The independent samples T-test for fat mass percentage showed no significant differences ($p = 0.59$). The non-parametric test for independent samples also found no significant differences in fat mass (kg), fat-free mass (kg), and total body water (kg) ($p = 0.36$, $p = 0.48$, $p = 0.73$). These findings suggest that the Samsung Galaxy Watch 6 provides reliable body composition measurements comparable to those obtained from a bioimpedance scale, supporting its potential as a practical alternative for body composition assessment. Its portability and affordability further enhance its viability as a tool for body composition measurement in various settings.

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Baseline Assessment of Physical Fitness and Functional Limitations in Breast Cancer Survivors: Insights from the Mama_Move Program

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Conflict of interest: nothing to declare. **Funding:** BII_3 and BII_4: Integrated development of clinical exercise programs, which will take place at the University of Beira Interior (CIDESD: UIDB/04045/2020)

Physical fitness is crucial for promoting autonomy and quality of life, reflecting an individual's ability to perform daily tasks and exercise with minimal effort (Kirkham et al., 2015). However, oncological treatments often result in physical and psychological side effects that compromise the quality of life for cancer survivors (Campbell et al., 2019). This study aimed to assess the physical fitness and body composition of breast cancer survivors prior to initiating an exercise program (MAMA_MOVE). Twenty-one women breast cancer survivors (mean age 56.20 ± 8.79 years) underwent physical fitness assessments (one-repetition maximum (1RM) on chest

press and leg press, 30-second chair stand test, 3 kg medicine ball throw, handgrip strength test, and the modified Balke protocol). Anthropometric measures included body mass, body fat percentage, fat-free mass, and visceral fat. Participants presented body mass 68.93 ± 12.92 kg, body fat percentage 35.39 ± 7.54 , fat-free mass 43.49 ± 4.68 kg, and visceral fat 8.00 ± 2.59 . Regarding physical performance, the mean values were chair stand (21.49 ± 5.69 repetitions), medicine ball throw (2.21 ± 0.41 m), right handgrip (25.11 ± 4.20 kg), left handgrip (25.35 ± 12.49 kg), chest press (10.91 ± 3.15 kg), leg press (82.72 ± 23.05 kg), and VO₂max (16.92 ± 2.96 ml/kg/min). The results revealed significant limitations in the physical fitness and body composition of breast cancer survivors, particularly in muscular strength and aerobic capacity, consistent with findings reported in the literature (Ortiz et al., 2018). These limitations underscore the importance of programs like Mama_Move, which aim to promote functional recovery and enhance quality of life.

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Physical Fitness Decline Following Training Cessation in Breast Cancer Survivors Post 12-Week Exercise Intervention

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Conflict of interest: nothing to declare. **Funding:** BII1- Integrated development of clinical exercise- Research Centre Health Sciences and Human Development- Strong Community (CIDESD -UIDB/04045/2020)

Cancer survivors face various barriers to exercise, but discontinuing exercise programs increases the risk of muscle loss, reduced quality of life, and potential recurrence, highlighting the importance of maintaining tailored, supervised physical activity (Herrero et al., 2007). This study aimed to assess how cessation of training affects the physical fitness of breast cancer survivors. Seventeen breast cancer survivors, aged 44-70 years, were recruited provided they had completed cancer therapies at least six months prior and had no contraindications to physical activity. Participants engaged in a 12-week combined aerobic and strength training

program, twice per week. Following the training protocol, subjects underwent a 6-week cessation period. Physiological parameters, including cardiorespiratory capacity, strength, and body composition, were assessed at baseline, after the 12-week intervention, and following the 6-week cessation period. Following the 12-week intervention, significant improvements were observed in cardiorespiratory fitness, strength assessment, and body composition. After 6 weeks of training cessation, there were decreases in VO₂max ($p < 0.01$), handgrip strength ($p < 0.01$), seated and standing ability ($p < 0.01$), seated medicine ball throw ($p < 0.01$), and chest press strength ($p < 0.01$). No significant differences were found in leg press performance ($p = 0.15$). Additionally, there were no significant changes in body mass ($p = 1.00$), BMI ($p = 1.00$), body fat percentage ($p = 1.00$), muscle mass ($p = 0.11$), or visceral fat ($p = 0.16$) after 6 weeks of cessation. This study concludes that a short cessation period of 6 weeks was sufficient to diminish the benefits gained from the 12-week training program for breast cancer survivors, emphasising the importance of engaging in regular physical exercise.

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Impact of a 12-Week Videoconference-Based Exercise Program on Physical and Psychological Outcomes in Institutionalised Older People

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Accessible exercise programs are crucial for improving the physical and psychological health of institutionalised elderly populations. This study evaluates the effects of a 12-week videoconference-based exercise program on physical fitness and psychological outcomes. Institutionalised elderly participants (mean age: 83.13 ± 7.63 years) were randomised into a videoconference group (n = 32) and a control group (n = 24). The intervention group participated in a twice-weekly multicomponent exercise program. Physical fitness and psychological outcomes were assessed at baseline and after 12 weeks. The Tukey test was used to analyse pre- and post-test differences. The videoconference group showed significant

improvements in body composition, including reduced body fat percentage ($p < 0.01$, $ES=0.733$) and increased fat-free mass ($p < 0.01$, $ES=0.217$), as well as enhancements in lower limb strength ($p < 0.01$, $ES=0.467$), upper limb strength ($p < 0.01$, $ES=0.547$), agility ($p < 0.01$, $ES=0.425$), and aerobic endurance ($p < 0.01$, $ES=0.184$). No significant differences were observed in body mass ($p = 0.45$, $ES = 0.019$). Participants showed significant reductions in anxiety ($p < 0.01$, $ES=0.420$) and depression ($p < 0.01$, $ES=0.605$). However, cognitive measures did not differ significantly between groups, including the Mini-Mental State Examination ($p = 0.07$, $ES=0.292$), Semantic verbal Fluency test ($p = 0.95$, $ES=0.191$), Phonemic verbal Fluency test ($p = 0.14$, $ES=0.117$), and the auditory verbal learning test ($p = 0.14$, $ES=0.107$). The findings suggest that a videoconference-administered multicomponent exercise program may be an effective intervention for improving body composition, physical fitness, functional capacity, and psychological well-being in institutionalised elderly individuals over 12 weeks. It is recommended that future research also compare the effects of face-to-face training with videoconferencing, as well as examine the impacts of hybrid interventions.

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Effectiveness of videoconference-based exercise program on the physical health of institutionalised older people: A Six-Week Study

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As the ageing population grows, accessible and effective interventions are needed to promote health and functionality (Tonga et al, 2022). This study investigates the effects of a six-week videoconference-delivered exercise program on physical fitness. Institutionalised older adults (mean age: 83.13 ± 7.63 years) were randomly assigned to a videoconference intervention group (n = 32) or a control group (n = 24). The intervention consisted of a multicomponent exercise program conducted twice weekly (100 minutes/week). Physical fitness was assessed at baseline and after six weeks, with differences between pre- and post-test results analysed using the Tukey test. Compared to the control group, the videoconference group demonstrated significant improvements, including a reduction in body fat (-5.04%, $p < 0.01$), an increase in

fat-free mass (+3.41 kg, $p < 0.01$), and reductions in waist and hip circumferences (waist: -3.51 cm, $p < 0.01$; hips: -3.13 cm, $p < 0.01$). Additionally, lower limb strength (+1.84 repetitions in the sit-to-stand test, $p < 0.01$) and upper limb strength (+0.17 m in the medicine ball throw, $p < 0.01$) significantly improved. Functional capacity, assessed via the 8-foot up-and-go test, also showed a significant reduction in completion time (-3.66 s, $p < 0.01$). However, no significant differences were observed between the groups in body mass ($p = 0.19$), body mass index ($p = 0.29$), waist-to-hip ratio ($p = 0.41$), or aerobic endurance measured by the 6-minute walk test ($p = 0.22$). Therefore, a videoconference-based physical exercise program can effectively enhance specific physical fitness parameters in institutionalised older adults within six weeks and may be a viable alternative to in-person programs, particularly in settings with limited resources.

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How do Passion and Motivation Shape the Well-Being of Athletes with Disabilities? - Systematic Review

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

The Dualistic Model of Passion and Self-Determination Theory both propose that behaviour endures over time through the internalisation of passion or motivation. Combining these frameworks may provide deeper insights into outcomes, particularly subjective well-being (SWB). The present study aimed to review the relationship between passion, behaviour regulation (self-determined motivation), and SWB in sports, following the PRISMA 2020 protocol. Electronic searches in Web of Science and PubMed using descriptors such as SWB, passion, motivation, behavioural regulation, and sport yielded 12 studies. Results showed that harmonious passion (HP) and autonomous motivation (AM) are positively related to SWB (life satisfaction, positive affect), while obsessive passion (OP) and controlled motivation (CM) are negatively associated with SWB. No studies analysed all three constructs simultaneously. These results highlight the importance of creating sports conditions that foster harmonious passion

and self-determined behaviour regulation to enhance athletes' well-being. These results highlight the need for more studies on the relationship between passion and motivation in sports, particularly the mediating role of motivation in the passion-well-being relationship.

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Does an 8-week personalised exercise program promote physical and cognitive enhancements in institutionalised older adults with sarcopenia?

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant number BIPD/UTAD/7/2023 and project number UI/04045.

We analysed the effects of an 8-week exercise intervention on physical and cognitive performance in institutionalised older adults with sarcopenia. Seventeen women and eight men (88 ± 7 years) diagnosed with sarcopenia through the European Working Group on Sarcopenia in Older People 2 (EWGSOP2) guidelines (Cruz-Jentoft et al., 2019) underwent an 8-week pre-post intervention. Participants performed two weekly supervised sessions with exercises focusing on developing strength, balance, flexibility, and cardiovascular endurance following the VIVIFRAIL guidelines (Izquierdo, 2020). Before and after the intervention, we assessed muscle strength through handgrip strength (HGS) and five-repetition sit-to-stand (5STS), estimated appendicular skeletal muscle mass (ASM) using a validated equation that considers calf circumference, and assessed physical performance through 4-m walking speed (4MWS), Short Physical Performance Battery (SPPB), and timed up & go (TUG). We assessed cognitive function using the Montreal Cognitive Assessment (MoCA) test. Following the intervention, there were non-significant changes in HGS ($+0.9 \pm 2.9$ kg, $p = 0.11$, effect size [ES] = 0.17), 5STS (-1.1 ± 6.4 s, $p = 0.45$, ES = 0.15), ASM (-0.3 ± 2.0 kg, $p = 0.40$, ES = 0.07), 4MWS

($+0.0 \pm 0.2$ m/s, $p = 0.34$, ES = 0.10), SPPB ($+0.5 \pm 2.0$ points, $p = 0.21$, ES = 0.20), and TUG (-2.5 ± 13.8 s, $p = 0.40$, ES = 0.08). Regarding cognitive function, there was a significant improvement in the MoCA test ($+1.8 \pm 3.1$ points, $p < 0.01$, ES = 0.25) post-8 weeks. The findings of this study suggest that an 8-week personalised exercise program may not be long enough to significantly improve physical performance in sarcopenic older adults. In contrast, this same duration was sufficient to enhance cognitive function. Future exercise interventions should extend beyond eight weeks to evaluate their effect on strength-related outcomes in sarcopenic older adults.

Acknowledgments

We thank the clinical staff of “Lar de São Tomás, Salgueiro do Campo, Castelo Branco” for their support and all participants included in this study.

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Cut-off values for physical performance tests to diagnose frailty in institutionalised Portuguese older women and men

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant numbers PRT/BD/154638/2023 and BIPD/UTAD/7/2023 and project number UI/04045, and the Portuguese Institute of Sport and Youth, I.P. (IPDJ) [TRAIN4BRAIN project; reference number: CP/0542/DDT/2023].

We determined sex-specific cut-off values for physical performance tests to diagnose frailty in institutionalised Portuguese older adults. One hundred sixty-three institutionalised individuals participated in the study (64% women; 85 ± 9 years). We determined frailty by the simultaneous presence of three or more parameters: weight loss, exhaustion, weakness, physical inactivity, and slowness (Fried et al., 2001). Participants performed the Short Physical Performance Battery (SPPB) and handgrip strength (HGS) tests. ROC curves calculated the area under the curve (AUC) and cut-off values for SPPB, balance, 4-m walking (4W), five-repetition sit-to-stand (STS), and HGS to diagnose frailty. In women, the cut-off values were $\text{SPPB} \leq 5$ points (AUC: 0.89, 95% confidence interval [CI]: 0.82–0.94), $\text{balance} \leq 1$ point (AUC: 0.83, 95% CI: 0.75–0.90), $4W > 6.78$ s (AUC: 0.88, 95% CI: 0.79–0.93), $\text{STS} > 12.93$ s (AUC: 0.83, 95% CI: 0.72–0.91), and $\text{HGS} \leq 17$ kg (AUC: 0.79, 95% CI: 0.70–0.87). For men, the cut-off values were $\text{SPPB} \leq 7$ points (AUC: 0.94, 95% CI: 0.85–0.99), $\text{balance} \leq 3$ points (AUC: 0.91, 95%

CI: 0.81–0.97), $4W > 5.61$ s (AUC: 0.95, 95% CI: 0.85–0.99), $STS > 13.94$ s (AUC: 0.97, 95% CI: 0.87–1.00), and $HGS \leq 26$ kg (AUC: 0.80, 95% CI: 0.68–0.89). The sex-specific cut-off values for physical performance tests revealed good to excellent diagnostic accuracy in diagnosing frailty. These cut-off points might be helpful for clinicians to make an early diagnosis and treat frailty in residential care facilities.

Acknowledgments

We sincerely thank all the residential care facilities (Santa Casa da Misericórdia do Fundão, Santa Casa da Misericórdia da Covilhã; Lar de São José, Covilhã; Associação Centro Social Sagrado Coração Maria, Ferro; Centro Social de Nossa Senhora da Conceição, Vila do Carvalho; Centro Social Vales do Rio; Centro Social e Paroquial da Freguesia de Cebolais de Cima, Castelo Branco; Lar de São Tomás, Salgueiro do Campo, Castelo Branco) and participants who agreed to be part of this study.

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A single resistance training set is sufficient to induce strength gains in cognitively impaired older adults

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant numbers PRT/BD/154638/2023, PRT/BD/154534/2022, and BIPD/UTAD/7/2023, and project number UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>) and the Portuguese Institute of Sport and Youth, I.P. (IPDJ) [TRAIN4BRAIN project; reference number: CP/0542/DDT/2023].

We analysed the effects of one resistance training set (S1) on strength gains in cognitively impaired older adults. Fifteen older adults (6 women and 9 men, 80 ± 10 years) with different cognitive impairment levels (mild [MILD], moderate [MOD], and severe [SEV]) performed an 8-week pre-post intervention with two sessions per week interspersed by 72 hours of rest. Participants performed the leg and chest press, chair squat, and 1-kg medicine ball throw with 1 set of 6-12 repetitions at relative intensities between 40-70% of one-repetition maximum (1RM). Before and after 8-weeks, participants performed the Short Physical Performance Battery (SPPB), 10-m walking (W10), 1-kg medicine ball throw (MBT), handgrip strength

(HGS), 1RM chest press, and 1RM leg press. After 8-weeks, paired samples t-tests showed significant improvements in SPPB ($p < 0.001$; effect size [ES] = 2.65), MBT ($p < 0.01$; ES = 0.27), 1RM chest press ($p < 0.001$; ES = 0.32), and 1RM leg press ($p < 0.05$; ES = 0.28). There were no significant changes in W10 ($p > 0.05$; ES = 0.11) and HGS ($p > 0.05$; ES = 0.06). One participant transitioned from SEV to MOD, one from MOD to MILD, and two from MILD to no cognitive impairment status. This study showed that single sets, which result in a low training volume per intervention, are an efficient strategy to increase strength in older adults. Furthermore, this low-volume approach can promote changes in cognitive status in cognitively impaired older adults.

Acknowledgments

We sincerely thank all the residential care facilities (Santa Casa da Misericórdia da Covilhã; Lar de São José, Covilhã; Associação Centro Social Sagrado Coração Maria, Ferro; Centro Social de Nossa Senhora da Conceição, Vila do Carvalho; Centro Social Vales do Rio; Centro de Convívio e Apoio à 3ª Idade, Tortosendo) and participants who agreed to be part of this study.

Effects of Non-Invasive Neuromodulation on Sleep and Muscle Recovery in Elite Female Athletes

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Elite female athletes often experience sleep disturbances due to high training loads, competition stress, and hormonal fluctuations throughout the menstrual cycle, which impact sleep quality, thermoregulation, and neuromuscular recovery (1,2). Sleep deprivation negatively affects cognitive and physiological functions by disrupting the autonomic nervous system, increasing cortisol levels, and altering metabolic and immune responses, further impairing sports performance (3). The menstrual cycle influences sleep patterns, with progesterone increases during the luteal phase raising core body temperature, potentially leading to fragmented sleep and impaired muscle recovery (4). Given these factors, optimising sleep and recovery strategies in female athletes is crucial. Non-invasive neuromodulation (NIN) has been proposed as a method to regulate autonomic activity, improve sleep, and enhance physiological recovery, yet its specific effects on female athletes remain underexplored (1). This pilot controlled study investigates the effects of NESA® microcurrent therapy on sleep quality and sports recovery in 12 professional female football players (ages 18–30), divided into an experimental group receiving NIN and a control group. The intervention consists of microcurrent application four times per week for eight weeks. Assessments are conducted at four time points: pre-season, pre-competition, pre-treatment, and post-treatment. Objective measures include heart rate variability (HRV) and salivary cortisol, alongside validated questionnaires such as the

Pittsburgh Sleep Quality Index (PSQI) for sleep assessment, the Competitive State Anxiety Inventory-2 Revised (CSAI-2R) for anxiety evaluation, and the Menstruation-Related Quality of Life Questionnaire (CVM-22) to assess the impact of the menstrual cycle on recovery. Expected outcomes include improved autonomic regulation, reduced stress-related biomarkers, and enhanced recovery processes. Preliminary results suggest a positive impact on sleep parameters, stress biomarkers, and overall well-being, supporting the potential of NIN as an innovative approach for optimising recovery in female athletes. Given the influence of menstrual cycle variations on sleep and performance, further studies are needed to validate its long-term efficacy in high-performance sports (2).

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The Impact of Home-Based Strength Training on Vertical Jump Performance in Individuals with Fibromyalgia.

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Conflict of interest: nothing to declare. **Funding:** This study was supported by the National Funds through the Portuguese Foundation for Science and Technology (FCT), I.P., (2022.11890.BD).

Fibromyalgia syndrome (FMS) is a chronic condition linked to alterations in pain modulating pathways, impacting physical and mental health (Wolfe & Rasker, 2021). Poor muscle strength is a common characteristic in FMS that contributes to functional incapacity (Kapuczinski et al., 2022). This study aimed to investigate the potential benefits of home-based strength training for vertical jumps in individuals with FMS. Assessments were conducted before and after the protocol using a force plate to measure the countermovement jump (CMJ) and the countermovement jump with free arms (CMJFA). Thirteen male and female participants (45.77±12.82 years) completed the home-based strength training via Google Meet or YouTube videos. The first eight sessions lasted 50 minutes (3x8 repetitions) and, from session nine onwards, 75 minutes (5x6 repetitions). Seven exercises without external equipment were performed at the maximum intended velocity on the concentric phase of the movement. The original Borg scale was used to assess exercise intensity. The exercise was individually adapted if a participant reported an effort rating above 15. Exercise adaptations were also made in cases

where the participant reported an inability to perform the movement due to flare-ups associated with fibromyalgia. Paired t-tests were carried out between the pre-test and post-test, and the statistical significance of $p \leq 0.05$ was considered. Significant differences were found between the pre- and post-assessments for both tests following the exercise protocol ($p < 0.05$), as shown in Table 1. The participants showed an improvement in CMJ of 28% in the vertical jump, while the CMJFA improved 11%. Considering the negative impact of FMS on functional capacity and daily activities, this home-based protocol consisting of strength training exercises focused on maximum intended velocity effectively improved the vertical jump of individuals with FMS and, consequently, increased the lower limbs' strength.

Table 1. Vertical jump variables before and after intervention

Variables	Pre	Post	Percentage (pre-post)	p-value
CMJ [cm]	10,62±5,91	13,59±5,86	28%	<0.001
CMJFA [cm]	14,02±7,25	15,56±7,08	11%	<0.01

CMJ: countermovement jump; CMJFA: Countermovement jump with free arms

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Effectiveness of Relaxation and Hypnosis in Chronic Pain Management: preliminary findings of a systematic review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Chronic pain is a debilitating condition that affects millions of people around the world, significantly compromising quality of life. Advances in mind-body therapies have allowed for a better understanding of the biological basis of chronic pain and human mental processes. Thus, the aim of this systematic review was to evaluate the effectiveness of relaxation and hypnosis in chronic pain management, emotional self-regulation and the promotion of well-being. Through a systematic review of the literature, using three databases: Scopus, PubMed and Web of Science, psychophysiological and neuropsychophysiological studies were identified that evaluated the efficacy of relaxation and hypnosis in patients with chronic pain. So far, 6 cross-sectional studies and 45 longitudinal studies have been selected by 2024, including 595 people with chronic pain who participated in the intervention with relaxation or hypnosis techniques. A total of 51 articles. A total of 39 articles demonstrated significant benefits for most patients, including reduced pain perception and associated anxiety, as well as improved physical function and psychological well-being. In addition, the combination of relaxation and hypnosis seems to produce a synergistic effect, enhancing the therapeutic benefits in some cases. The results of this review suggest that relaxation and hypnosis represent promising and safe options for chronic pain management, complementing conventional approaches and contributing to a more comprehensive multidisciplinary approach.

Effectiveness of Meditation and Mindfulness in the Treatment of Chronic Diseases: preliminary findings of a systematic review

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Chronic diseases represent a significant challenge for health systems around the world, with a substantial impact on patients' quality of life. Given the limitations of conventional treatments, complementary approaches such as meditation and mindfulness have been studied for their therapeutic potential. This systematic review analysed the effectiveness of these practices in treating chronic diseases, considering their impact on symptoms, psychological well-being, and disease progression. The *Scopus*, *PubMed*, and *Web of Science* databases were searched, applying inclusion criteria that included experimental, quasi-experimental, longitudinal, and cross-sectional studies, whose target population were adults (18-65 years) with chronic diseases undergoing meditation and mindfulness interventions, and evaluating their effectiveness. Articles that did not use English, Portuguese, or Spanish were excluded. In addition, studies with patients with psychiatric or cancerous diseases, and grey literature were not considered. The methodology followed the PRISMA guidelines, including structured database search, independent screening of studies by two reviewers, and evaluation of the methodological quality of the selected investigations. The selection so far has included 5 cross-sectional studies and 33 longitudinal studies up to 2024 that included 205 people with chronic diseases who participated in the intervention with meditation and mindfulness techniques. A total of 24 papers indicated that meditation and mindfulness demonstrated efficacy in reducing symptoms

associated with a variety of chronic diseases, including diabetes, hypertension, asthma, parkinson's, epilepsy, obesity, and fibromyalgia. These practices have also been associated with improvements in quality of life, increased psychological resilience, and possible beneficial effects on disease progression in some cases. Factors such as patient compliance, the quality of the meditative practice, and its integration with other aspects of the treatment plan should be considered. The present review suggests that meditation and mindfulness are promising and accessible strategies for the management of chronic diseases, highlighting the importance of their inclusion in integrative and patient-centred therapeutic approaches.

Do Attachment Dimensions mediate the Association between Primary Emotional Systems and Connectedness to Nature

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045

Background

Recent studies suggest that connection to nature influences responses to its benefits, with positive emotional experiences enhancing this bond (Chang et al., 2024). Primary emotional systems likely contribute to this connection by fostering strong affective ties to nature (Pihkala, 2020; Panksepp, 1998; Panksepp & Biven, 2012). We propose that these systems strengthen the connection to nature through attachment behaviours, with secure attachment playing a key role.

Aims and hypotheses

The aim of this study was to analyse the indirect relationship between the primary emotional systems and connection to nature through the behavioural systems of attachment. It was expected that higher levels would be associated with higher levels of positive emotional

systems, and lower negative emotional systems would be associated with increased connection to nature through higher levels of dependency and closeness.

Methods

The sample included 592 Portuguese participants aged 18 or older with a mean age of 36.13 (SD=16.32, age range: 18-83 years). There are no missing cases due to careful data collection procedures. Participants were invited to complete a package of questionnaires containing measures that assessed primary emotional systems (Brief Form of the Affective Neuroscience Personality Scales), behavioural systems of attachment (Revised Adult Attachment Scale), connection to nature (Revised Environmental Identity Scale), and sociodemographic variables. We used a multiple-step mediation methodology to test our hypothesis, with a bootstrapped confidence interval for indirect effects.

Result

Higher levels of positive emotional systems were directly linked to higher levels of connection to nature, and higher levels of negative emotional systems were directly linked to lower levels of connection to nature. Higher levels of positive emotional systems were linked to higher levels of Dependency, which in turn were associated with higher levels of Connection to Nature. Higher levels of negative emotional systems were linked to lower levels of Dependency and higher levels of Anxiety, which in turn were associated with lower levels of Connection to Nature.

Conclusions

The current findings suggest that individuals with under-regulation of negative emotional systems who have greater difficulties depending on others and greater concern about being abandoned and rejected by others also have difficulties establishing deep and meaningful relationships with the natural world. Strengthening attachment relationships plays a crucial role in fostering a deep connection with nature.

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Preliminary Results from the ADVICE Project, Phase I: The Interaction Between Multiple Sclerosis and Menstrual Cycle Phases on Basal Interleukins 6 and 10, and Brain-Derived Neurotrophic Factor

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Conflict of interest: nothing to declare. **Funding:** PID2021-123447OA-I00 funded by MCIN/AEI /10.13039/501100011033 and by FEDER, UE; JDC2022-048611 funded by the MCIN

Introduction

Multiple Sclerosis (MS) is a multifactorial disease in which sex hormones may have a paramount role (Roeder & Leira, 2021). Exercise is proposed as a tool to improve MS symptoms, but training load has to be adapted considering the basal (i.e. pre-session) status. However, the impact of menstrual cycle phases on some basal markers, such as inflammatory (interleukins IL-6 and IL-10) and cognitive function (Brain-Derived Neurotrophic Factor, BDNF) markers, is unknown. Thus, this study aims to analyse the impact of menstrual cycle phases on inflammatory and neurotrophic basal markers in females with and without MS.

Methods

A total of 17 females, 11 diagnosed with relapsing-remitting MS (MS group) and 6 without MS (non-MS group), were enrolled. The three-step method, combining calendar tracking, urinary

luteinising hormone (LH) peak tests, and serum hormones analysis, was used for menstrual cycle phase confirmation. Serum IL-6, IL-10, and BDNF were assessed following previous protocols (Briken et al., 2016). Two-way mixed ANOVA was used to examine the interaction between MS and the most representative phases of the menstrual cycle (i.e. early follicular phase, EFP; late follicular phase, LFP; mid follicular phase, MLP). Pairwise comparisons were conducted with Cohen's d calculated for intra-group (menstrual cycle phases differences) effects.

Results

The ANOVA showed a “MS x menstrual cycle phase” interaction for the anti-inflammatory IL-10 ($p=0.01$) and a main effect of the menstrual cycle phase for BDNF ($p=0.03$). Significant variation in BDNF levels between EFP (29.05 ± 12.05 ng/mL) and LFP (33.57 ± 11.83 ng/mL) was observed only in the non-MS group ($p=0.01$, $d=0.1$). In the MS groups, although not significant, clinically relevant differences were found for the anti-inflammatory IL-10, with the EFP levels being lower (7.5 ± 3.7 pg/mL) compared to LFP (13.1 ± 10.4 pg/mL, $p=0.13$, $d=-0.84$) and MLP (16.4 ± 10.9 pg/mL, $p=0.1$, $d=-0.82$).

Conclusion

These findings suggest that MS interacts with the menstrual cycle, affecting inflammatory and cognitive basal statuses. Whereas a less anti-inflammatory basal status may be present at the beginning of the cycle in women with MS, BDNF seems to be unaffected by hormonal fluctuation in this population, in contrast with healthy women. The large observed effect sizes reinforce the clinical significance of phase-specific changes, even in a small sample. Future research should further explore functional, well-being and physical parameters potentially affected by the inflammatory and cognitive function statuses in females with MS.

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Physiological load and perceived experience of long-term recreational football training in elderly men with prostate cancer

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UI/04045 and the Portuguese Urology Association.

Recreational football (RF) has been shown to improve prostate cancer patients' health and to mitigate some of the negative consequences of the treatment (Uth et al., 2016). Yet, the variation of the physiological demands in long-term training participation has not been yet addressed. This study described the trimestral variations of cardiovascular demands, rating of perceived exertion (RPE) and fun levels of >60-year-old men with prostate cancer undergoing androgen deprivation therapy (n=10; age=72±3 years; stature=165±6 cm; body mass=74.9±9.0

kg; fat mass=25.4±6.2%; SBP=123±12 mmHg, DBP=74±5 mmHg) during 100 training sessions of RF-based exercise intervention during 9 months. The 2-3x60-min weekly training sessions consisted of warm-up, strength and balance exercises and small-sided games, played on an artificial grass football pitch. Average and peak HR as well as the amount of time spent in each intensity zone ($\leq 60\%$ HRmax; 61–70% HRmax; 71–80% HRmax; 81–90% HRmax; and 91–100% HRmax) were analysed. RPE (0-10 scale) (Foster et al., 2011) and fun levels (visual analogic scale: 0–10 AU) (Grant et al., 1999) were assessed at the end of the training sessions. During the first trimester (1T), average and peak HRs were 72±16 and 82±17% HRmax, while in the second trimester (2T) were 70±16 and 81±15% HRmax, and during the third trimester (3T) were 71±16 and 82±16% HRmax, respectively, ($p \geq 0.05$). The participants spent 21%, 25% and 29% of total match time $\leq 60\%$ HRmax, 24%, 27% and 22% at 61-70% HRmax, 27%, 30% and 29% at 71-80% HRmax, 23%, 16% and 17% at 81-90% HRmax, and 4%, 2%, 3% at 91-100% HRmax during 1T, 2T and 3T, respectively, ($p \geq 0.05$). RPE was 5.4±1.7 during 1T, 5.9±1.9 during 2T, and 5.9±2.0 during 3T. Fun levels were maintained throughout the season (1T: 8.3±1.4, 2T: 8.6±1.5 and 3T: 8.5±1.5; $p \geq 0.05$). In conclusion, exercise intensity was maintained during a 9-month RF season, and levels of enjoyment were kept high.

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Calf Muscle Oxygen Saturation as a Prospective Indicator of Intermittent Claudication Severity in Peripheral Arterial Disease

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045.

Intermittent claudication (IC), an exercise-induced pain caused by peripheral arterial disease (PAD), is commonly used as a criterion for assessing disease severity, along with the ankle brachial index (ABI) (Nordanstig et al., 2023). The IC can be unilateral or bilateral, and the severity of symptoms is associated with a greater impairment in oxygen supply. To better understand the rest and the exercise-mediated tissue ischemia and the IC related pain, this study aims to compare calf oxygen saturation (SmO_2) at rest, at pain-free walking distance (PFWD), and at maximal walking distance (MWD) during a graded protocol, across three ABI-defined levels of leg disease severity. Thirty-one PAD patients with IC (age=65.7±8.1yrs; height=169.1±6.5cm; body mass=75.0±10.0kg; Fontaine stage Ila=41.9%, I Ib=58.1%; Ila MWD=422.0±239.8m; I Ib MWD=263.7±111.8m; graded protocol peak heart rate=105.8±16.3bpm), performed the graded Gardner-Skinner test. The average SmO_2 in resting ($SmO_{2\text{ rest}}$), in the first stage ($SmO_{2\text{ 1st stage}}$), at PFWD ($SmO_{2\text{ PFWD}}$), at MWD ($SmO_{2\text{ MWD}}$)

MWD), amplitude ($\text{SmO}_2_{\text{ deoxy}}$), and minimum achieved ($\text{SmO}_2_{\text{ min}}$) were tested with a NIRS sensor (MOXY 5, Fortiori Design LLC, Minnesota, USA) in the *gastrocnemius medialis* muscle of both legs. The disease severity level was stratified for each leg according to Crawford et al. (2016), ABI values: >0.91 , no-disease; between 0.99 - 0.70 , mild severity; 0.69 - 0.41 , moderate severity (the standard stratification differentiates disease 0.99 - 0.41 and critical ischemia <0.40). A Kruskal-Wallis test with Dunn's post hoc test (Holm correction) was performed (JASP Team, 2023). The results revealed no statistically significant difference in $\text{SmO}_2_{\text{ rest}}$ between the disease severity levels, $H(2)=0.622$, $p=0.733$, $\eta^2=0.00$, however, a statistically significant difference was found in $\text{SmO}_2_{\text{ 1st stage}}$, $H(2)=6.382$, $p=0.041$, $\eta^2=0.08$, with the Post hoc test revealing differences between no-disease ($Mdn=31.0$; $IQR=23.5$ - 36.0) and mild severity ($Mdn=20.5$; $IQR=18.3$ - 26.8) levels, $Z= -2.53$, $p=0.035$, $r=0.64$. No statistically significant difference was identified in $\text{SmO}_2_{\text{ PFWD}}$, $H(2)=4.239$, $p=0.120$, $\eta^2=0.04$, in $\text{SmO}_2_{\text{ MWD}}$, $H(2)=6.897$, $p=0.052$, $\eta^2=0.09$, neither in $\text{SmO}_2_{\text{ deoxy}}$ $H(2)=3.852$, $p=0.146$, $\eta^2=0.03$, between the disease severity levels. A statistically difference in $\text{SmO}_2_{\text{ min}}$ between the disease severity levels was found, $H(2)=9.586$, $p=0.008$, $\eta^2=0.14$, and the Post hoc showed differences between no-disease ($Mdn=20.0$; $IQR=16.5$ - 28.8) and moderate severity ($Mdn=10.0$; $IQR=4.0$ - 21.0), $Z= -2.55$, $p=0.022$, $r=0.49$, and between no-disease and mild severity ($Mdn=7.0$; $IQR=5.0$ - 11.8), $Z= -2.97$, $p=0.009$, $r=0.71$. These findings suggest that resting, PFWD, and MWD SmO_2 values are not discriminating outcomes for different ABI-defined levels of disease severity in PAD. However, the changes observed during the first stage and the minimum SmO_2 value reached during the graded protocol are important outcomes to help discriminate the severity of the disease. Further research into different strategies using SmO_2 is essential to guide appropriate interventions considering macro- and microcirculatory dynamics.

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Rate pressure product and 24-hour movement behaviours in school-age youth

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the Portuguese Foundation for Science and Technology (FCT), grant number 2022.14139.BD.

The Rate Pressure Product (RPP) indicates myocardial oxygen demand and cardiac workload. Elevated RPP has been associated with an increased risk of cardiovascular diseases later in life. Lifestyle behaviours collectively impact physiological outcomes, including physical activity (PA), sedentary behaviours (SB), and sleep, conceptualised within the 24-hour movement framework. This study aims to examine the associations between 24-hour movement behaviours and RPP in children and adolescents, considering both overall and sex-specific differences. This cross-sectional observational study included 913 participants (517 girls and 396 boys) aged 10 to 18 years. PA was assessed using the International Physical Activity Questionnaire (IPAQ). Sleep was measured using the Pittsburgh Sleep Quality Index (PSQI). Sedentary behaviours were assessed by questionnaire to estimate daily time (h) spent in personal computers for study (PCS) and leisure (PCL), tablets, smartphones (SPH), social networks (SN), watching television (TV), and screening time (– +2h), and sitting (ST) (– +8h). Systolic (SBP) and diastolic blood pressure (DBP) were measured using a portable sphygmomanometer (M4 Intelli IT, OMROM). The RPP was calculated as the product of SBP

and heart rate. Multiple linear regression analysis was conducted to analyse the association between RPP and potential predictors, including age, body mass index (BMI) and 24-hour movement behaviours. The analysis was performed for the entire sample and then separately for girls and boys. Model significance was assessed using an F-test, and single predictor significance was determined based on p-values (≤ 0.005). Adjusted R^2 values were reported to indicate the proportion of variance explained by each model. The regression model was statistically significant, explaining a significant proportion of the variance in RPP ($R^2=0.060$, $F(15, 897)=4.884$, $p\leq 0.001$). Significant predictors included BMI ($\beta=106.8$, $p\leq 0.001$), vigorous PA ($\beta= -9.71$, $p\leq 0.001$), sleep quality (total PSQI; $\beta=-106.6$, $p=0.003$), and hours of sleep ($\beta=-257.0$, $p=0.001$). In the sex-stratified analysis, the model for girls explained a significant proportion of the variance in RPP ($R^2=0.026$, $F(15, 501)=1.924$, $p=0.019$) with significant predictors including vigorous PA ($\beta=-8.92$, $p=0.017$), total PSQI ($\beta=-124.88$, $p=0.008$), and hours of sleep ($\beta= -346.90$, $p=0.001$). In boys, the model explained 15.3% of the variance in RPP variability, $F(15, 380)=4.574$, $p\leq 0.001$, with significant predictors including BMI ($\beta=163.75$, $p\leq 0.001$), and vigorous PA ($\beta= -10.77$, $p=0.005$). Non-significant predictors, such as moderate-to-vigorous and use of smartphones, were excluded from the final model. The results suggest that BMI, vigorous PA, sleep quality, and hours of sleep were significant predictors of RPP. The sex-stratified analysis indicated that these variables had a stronger impact on boys, whereas the model explained less variance in girls. Specifically, vigorous PA was a significant predictor in both sexes, while sleep-related variables played a more prominent role in girls. The loss of significance for some variables in the sex-specific analyses suggests that their effects may be weaker within each sex or that the smaller sample size reduced the statistical power. Additionally, the better model fit for boys suggests that other unmeasured factors may play a significant role in girls' RPP.

Fit but Sedentary? The Paradox of Sports Science Students

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Conflict of interest: nothing to declare. **Funding:** This research was funded by FCT - Portuguese Foundation for Science and Technology, grant number UIDB/DTP/04045/2020.

Physical fitness and body composition are critical for health and performance, particularly among sports science students, who are assumed to engage in high levels of physical activity. However, despite their involvement in structured exercise, research suggests that university students in general may still exhibit prolonged sedentary behaviour, potentially diminishing the benefits of physical activity (Alzahrani & Saad, 2024). Whether this paradox also applies to sports science students remains unclear. However, limited research has specifically assessed how variations in activity intensity and sedentary time influence physical fitness markers in sports science students. This study aims to address this gap by evaluating the physical fitness, body composition, and activity levels of sports science students. This cross-sectional study assessed university students enrolled in a sports science program. Participants were recruited

voluntarily, and ethical approval was obtained before data collection. The sample consisted of 38 sports science students (31 men, 175.71 ± 5.70 cm, 70.70 ± 7.68 kg; 7 women, 161.36 ± 5.14 cm, 62.93 ± 7.11 kg). Anthropometric and body composition measures included height, body mass, and BMI. Physical fitness was evaluated through the Sit-and-Reach, Grip Strength, Mid-Thigh Pull, Standing Long Jump, and Standing Stork tests. Cardiorespiratory capacity was estimated using the StepTest4All protocol. Physical activity levels were assessed with the International Physical Activity Questionnaire. Data analysis was conducted using descriptive statistics in IBM SPSS Statistics.

Table 1. Descriptive Statistics of Sports Science Students.

	Men (n=31) Mean $\pm$ SD	Women (n=7) Mean $\pm$ SD
Height (cm)	175.71 $\pm$ 5.70	161.36 $\pm$ 5.14
Body Mass (kg)	70.70 $\pm$ 7.68	62.93 $\pm$ 7.11
BMI (kg/m ²)	22.93 $\pm$ 2.55	24.23 $\pm$ 3.05
Sit-and-Reach (cm)	4.05 $\pm$ 6.59	1.50 $\pm$ 9.07
Total Physical Activity (MET-min/week)	8808.42 $\pm$ 5254.42	11727.64 $\pm$ 11582.03
Sedentary Time (min/day)	642.26 $\pm$ 249.09	702.86 $\pm$ 340.67
Grip Strength (kg)	44.45 $\pm$ 6.40	30.19 $\pm$ 5.43
Mid-Thigh Pull (kg)	128.69 $\pm$ 26.09	88.43 $\pm$ 15.61
Standing Stork Test (s)	1.95 $\pm$ 0.15	15.10 $\pm$ 11.12
VO _{max} (ml/kg/min)	40.75 $\pm$ 4.51	33.79 $\pm$ 5.35
HRR ₆₀ (bpm)	36.16 $\pm$ 9.96	48.43 $\pm$ 11.90

Despite high physical activity levels, sports science students accumulate considerable sedentary time, raising concerns about its potential impact on health and performance. Research suggests that prolonged inactivity can counteract the benefits of exercise, highlighting the need to address sedentary behaviour even in active populations. The variability in body composition and fitness levels suggests diverse training backgrounds and activity patterns. While maintaining physical activity is essential, reducing sedentary time should also be prioritised to optimise outcomes. Future research should explore its long-term effects and potential interventions to mitigate risks in active individuals.

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Physical Exercise Program for Patients with Psychosis: Preliminary Results

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Foundation for Science and Technology (FCT) for the research grant 2024.04489.BDANA and under the project UI/04045.

Mental disorders account for 11.8% of global diseases, with 3.0% to 4.0% being psychotic. These patients have reduced life expectancy due to suicides and preventable diseases. Exercise benefits mental, cardiovascular, and metabolic health. This study examines the impact of physical Exercise on mental health, functionality, and dyslipidemia in patients with psychosis. Fifteen patients on prolonged-release injectable antipsychotics (AILEs) were divided into control (n=9) and experimental (n=6) groups and assessed at four different times. The intervention was a multimodal physical exercise program, held twice a week for 60 minutes. Psychological assessments included PANAS, EUROHIS-QOL-8, and PHQ-9. Functional assessments included the 30-second Sit and Stand Test, HandGrip, and Brief-BEST Test. Body composition was measured using a bioimpedance scale, stadiometer, and tape measure. Blood samples were analysed for total cholesterol, HDL-cholesterol, and triglycerides. Significant differences were found in pre-test quality of life (p=0.001), fat mass percentage (p=0.041), and upper limb strength (p=0.007) between the control and experimental groups. After 12 weeks, improvements were seen in cholesterol levels (p=0.003), Positive Affects (p=0.044), and lower limb strength (p=0.015). At 24 weeks, improvements included Negative Affects (p=0.044),

balance ($p=0.022$), and lower limb strength ($p=0.044$). Waist circumference continuously reduced, with significant differences ($p=0.002$) between the first and fourth evaluations. The control group showed no significant improvements. The intervention improved emotional well-being, body composition, and functional capacity in patients with Psychosis on AILPs. The lack of changes in the control group supports the effectiveness of the program.

This pilot study lays the groundwork for larger research and helps develop health programs that promote physical activity to enhance the quality of life for patients.

Tabela 1. Main results of the exercise program.

Experimental Group						Control Group					
	Variables	Pre-test (T1)	12weeks test (T2)	Post-test (T3)	Follow-up (T4)	P	Pre-test (T1)	12weeks test (T2)	Post-test (T3)	Follow-up (T4)	P
PSYCHOLOGICAL	POSITIVE AFFECTS	21.33±3.50	28.83±4.17	29.67±7.76	28.33±6.89	0.022* _a	24.78±8.98	24.11±6.55	24.56±7.81	23.78±7.22	0.810
	NEGATIVE AFFECTS	19.83±7.39	15.17±5.56	12.50±3.02	16.50±7.31	0.048* _b	14.56±5.83	14.67±6.14	15.44±6.35	13.78±6.06	0.506
	QUALITY OF LIFE	73.96±10.77	82.29±12.91	75.00±13.98	71.35±17.16	0.384	29.33±5.10	30.11±4.57	28.44±4.07	29.78±4.02	0.203
	DEPRESSIVE SYMPTOMS	9.50±6.38	5.00±4.43	7.17±6.77	9.00±7.80	0.330	5.00±3.50	4.89±3.92	5.56±5.27	5.44±5.15	0.539
BODY COMPOSITION	BMI	28.83±4.77	28.29±4.42	27.86±4.30	27.65±4.72	0.037*	26.41±6.72	26.36±6.85	26.48±6.81	26.19±6.62	0.768
	WAIST CIRCUMFERENCE	103.83±12.98	98.50±12.18	97.50±11.59	95.33±12.08	0.003* _c	93.56±16.67	92.94±17.06	92.78±18.32	93.78±17.22	0.968
	% FAT	37.53±7.69	35.62±9.07	36.25±7.69	35.35±9.65	0.145	25.88±13.70	25.80±13.73	25.86±13.45	25.61±13.36	0.702
FUNCTIONAL ASSESSMENT	LOWER LIMB STRENGTH	11.33±3.01	17.17±3.65	16.33±1.97	15.79±3.28	0.010* _d	12.56±2.96	13.22±3.27	14.33±3.97	13.44±3.57	0.587
	RIGHT UPPER LIMB	19.90±4.17	22.17±3.42	22.15±3.62	21.33±3.43	0.133	33.40±11.24	34.75±10.54	34.19±12.33	34.37±12.70	0.706
	LEFT UPPER LIMB	18.15±4.90	21.13±3.10	19.92±3.23	21.28±6.04	0.102	30.64±12.18	32.54±10.26	30.45±11.39	30.89±10.06	0.896
	BALANCE	17.50±4.37	22.67±0.82	23.00±1.10	20.17±2.14	0.008* _e	19.00±3.87	18.44±4.36	18.56±4.56	18.22±4.52	0.698
BIOCHEMICAL ANALYSIS	TOTAL CHOLESTEROL	203.67±19.26	162.00±36.66	172.33±31.30	173.00±31.37	0.005* _f	182.33±49.76	175.00±38.06	188.67±56.16	171.22±37.16	0.435
	HDL	44.00±8.81	39.50±6.75	39.50±8.53	41.17±11.65	0.099	46.11±11.35	44.56±11.18	47.11±11.41	46.67±11.50	0.143
	TRIGLICERIDES	102.17±18.94	134.17±46.91	112.67±25.11	99.83±20.01	0.284	115.11±44.37	138.89±78.54	117.33±41.03	117.22±48.16	0.730

* $p \leq 0.05$; _a($p=0.044$, T1-T2); _b($p=0.044$, T1-T3); _c($p=0.002$, T1-T4); _d($p=0.015$, T1-T2; $p=0.044$, T1-T3); _e($p=0.022$, T1-T3); _f($p=0.003$, T1-T2)

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Exploring Physical Fitness and Quality of Life in Community-Dwelling Older Adults: a pilot study.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

The average age of the European population has been rising significantly over the past few decades. Portugal is the fourth country in the European Union with around 2 million people aged 65 or over, corresponding to almost one fourth of the Portuguese population. While life expectancy is increasing, it is not equally met with increased quality of life (QoL) and independence at later stages in life. Physical fitness is often used as a biomarker for health and functional independence in older adults. However, there is still limited information about how physical fitness assessed in community settings relates to QoL among the older population.

Objectives

The main aim of this study was to analyse the relationship between QoL and neuromuscular and functional fitness and in community-dwelling older adults.

Methods

The sample consisted of 41 (Female n=34) users of community day centres aged between 67 and 97 years (84 ± 6.3 years). QoL was collected using the Control, Autonomy, Self-realisation, and Pleasure (CASP -12 item) questionnaire for the Portuguese population. In addition, participants underwent assessments of body composition, upper and lower limb isometric maximal voluntary contractions (IMVCs), and functional mobility tests, including 5xSit-to-Stand and Gait Speed. Linear regression analysis was used to examine the associations between the physical fitness tests and QoL. Significance was set at $P < 0.05$.

Results

Favourable associations were identified between QoL and 5xSit-to-Stand, Gait Speed and Knee Extension IMVC peak strength ($r=0.683$, $p<0.005$).

Conclusions

Physical fitness tests are simple and easy-to-use tools to apply in older adults participating in community day centres. The 5xSit-to-Stand, Gait Speed and Knee Extension IMVC tests association with QoL reinforces the utility of using such simple assessments and outcomes as monitoring tools of physical fitness and QoL of older individuals living in the community.

Acknowledgements

We would like to thank all the volunteer participants and the partner organisation that supported the implementation of this programme, the Junta de Freguesia de Ramalde.

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Effects of Home-based Isometric Handgrip and Aerobic Training on Blood Pressure Variability in Older Adults with Elevated BP and Hypertension: Secondary results from the HoldAge Trial

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Conflict of interest: The authors have no competing interests. LSP is the founder and sole proprietor of P3-EX LLC, which could potentially benefit from this research. **Funding:** Pinto (SFRH/BD/701482/2019), Dias (2021.08979.BD), Garcia (SFRH/BD/149054/2019), and Teixeira (2020.08565.BD) were granted PhD studentships by the Portuguese Foundation for Science and Technology. This work is financially supported by FEDER funds through the Operational Competitiveness Factors Program 2020 (COMPETE2020) (Ref: POCI-01-0145-FEDER-030646) and by national funds through the Foundation for Science and Technology (FCT), Portugal (Ref: PTDC/SAUDES/30646/2017). Research Centre in Sports Sciences, Health and Human Development (CIDESD; reference No. UID/DTP/04045/2020) (<https://doi.org/10.54499/UIDB/04045/2020>) and Institute of Biomedicine (iBiMED; reference No. UID/BIM/04501/2020) are research centres supported by the Portuguese Foundation for Science and Technology.

Hypertension is a multi-factorial condition that is likely to affect older adults. Higher blood pressure variability (BPV) is associated with worse clinical outcomes, irrespective of the mean ambulatory 24-hour blood pressure (BP). This study aimed to evaluate the effects of home-based isometric handgrip training (IHT) and aerobic exercise training (AET) on the vascular health of older adults with elevated BP and hypertension. The HoldAge trial (NCT04275032) was a two-centre prospective randomised controlled trial. Eighty-four participants (46 women, 71.1 ± 3.6 years, BP $137.1 \pm 13.8/80.8 \pm 8.3$ mmHg) were randomised into IHT, AET, or usual medical care (UC). Participants performed IHT or AET 3 times/week for 8 weeks. IHT consisted of 4x45 bilateral contractions at 50% of maximum voluntary contraction with 1-minute rest between sets. AET consisted of walking 30 minutes at 50-70% of estimated maximum oxygen consumption, assessed with the Chester step test. UC received standardised medical care, including lifestyle advice. Outcome measures included 24-hour, daytime and nighttime systolic and diastolic BPV. BPV was calculated using average real variability, a method that measured the absolute differences between consecutive ambulatory BP measurements. No significant group x time interaction effects were observed for 24-hour systolic ($p=0.768$) or diastolic BPV ($p=0.742$). Similarly, no group x time interaction effects were observed for daytime ($p=0.059$) or diastolic BPV ($p=0.364$). In contrast, a significant group x time interaction was observed for nighttime systolic BP ($p=0.005$). IHT decreased nighttime systolic BPV over time (-1.5 ± 3.0 mmHg; $p=0.011$), while AET (1.1 ± 2.9 mmHg; $p=0.064$) and UC (0.6 ± 2.7 mmHg; $p=0.344$) remained unchanged. In conclusion, home-based IHT reduced nighttime systolic BPV in older adults with elevated BP and hypertension, suggesting it could serve as a valuable, low-cost, time-efficient non-pharmacological strategy to improve nighttime BPV.

Acknowledgments

We acknowledge the Family Health Unit Santa Joana, ACES do Baixo Vouga, and the Family Health Unit of Serzedelo ACES do Alto Ave, and Dr. José Garcia and Dr. Pedro Ruivo for their important collaboration with the study recruitment.

Adaptation and Validation Scales: Digital Identity Scale and The Duke Social Support Index

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

Background

The use of technologies and applications has become common in daily activities (Winstone et al., 2021). There is a need to understand how the use of social media impacts face-to-face interactions, namely social displacement, and the development of a digital identity (Culiberg et al., 2023; Deh & Glodovic, 2018). Portugal lacks sufficient data and research on the concept of social displacement and its implications, as well as on understanding digital identity itself.

Aims

The main aim of this project is to adapt and validate The Digital Identity Scale (Sohier & Brée, 2016) and The Duke Social Support Index (DSSI; Wardian et al., 2013).

Methods

The sample is composed of young adults between 18 and 35 years of age living in Portugal who use different social media networks (e.g., Instagram and Facebook). The questionnaires will be within the Portuguese context. Exploratory factor analysis (EFA) and confirmatory factor analysis will be conducted to test the factorial structure of both measures.

Conclusion

The expected data may contribute to the development of new measures regarding the Digital Identity and the Duke Social Support Index (DSSI). Additionally, the results may inform policy initiatives aligned with the United Nations 2030 Agenda, particularly in the goal 5 - Achieve gender equality and empower all women and girls; target 5.5 - Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life and goal 16 - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels; target 16.6 - Develop effective, accountable, and transparent institutions at all levels; target 16.7 - Ensure responsive, inclusive, participatory, and representative decision-making at all levels.

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Feeling to acting: Eco-emotions as mediators of the association between Connectedness to Nature and Pro-environmental Behaviours

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

Research has consistently found that people frequently struggle to take recommended actions to mitigate climate change (CC) impacts. Previous studies indicate that being in touch with nature makes the perception of environmental threats more urgent and severe, increasing the likelihood of taking action to benefit the environment (Mackay & Schmitt, 2019). However, high connectedness to nature does not necessarily translate to climate action. It is necessary to identify contributing factors to understand the link between these variables. Eco-emotions describe reactions arising from the individual's interaction with the biophysical environment in which they are integrated. Eco-emotions are higher in people who feel more connected to nature (Clayton & Karazsia, 2020). In various contexts, negative emotions, such as eco-anxiety, eco-grief, eco-guilt and eco-anger, can play an adaptive role, driving action and encouraging a proactive approach to CC (Stanley et al., 2021). Considering the links between variables mentioned above, we propose that eco-emotions can mediate the relation between connectedness to nature and individual and collective pro-environmental behaviours.

Aims and hypothesis

The aim of this study is to analyse the indirect relationship between connectedness to nature and individual and collective pro-environmental behaviours, through eco-emotions. It is expected that higher connectedness to nature will be associated with higher levels of pro-environmental behaviours. It is also expected that connectedness to nature and pro-environmental behaviours will be indirectly linked through eco-emotions.

Methods

This study was reviewed and approved by the institutional review board (IRB) of the Universidade Europeia (UE). We will recruit a sample of Portuguese young adults aged between 18 and 35. Data will be collected using self-report measures, compiled into Microsoft Forms. Participants will also fill out questions concerning sociodemographic variables. For data analysis, we will employ a structural equation modelling strategy using the AMOS software (Version 29). To test the significance of indirect paths, Preacher and Hayes' procedures (2008) with bootstrapping methods will be used.

Expected Results

It is expected that higher connectedness to nature will be positively, but weakly, associated with increased pro-environmental behaviours. Eco-emotions are expected to mediate this relationship. Specifically, we expect that higher connectedness to nature will relate to higher levels of eco-emotions, which will then relate to higher pro-environmental behaviours. It is also expected that eco-anger and eco-guilt have stronger links to pro-environmental behaviours.

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Evaluating the acute effects of heat therapy on NIRS-Based assessment of muscle in Peripheral Arterial Disease: A pilot study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Peripheral arterial disease (PAD) impairs perfusions due to atherosclerosis, leading to manifestations ranging from intermittent claudication to critical ischemia (Norgren et al., 2007). Heat therapy, which involves increasing limb and body temperature to enhance blood flow, has emerged as an intervention for PAD (Anderson et al., 2021). This study aimed to evaluate the acute effects of heat therapy with parafango on muscle oxygen, assessed by near-infrared spectroscopy (NIRS) in patients with PAD. Five participants with Fontaine stage II PAD (age: 64.7±6.2 years; ankle-brachial index: 0.64±0.10; Fontaine Stage IIa: 60%; Fontaine Stage IIb: 40%; skinfold thickness ≤15 mm) underwent two randomly assigned sessions (≥72-hour interval). In each session, participants received in rest either heat therapy with parafango (HTP; body wrapping at ~43.5°C on thigh and calf) or non-parafango control therapy (NPT) for 20-min in supine. The Gardner-Skinner protocol was then performed, followed by a 10-minute recovery. Muscle oxygenation saturation (SmO₂) was assessed in the *vastus lateralis* (VL) and *gastrocnemius medialis* (GM) muscles with Moxy 5 NIRS sensors. The recovery SmO₂ in the first minute after exercise (SmO₂ Rec1), hyperemia (SmO₂ Hyp), deoxygenated hemoglobin (HHb)=[(100-SmO₂)/100]*tHb, and

oxygenated hemoglobin (O_2Hb) = $[tHb - HHb]$, were determined (averages) over the final 2 minutes of the 20-minute period, and the first minute of the incremental protocol. Paired sample analyses revealed no statistically significant differences in SmO_2 parameters at rest or during the protocol between HTP and NPT conditions. Despite no differences, on the last 2 minutes of rest, O_2Hb levels were similar between sessions in the GM, but HHb was higher under HTP (5.13 ± 0.76 g/dL) compared to NPT (4.79 ± 0.69 g/dL) ($d = -0.68$; $p = 0.19$), suggesting a possible enhanced oxygen extraction without affecting local oxygen availability. In the VL, HHb had a moderate effect ($d = -0.50$; $p = 0.33$), while the O_2Hb remained similar between conditions, suggesting that HTP may affect oxygen availability through alterations in blood flow dynamics. During the first minute of the incremental protocol in the VL, HHb and O_2Hb values differed between sessions, NPT yielded values of 4.73 ± 2.45 g/dl and 7.82 ± 2.02 g/dl, respectively, compared to HTP with values of 5.31 ± 1.57 g/dL and 7.11 ± 1.17 g/dL ($d = -0.59$ and $p = 0.26$ for HHb ; $d = 0.81$ and $p = 0.14$ for O_2Hb). The recovery rates were slower under HTP for both muscles, particularly in the GM, where a large effect was observed ($d = -0.91$; $p = 0.11$). Moreover, $SmO_{2\ Hyp}$ in the VL was elevated under HTP ($d = 1.10$; $p = 0.06$), whereas in the GM the values were reduced. The elevated effect sizes (*Cohen's d*), despite non-significant *p-values*, may indicate limitations due to the small sample size. These preliminary findings suggest that parafango heat therapy may influence muscle oxygenation dynamics in PAD. The observed changes in NIRS parameters did not reach statistical significance, and the potential clinical implications remain unclear. The small sample size is a significant limitation, and future studies should involve larger cohorts to elucidate these effects.

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Relationship between the Trail Making Test A and B and sociodemographic, cognitive and quality of life variables in breast cancer survivors from Beira Interior, Portugal

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Cancer diagnosis and the associated treatments can impair cognitive function and, consequently, have a negative impact on the quality of life of survivors. The high survival rate of breast cancer patients increases the relevance of understanding the issues associated with cognitive impairment. According to some studies, 60% of breast cancer survivors report cognitive problems, particularly in terms of thinking, memory and attention, and of these, 60% show the onset of these problems within 6 months of starting treatment. The Trail Making Test A and B (TMT A and B) is an instrument that assesses various cognitive functions, such as information processing speed, attention control, monitoring and cognitive flexibility. This exploratory study aims to observe the relationship between the TMT A and B instruments and sociodemographic and cognitive variables, and quality of life in breast cancer survivors from Beira Interior of Portugal. The present study has a convenience sample of 41 female breast cancer survivors, aged between 39 and 68 years ($M = 53.95$; $SD = 7.82$), and with between 5

and 20 years of schooling ($M = 12.88$; $SD = 3.96$). The instruments used in this study were: Sociodemographic and Clinical Questionnaire, the Functional Assessment of Cancer Therapy-Cognitive Function-Version3 (FACT-COG), Trail Making Test A and B (TMT A and B) and European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire C30 (EORTC QLQ-C30). Analysis of the results showed statistically significant negative correlations between the TMT B and the Oth ($rS = -.41$; $p < .05$) and PCA ($rS = -.37$; $p < .05$) subscales of the Fact-Cog; between the TMT B and years of schooling ($rS = -.46$; $p < .01$); and between the TMT B and Cognitive Functioning (QLQ-C30_CF) ($rS = -.36$; $p < .05$). The results suggest that the TMT instrument is sensitive in detecting cognitive impairment in relation to the selected variables.

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The Impact of Exercise Prehabilitation on Arterial Stiffness and Blood Pressure in Head and Neck Cancer Patients: Secondary Outcomes of The FIT4TREAT Trial

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Conflict of interest: nothing to declare. **Funding:** CG PhD was funded by FCT (SFRH/BD/149054/2019). This work was funded by National Funds by FCT - under the following project UIDB/04045/2020.

An important percentage of patients with head and neck cancer (HNC) have pre-existing cardiovascular disease, and this rate nearly doubles after radiotherapy (RT). Exercise training can enhance cardiac, autonomic, and vascular functions and may help manage the cardiovascular health of these patients before starting treatment. This study aimed to explore the preliminary results of exercise prehabilitation (EP) on arterial stiffness and office blood pressure (BP) in HNC patients proposed for radical chemoradiotherapy. The FIT4TREAT trial is a randomised controlled trial (NCT05418842) aiming to evaluate the effects of EP on functional capacity in HNC patients. Patients with HNC were randomly assigned to either the

EP program or usual care (UC). The EP group participated in a 60-minute combined aerobic and resistance training program, three times per week, from randomization until the beginning of RT. Office systolic and diastolic blood pressure (BP) and aortic pulse wave velocity (aoPWV) were assessed at baseline and 1-3 days before the start of RT. Twenty-nine patients completed both pre-treatment assessments, 13 in the EP group (62.0±8.1 years, 92.3% men) and 16 in the UC group (63.2±10.9 years, 87.5% men). The median length of the pre-treatment phase was 28 days (IQR, 25-33 days) and 28 days (IQR, 21-32 days) in the EP and UC groups (p=0.589), respectively. The proportion of patients with pre-existing cardiovascular risk factors was similar between groups. Baseline aoPWV (EP: 11.3±1.1 vs. UC: 11.4±1.4 m/s, p=0.769), systolic BP (EP: 127.8±16.9 vs. UC: 132.2±16.3 mmHg, p=0.487) and diastolic BP (EP: 80.6±8.8 vs. UC: 81.8±10.4 mmHg, p=0.729) were comparable between groups. Adherence to exercise sessions was 75.6±27.6%. No significant differences were found between groups in the mean change of aoPWV (EP: Δ -0.4±1.2 vs. UC: Δ 0.1±1.6, p=0.322) and diastolic BP (EP: Δ -6.7±9.2 vs. UC: Δ -1.3±8.1, p=0.104) during the pre-treatment period. However, significant reductions were observed for systolic BP in the EP group when compared to UC (EP: Δ -12.5±9.0 mmHg vs. UC: Δ -2.1±14.0 mmHg, p=0.029). No serious adverse events related to exercise were reported. The EP program showed no significant impact on aoPWV and diastolic BP during the pretreatment period; however, it effectively reduced systolic BP in HNC patients proposed for radical chemoradiotherapy.

Acknowledgments

The authors would like to thank all patients who agreed to participate in the FIT4TREAT trial; health professionals of the Medical Oncology Service of ULSGE; the Functional Unit of Head and Neck Tumours of ULSGE; the Oncology Day Hospital of ULSGE; Liga dos Amigos do Centro Hospitalar de Gaia; and Nutricia.

Trauma outcomes: the mediating role of dissociation

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Exposure to adverse childhood events (ACEs) has been associated with somatoform and psychoform dissociation, each with unique implications for both Post-Traumatic Stress Disorder (PTSD) and Complex Post-Traumatic Stress Disorder (CPTSD) (Van der Hart et al., 2005). Specifically, childhood neglect and abuse contribute to dissociative symptoms, which increase vulnerability to PTSD and CPTSD (Dalenberg et al., 2012). This study explores the relationship between ACEs and PTSD and CPTSD through the mediation of somatoform and psychoform dissociation. A total of 340 participants were recruited for this study. Participants completed the Childhood Trauma Questionnaire-Short Form to assess ACEs along with the International Trauma Questionnaire to evaluate PTSD and C-PTSD symptoms. Additionally, dissociation was measured using the Dissociation Experiences Scale–Portuguese Version (DES-Port) for psychoform dissociation and the Somatoform Dissociation Questionnaire-20 (SDQ-20) for somatoform dissociation. It is expected that psychoform dissociation mediates the association between neglect (physical and emotional) and sexual abuse with CPTSD, and somatoform dissociation mediates the association between physical abuse and PTSD. The results of this study will show that the emotional regulation process is more pathological in both physical and mental neglect, which is in line with the literature (Cloitre et al., 2019). The role of dissociation as a mediator underscores the necessity of trauma-informed interventions targeting both cognitive and somatic dysregulation in individuals exposed to early-life

adversity. Understanding these dynamics may contribute to the development of more precise interventions, targeting both the psychological and somatic aspects of dissociation in individuals affected by trauma (Hopper et al., 2007).

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The Influence of Parathyroid Hormone in the Sensitivity of Bone Turnover Markers to Intradialytic Exercise in Haemodialysis Patients

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the project UI/04045. DC was supported by an FCT doctoral grant (SFRH/BD/138940/2018).

Mineral and bone disorders are common in patients with chronic kidney disease undergoing haemodialysis (HD) treatment. Previous work from our group observed that, regardless of type, exercise may have had a modulatory effect on bone remodelling by stimulating bone resorption and maintaining its formation. A major determinant in bone remodelling is parathyroid hormone (PTH). This biomarker exerts impactful effects on skeletal homeostasis through multiple cellular and molecular mechanisms, with continuous hyperparathyroidism altering bone remodelling by increasing bone formation and resorption. In this present study, we aimed to investigate whether PTH influences the sensitivity of bone biomarkers' responses to exercise training. This is a secondary analysis from an RCT completed on 88 HD patients who undertook a 6-week run-in period followed by 12 weeks of intradialytic aerobic (n= 36, male: 66%, age:

67±14 years), or resistance exercise (n= 29, male: 74%, age: 65±14 years), where we combined the exercise groups and stratified patients in low <150 pg/mL (L-PTH), normal 150-600 pg/mL (N-PTH), or high PTH >600 pg/mL (H-PTH) concentrations (for this population). Circulating TRAP-5b, sclerostin, RANKL, osteoprotegerin, and osteocalcin (OCN) were measured by either commercially available or Duoset ELISA kits. PTH levels were obtained from clinical records. At baseline, there were 15 patients with L-PTH, 55 patients with N-PTH, and 7 patients with H-PTH. Most biomarkers were unchanged after the control period, except for a reduction in OCN observed only in L-PTH patients (p=0.026). Following exercise, an elevation in TRAP-5b was observed in both L-PTH and N-PTH patients (p<0.001). No changes in bone biomarkers were observed in patients with H-PTH at any time point (p>0.05 in all). Exercise led to increased bone resorption in patients with low and normal PTH levels and maintained bone formation in patients with low PTH levels, but no such effects were observed in those with high PTH levels. This differential response suggests a protective effect of exercise in patients with low PTH by activating the cycle of bone formation through an increase in resorption and conservation of bone formation, which might be clinically relevant considering their reduced bone turnover. As it is the start of resorption that triggers a new cycle of bone remodelling in each active zone, these results point to a physiological, non-pharmacological alternative for managing adynamic bone disease.

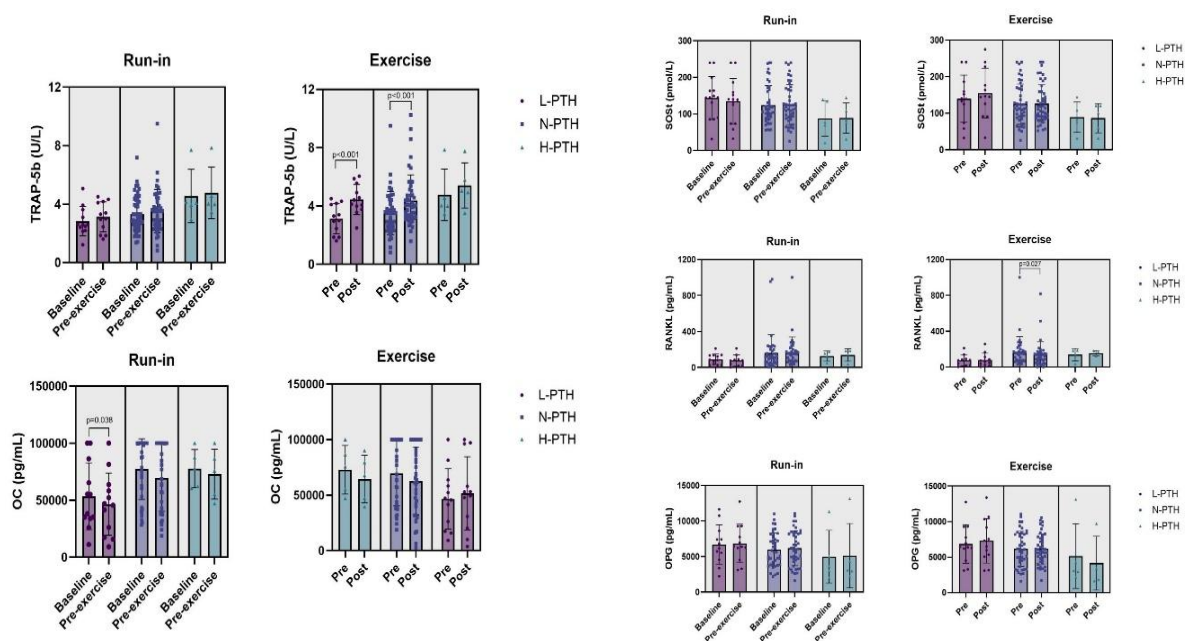


Figure 1. Resting bone turnover markers concentrations in response to a run-in period and an exercise intervention.

The impact of exercise professionals in the implementation of intradialytic exercise

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation of Science and Technology under the project UI/04045.

Integrating exercise professionals (ExP) into intradialytic exercise programmes (iEP) may enhance their effectiveness and adherence. Therefore, this study examined the impact of the presence of ExP during the first year of iEP implementation in 20 NephroCare Portugal dialysis units, comparing outcomes between units with and without ExP. Implementation was assessed using the RE-AIM framework. Effectiveness was measured through Sit-to-Stand 30sec (STS-30), 5-times (STS-5), single-leg stance (SLS), timed-up-and-go (TUG), and handgrip strength (HGS). Only two units had ExP, with no differences in patient baseline characteristics ($p>0.05$).

Reach

Of 2,280 patients, 1,270 met eligibility criteria (148 in ExP, 1,122 in non-ExP units). Patient uptake was higher in ExP (79.7%, N=118) vs. non-ExP units (61.7%, N=693; $p<0.001$).

Effectiveness

STS-30 ($p<0.001$) and SLS ($p=0.006$) performance improved in ExP units. In non-Exp units, HGS decreased (-1.5kg, $p<0.001$), while all other variables improved ($p<0.001$). Yet, Exp

elicited greater absolute change in STS-30 (+1.7 reps, $p=0.019$) and in HGS (+2.9 kg, $p=0.004$) than non-Exp units.

Implementation

Regardless of type, the average number and duration of weekly exercise sessions were identical in Exp and non-Exp ($p>0.05$). However, the weekly workload (sets x reps x weight) in the resistance exercise sessions was higher in Exp than in non-Exp units (336 ± 489 vs. 146 ± 222 , $p<0.001$).

Maintenance

Attrition rate was identical between Exp (Dropout: $N=64$, 54.2%) and non-Exp (Dropout: $N=400$, 57.7%) units. Reasons for withdrawal were mainly voluntary in both Exp ($N=37$, 57.8%) and non-Exp ($N=253$, 63.2%) units. Exp seems to be efficient in the recruitment process for iEP. Despite similar attrition rates and session frequency, Exp units show greater resistance training workload, which is potentially responsible for greater absolute improvements in muscle endurance and strength. However, while Exp may enhance iEP reach and effectiveness, additional strategies may be needed to sustain long-term engagement.

From Renal Damage to Muscle Decline: Is Nrf2 Deficiency a Driver of CKD Progression?

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Conflict of interest: nothing to declare. **Funding:** SM was supported by a Portuguese Foundation for Science and Technology (FCT) doctoral grant (SFRH/BD/07740/2020). This project is partly supported by the National Funds by FCT - Portuguese Foundation for Science and Technology under the project UI/04045.

Chronic Kidney Disease (CKD) is being seen as a model of accelerated ageing, with patients exhibiting low cardiorespiratory and muscular fitness. Alterations in the nuclear factor erythroid 2–related factor 2(Nrf2) pathway in CKD have been reported to contribute to the disease progression and associated morbidity. Identifying Nrf2's roles and associated mechanisms is important to better understand CKD progression. This work aimed at evaluating the role of Nrf2 during renal and skeletal muscle ageing. For this, tissue samples from renal and skeletal muscle of wild-type (WT) and Nrf2-KO mice were obtained at the ages of 8-12 (juvenile-J) or 38-42 (adult-A) weeks. Tissue sections were stained with hematoxylin & eosin

(H&E) and Picrosirius Red (PSR) for morphological examinations and tissue fibrosis quantification, respectively. IgG deposition (a driver of fibrosis) was evaluated by western blotting. Statistical analysis was performed using a two-way ANOVA followed by Tukey's post hoc test. Results show no changes in the parameters evaluated when comparing the J groups (JWT vs. JNrf2-KO). Significant increases in glomerular and muscle fibre area were observed in JWT compared with ANrf2-KO (glomerulus: 2.04x, $p < 0.01$; fibres: 1.9x, $p < 0.05$), but not compared with AWT. The increase in the glomerular area was paralleled by a significant decrease in their number (1.03x, $p < 0.05$), but the same was not observed on muscle fibres. IgG deposition increased with age. In the kidney, IgGs were more abundant in AWT (2.78x, $p < 0.05$) and ANrf2-KO (4.00x, $p < 0.0001$) groups (in comparison to YWT) and, as expected, tissue fibrosis was also higher (AWT – 3.35x, $p < 0.0001$; ANrf2-KO – 3.93x, $p < 0.0001$). However, when compared to JWT, muscle IgG was more abundant only in the ANrf2-KO group (2.9x, $p < 0.05$), yet fibrosis was not different. In conclusion, markers of tissue ageing and dysfunction are more evident in the kidney than in muscle, being exacerbated by the absence Nrf2 expression. The mechanism underlying the role of the Nrf2 pathway in the protection against renal and kidney damage needs further investigation.

Association of diabetes with sarcopenia in patients on haemodialysis: a nationwide cross-sectional study

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Conflict of interest: nothing to declare. **Funding:** This work is supported by the National Funds by FCT - Portuguese Foundation for Science and Technology under the project UI/04045.

Diabetes mellitus is a major cause of chronic kidney disease and has been linked to an increased risk of sarcopenia in older people. However, evidence for this association remains inconclusive in patients on haemodialysis. The main goal of the present study was to investigate the association between diabetes and sarcopenia in patients on haemodialysis. Therefore, a cross-sectional analysis was conducted using data from a nationwide cohort study conducted in 20 NephroCare Portugal dialysis units. Sarcopenia was diagnosed and staged according to the revised European Working Group on Sarcopenia in Older People, while diabetes was identified following the American Diabetes Association guideline. A total of 715 patients were included (median age 63 years; 37% female). The prevalence of confirmed sarcopenia and diabetes was 16% and 27%, respectively. Sarcopenia was twice as common in patients with diabetes (27% vs. 12%, $P < 0.001$), who also exhibited poorer physical function (all $P < 0.001$). Moreover, diabetes was independently associated with confirmed sarcopenia (adjusted odds ratio [aOR] =

2.41; 95% confidence interval [95% CI], 1.41–4.11). Subgroup analysis revealed that this association was only seen in male individuals (aOR = 2.64; 95% CI, 1.37–5.09). Our findings demonstrated that diabetes mellitus was independently associated with sarcopenia in patients on haemodialysis, but this association was only observed in male patients. Therefore, early detection and management of diabetes in this population are crucial to mitigate adverse effects on physical function and muscle mass.

Association of hydration status and physical function in haemodialysis patients

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Conflict of interest: nothing to declare. **Funding:** This work is supported by National Funds by FCT - Portuguese Foundation for Science and Technology under the project UI/04045.

The interdialytic period may be characterised by weight fluctuations due to fluid overload, and this hyperhydration environment may result in damage to the mechanisms for supplying oxygen to the muscles, which in turn may contribute to impaired physical function. This study examined the association between hydration status and physical function in haemodialysis (HD) patients. This is a retrospective cross-sectional study completed in 830 HD patients. Hydration status and body composition were determined using bioelectrical impedance. Hyperhydration/extracellular water ratio $\geq 7\%$ was used as an indicator of fluid overload. Time Up and Go (TUG), Sit-to-Stand 30 seconds and 5 reps (STS-30 and STS-5), and Handgrip Strength (HGS) were used to determine physical function. The association of hydration status and physical function outcomes was assessed by Spearman's correlation test. Patients were categorised as hyperhydrated or normohydrated, and physical function was compared using the Student's t-test or Mann-Whitney U-test. The examined patients had been on HD for 41 (17–79) months, and were 70 (58–79) years, with 62.5% being male. Correlation analyses showed that hydration status was associated with TUG ($r=0.207$; $p<0.001$), STS-30 ($r=-0.200$; $p<0.001$), STS-5 ($r=0.229$; $p<0.001$), and HGS ($r=-0.131$; $p<0.001$). Although these correlations were predominantly weak or very weak, these findings suggest that higher

hydration status is associated with poorer physical function. Further, subgroup comparisons between hyperhydrated (n=412) and normohydrated (n=418) patients indicated that hyperhydrated patients were older, and had longer HD vintage, more comorbidities, lower lean and fat mass, and poorer performance on the TUG, STS-30, STS-5, and HGS tests ($p < 0.050$ in all). Maintaining an adequate hydration status is crucial, particularly for preserving physical function and muscle strength. Hyperhydration can negatively impact these aspects, potentially increasing the risk of reduced mobility, physical frailty, and impaired daily functioning.

Improving Response to Chemotherapy by Adding Physical Exercise in the Neoadjuvant Setting of Breast Cancer Patients – Study Protocol for the KEYMOVE trial

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Conflict of interest: nothing to declare. **Funding:** 2021.09879.BD; 2023.15551.PEX.

Breast cancer (BC) treatment has a high incidence and leads to significant mortality. Therefore, it is crucial to explore effective ways of ameliorating its treatment. Neoadjuvant chemotherapy

(NACT) is a common approach in majority of triple-negative and HER2 positive and some luminal HER2 negative BC patients. Recent research suggests that exercise may improve cancer treatment efficacy. This study aims to 1) understand if exercise training combined with NACT improves its efficacy; 2) explore possible biological mechanisms underlying the impact of exercise on NACT efficacy. We implemented a parallel arm 1:1 randomised controlled trial (RCT). Eighty-six women with primary BC undergoing NACT will be randomised to a control group (standard care) or an intervention group (standard care + exercise intervention), considering the tumour subtype as a factor. The intervention includes three weekly sessions of moderate to vigorous concurrent exercise training during the neoadjuvant phase. The main outcome is pathologic complete response (pCR) (absence of residual invasive tumour in the breast and lymph nodes at the time of surgery). Exploratory endpoints include treatment tolerance and compliance, tumour and systemic immune responses, inflammatory biomarkers, maximal handgrip and quadriceps isometric strength, maximal exercise tolerance, physical activity and quality of life. Variables will be assessed pre- and post-neoadjuvant chemotherapy. Relative dose intensity of NACT will be calculated at the end of the study period. Additionally, patient reported outcomes will be recorded every week during the neoadjuvant period. The sample size was calculated to detect an effect on pCR with 80% power. A 95% confidence interval will be applied in statistical methods. The study occurs at the Local Health Unit of Gaia/Espinho, Portugal. It has been registered (NCT05976815) and approved by an ethics committee. Status: Recruitment started on 10/08/2023. On 01/11/2024, 49 patients were included (32 completed the intervention). This trial will be one of the first RCT assessing the impact of physical exercise on the pathologic response to NACT as the primary outcome. The effect of the intervention on the immune system and treatment compliance will be explored as potential mechanisms behind the hypothesised benefits of exercise training on treatment efficacy.

Impact of Combined Aerobic and Resistance Training on Quality of Life and Stress of Middle-Aged Adults

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Conflict of interest: nothing to declare. **Funding:** Fernanda M. Silva was a grant holder from the Portuguese Foundation for Science and Technology (2020.08759.BD).

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Prolonged sedentary behaviour may negatively impact health-related quality of life (Chen, Holahan, & Castelli, 2022) and the capacity to deal with stress in middle-aged adults (Ashdown-Franks et al., 2018). In contrast, regular physical activity supports healthy ageing and has been associated with improved quality of life and overall well-being (Hao et al., 2024). However, the specific effects of combined aerobic and resistance training on health-related quality of life and perceived stress in sedentary middle-aged adults remain poorly understood. This study aims to address this gap by assessing the impact of a 16-week combined training program on these outcomes. A total of 36 middle-aged adults (aged between 40 and 64 years) completed this RCT study (non-exercise control group, n = 18; exercise group, n = 18). The exercise group

performed combined resistance and aerobic training three times per week (75 minutes/session), achieving the 225 minutes/week recommended by current physical activity guidelines. Health-related quality of life was assessed using the 36-Item Short Form Survey (SF-36), and the perceived stress was evaluated with the Perceived Stress Scale at baseline and after 8 and 16 weeks of intervention. Data were analysed using mixed ANOVA for normally distributed data or by Friedman's test for non-normally distributed data. After 16 weeks, the exercise group showed significant improvements in the SF-36 Mental Component Summary ($p = 0.047$, Kendall's $W = 0.170$ [small effect]) and Social Functioning subdomain ($p = 0.040$, Kendall's $W = 0.179$ [small effect]). No significant changes were observed in the Physical Component Summary or its subdomains. Perceived stress showed a trend toward reduction in the exercise group (mean decrease: -3.67 points, 95% CI [-6.97, -0.364]), while the control group showed a slight, non-significant increase (0.94 points, 95% CI [-2.57, 4.45]). In conclusion, 16 weeks of combined exercise training can enhance health-related quality of life, particularly the mental component and social functioning subdomain, in previously sedentary middle-aged adults. Although not statistically significant, the observed trend toward decreased perceived stress in the exercise group suggests a clinically meaningful benefit that warrants further investigation.

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Characterisation of physical exercise performed by breast cancer survivors in Beira Interior, Portugal, as well as the recommendation and opinion of health professionals

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Although physical activity benefits the cancer population, its practice is low among cancer patients. In addition, knowledge about physical activity is poorly publicised among cancer patients. This study aims to describe the practice, type of exercise, and frequency performed by breast cancer survivors, as well as the recommendations and opinions of health professionals about this practice. This descriptive study had a convenience sample of 38 female breast cancer survivors from Beira Interior in Portugal, aged between 39 and 68 (M = 55.58; SD = 8.04). A sociodemographic and clinical questionnaire was used to obtain information on the variables indicated. Analysis of the results revealed that the majority (73.7 %) of the sample practised physical exercise, with walking being the most practised (57.8 %). Most of the sample (36.8 %) said they practised physical exercise both individually and in groups, and said they did not have the guidance of a professional (52.6 %). Most of the sample (65.8 %) saw no obstacles to

physical exercise and mentioned psychological and physical benefits (73.7 %). Most of the sample (73.7 %) said that professionals had recommended physical exercise, and the majority (71.1 %) said they had received a positive opinion from them. Despite this, a considerable percentage of the sample (21.1 %) indicated that exercise was neither recommended nor discussed by health professionals. Other studies indicated that less than 50% of the health professionals know the guidelines for exercise for this population, less than 40% of cancer survivors report having received recommendations to practice exercise, and less than 30% of cancer survivors follow the recommendations of exercise. The results suggest a good prevalence of cancer survivors who practice physical exercise, as well as in the recommendations made by health professionals for this population, although a high percentage limit the physical exercise to walking and practice without professional guidance. In comparison with other studies' results, this study shows a better prevalence of exercise practice among cancer survivors, as well as higher percentages of cancer survivors who received any indications or recommendations about this practice. Despite this, there is a need to continue investing in research about obstacles and facilitators of the dissemination of this knowledge and practice to increase the percentage of cancer survivors and health professionals who implement this good health practice.

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Circulating immune mediators and habitual exercise practice among older adults: beyond the statistical significance, towards clinical significance

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Conflict of interest: nothing to declare.

Funding: Research supported by FAPDF (grant #193.00000234/2023-03) and CAPES (Finance Code #001). O.T. Nóbrega received a fellowship for productivity in research G.S. Morais-Junior had a stipend from CAPES, Brazil. None of the funding agencies has interfered with or advised on the analyses conducted.

Physical exercise is considered an effective and relatively safe practice to reduce or maintain levels of pro-inflammatory mediators throughout ageing. However, study results are often interpreted based on the “importance” of statistical significance, relegating issues as the magnitude of effects and clinical significance of findings to a secondary level. The present cross-sectional study aimed to expand the scope of previous reports by addressing possible clinical implications of regular physical exercise on circulating levels of key inflammatory mediators [C-reactive protein (C-RP), Tumor Necrosis Factor (TNF)- α , Interleukin (IL)-6, IL-

8, IL-10 and IL-12)] in a sample of 342 community-dwelling older adults eligible for primary prevention. Criteria for regular practice of physical exercises (or not) followed the current 2020 World Health Organisation's guidelines, whereas levels of cytokine and other traits were assessed according to routine laboratory techniques. The results suggest that older practitioners exhibited lower levels of C-RP (-0.68 mg/L; 95% CI: -0.98 to -0.34 mg/L, $P = 0.001$) compared to non-practitioners, even in analyses adjusted for sex, age or BMI. In reality, the amplitude of the plausible effects estimated with the 95%CI_{boot} is compatible with a rise in C-RP near 1.0 mg/L among non-practitioners, a threshold clinically associated with a 10–20% increase in the risk of cardiovascular events. On the other hand, the results did not show important differences in TNF- α , IL-8, IL-10, and IL-12 levels between groups, albeit clinically important effects cannot be excluded when considering the magnitude of the difference in IL-6 levels (-4.34 pg/mL among practitioners), and given the asymmetry observed in interval estimates (95%CI: -9.41 to 0.24 pg/mL) for this cytokine. All in all, the scenario suggests that the practice of physical exercises by older adults according to public policy standards can influence C-RP levels to the extent of producing clinical importance for this population.

The effect of exercise on life quality and depression levels in postpartum women

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

A woman's quality of life in the postpartum period seems to have a major influence on her recovery, as well as on the care of the newborn. Additionally, depressive symptoms at this stage appear to negatively impact quality of life. However, in the last decade, the potential of physical exercise as a non-pharmacological measure to mitigate depressive symptoms has been questioned, but with unclear results. The aim of this study is to analyse and discuss the main results present in the literature regarding the effects of physical exercise on quality of life and depressive symptoms in postpartum women, as well as to present practical recommendations for prescribing physical exercise for this population. To this, research on 4 databases (Web of Science, Scopus, PubMed, Science Direct) for original research published until 20 January 2025 was performed. The review was conducted in accordance with PRISMA. The literature reveals that supervised programs with a duration of more than 8 weeks reduce postpartum fatigue levels. Additionally, progressive stimulation adapted to the physical fitness level of each postpartum woman supports to ensure adherence, as well as improve her quality of life and health. Furthermore, the practice of group physical exercises ensures moderate positive results. In addition, through the analysed studies, it may be recommended to healthy postpartum women, through supervised monitoring, to perform 150-300 minutes of moderate to vigorous intensity aerobic exercise/week (e.g., walking and/or dancing), combined with muscle

strengthening activities (e.g., free weights and/or body weight exercises) performing submaximal intensities (i.e., 12-15 repetitions) with the main initial focus on deep postural muscles and balance and coordination exercises with a training volume of 20-60 minutes/day, at least 2-3 days/week (e.g., Pilates, Yoga). The studies analysed demonstrate that practising physical exercise appears to be a positive strategy for reducing postpartum depression, improving quality of life and, consequently, increasing emotional availability in caring for the child. Therefore, it seems pertinent and effective to combine recommendations for supervised physical exercise with medical prescriptions in Maternal Health consultations, as well as in the Postpartum Consultation. At the same time, it seems to be a strategy that relieves the public health system and contributes to reducing the prescription of pharmacological therapy.

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Active Pregnancy: Implementation of a community-based supervised exercise program to promote a healthy lifestyle, physical activity and fitness of pregnant and postpartum women in the North Region of Portugal

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Conflict of interest: nothing to declare. **Funding:** This work is financed by national funds through FCT – Fundação para a Ciência e Tecnologia - Foundation for Science and Technology, I.P. (Portugal), within the scope of the project [2023.14896.PEX]

Physical activity during pregnancy and postpartum is one major multigenerational public health protective factor, and at a community-based level, can bring various health benefits to both mother and baby. In previous studies, the Criteria for Reporting the Development and Evaluation of Complex Interventions in Healthcare (CReDECI2) were followed to develop

physical exercise programs tailored to pregnancy and postpartum based on current international recommendations. The objective of this study was to describe the protocol of a community-based physical exercise program aimed at promoting a healthy lifestyle, physical activity, and fitness for pregnant and postpartum women living in the North Region of Portugal. After medical clearance and informed consent obtained, pregnant women will be enrolled in one of the available supervised exercise groups of moderate intensity, either online or in-person, delivered by a qualified exercise physiologist for 12 weeks (distributed by 3 sessions of 45 min/each per week), tailored either to pregnancy or to postpartum periods. Health parameters and satisfaction with the program will be collected as control variables regarding feasibility. Lifestyle, physical activity, and fitness parameters will be collected at baseline and post-intervention levels through the application of the Pregnancy Physical Activity Questionnaire, the International Fitness Scale, and field tests.⁴ The expected results aim to prove the feasibility and the positive impact of the multicenter exercise trial regarding the maintenance or improvement of physical activity levels and healthy lifestyle, as well as perceived and assessed fitness parameters. The relevance of the study is focused on the citizen engagement towards health, wellbeing, and prevention of diseases, and shall enable women to become co-managers of their health and physical and mental wellbeing, including quality of life, health literacy, among other lifestyle factors.

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The Impact of Ageing, Fall-Risk, and Power Training on Neuromuscular and Biomechanical Mechanisms of Gait Initiation and Balance

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background and aim

Ageing leads to declines in neuromuscular performance, particularly in the rate of force development (RFD) and muscle power, which are critical for balance and fall prevention. These deficits are more profound in muscles responsible for medio-lateral (ML) weight transfers and worsen in older adults with a history of falls. While gait initiation (GI) relies on different neuromotor mechanisms than reactive balance, it is also affected by these declines. Power training enhances neuromuscular performance in older adults; however, its effects remain underexplored. This study aimed to 1) investigate how ageing and fall-risk affect GI neuromuscular/biomechanical mechanisms, neuromuscular performance, functional mobility and balance, and 2) assess if a 10-week lower limb power training program improves these outcomes in high fall-risk older adults.

Methods

Forty five participants were recruited: 15 younger adults (PY: 26.36 ± 4.62 years), 15 older non-fallers (PNF: 71.64 ± 4.63 years), and 15 older fallers (PF: 72.67 ± 4.81 years). Participants completed maximal voluntary isometric contractions (IMVC) of ankle dorsiflexors and hip abductors/adductors (DESMOTEC, IT), functional mobility and balance tests (Mini-BESTest, Timed Up-and-Go [TUG], Dual-task TUG, Four-Square Step Test [FSST]), and a voluntary step initiation protocol on a force platform (AMTI, USA) under simple (SRT) and choice (CRT) reaction time conditions. For the second aim, 15 PF completed a 10-week (twice/week) progressive power training program on a flywheel isoinertial device (DESMOTEC, IT), targeting bilateral ankle dorsiflexors and hip abductors and adductors. Pre- and post-training assessments included the same neuromuscular, mobility, and GI measures. A linear mixed-effects model evaluated between-group differences and intervention effects ($p < 0.05$).

Results

PY showed fastest ($p < 0.05$) FSST (4.30 ± 0.73 s), TUG (4.23 ± 0.28 s), Dual-Task TUG (4.24 ± 0.39 s), better Mini-BESTest score (27.73 ± 0.59), higher normalised IMVC RFD ($\approx 120\%$ more hip abduction; $\approx 130\%$ greater hip adduction; $\approx 39\%$ more ankle dorsiflexion) and peak force (hip abduction $\approx 40\%$; hip adduction $\approx 35\%$; ankle dorsiflexion $\approx 18\%$). During voluntary stepping, while PY outperformed in every measure ($p < 0.05$), PF had the slowest reaction time (SRT: 0.217 ± 0.066 s; CRT: 0.240 ± 0.092 s, $p < 0.05$), shortest peak CoP displacement (SRT: lateral- 0.045 ± 0.006 m; posterior- 0.094 ± 0.007 m; CRT: lateral- 0.053 ± 0.005 m; posterior- 0.096 ± 0.006 m, $p < 0.05$), slowest peak CoP velocity (SRT: lateral- 0.127 ± 0.009 m/s; posterior- 0.268 ± 0.012 m/s; CRT: lateral- 0.125 ± 0.010 m/s; posterior- 0.232 ± 0.012 m/s, $p < 0.05$), lowest normalised RFD (SRT: lateral- 0.201 ± 0.020 bw/s; posterior- 0.268 ± 0.022 bw/s; CRT: lateral- 0.196 ± 0.024 bw/s; posterior- 0.232 ± 0.023 bw/s, $p < 0.05$) and weakest normalised peak force (SRT: lateral- 0.051 ± 0.008 bw; posterior- 0.127 ± 0.011 bw; CRT: lateral- 0.055 ± 0.009 bw; posterior- 0.125 ± 0.012 bw, $p < 0.05$). Post-intervention, PF improved isometric RFD in ankle dorsiflexion (Pre: 0.21 ± 0.10 vs Post: 0.26 ± 0.13 , $p < 0.05$), hip abduction (Pre: 0.18 ± 0.09 vs Post: 0.24 ± 0.16 , $p < 0.05$), and hip adduction (Pre: 0.18 ± 0.08 vs Post: 0.25 ± 0.11 , $p < 0.05$). GI parameters also improved, with reduced CRT reaction time (Pre: 0.240 ± 0.092 s vs Post:

0.215±0.066s, $p<0.05$), reduced mediolateral normalised RFD (Pre: 0.20±0.10 vs Post: 0.16±0.08, $p<0.05$), lower CoP displacement (Pre: 0.053±0.026m vs Post: 0.044±0.020m, $p<0.05$), and reduced CoP velocity (Pre: 0.125±0.039m/s vs Post: 0.102±0.036m/s, $p<0.05$). Functional mobility and balance also improved, with increased Mini-BESTest scores (Pre: 23.33±3.5 vs Post: 25.5±2.47, $p<0.05$) and faster FSST times (Pre: 7.59±1.53s vs Post: 6.53±1.49s, $p<0.05$).

Conclusion

Ageing and fall risk significantly impair neuromuscular and biomechanical mechanisms of stepping and balance, particularly in high-risk individuals. However, targeted power training improves neuromuscular performance, mobility, dynamic balance, and GI mechanisms linked to fall risk. These findings support the integration of power training to mitigate age-related declines and reduce fall risk in ageing populations.

Active Pregnancy: preliminary results of a supervised multi-component virtual exercise intervention impact on physical activity and fitness parameters of pregnant women

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Conflict of interest: nothing to declare. **Funding:** This work is financed by national funds through FCT – Fundação para a Ciência e Tecnologia - Foundation for Science and Technology, I.P. (Portugal), within the scope of the project Active Pregnancy [2023.14896.PEX] (PI: Rita Santos-Rocha)

Exercise during pregnancy and postpartum, as well as online training, are among the fitness trends for Portugal, in accordance with the survey applied by the American College of Sports Medicine. A previous study followed the Criteria for Reporting the Development and Evaluation of Complex Interventions in Healthcare (CReDECI2) to develop a prenatal exercise program. Virtual interaction increased after the 2020 pandemic, but no studies addressed its effectiveness on fitness and physical activity (PA). The objective was to describe preliminary results of a supervised virtual exercise intervention's impact on PA and fitness parameters of pregnant women. After signing an informed consent, 31 pregnant women (mean age of 32 years) participated in a moderate-intensity exercise

program delivered by a qualified exercise physiologist during 12 weeks (3 sessions of 45-60 minutes/week). The program included aerobic, resistance, postural, stretching, balance, and pelvic floor training exercises. The participant adherence rate was 75.5%. Health parameters and satisfaction with the program were collected as control variables regarding feasibility. Physical activity and fitness parameters were collected at baseline and post-intervention by means of the Pregnancy Physical Activity Questionnaire (PPAQ), the International Fitness Scale (IFIS), and 9 field tests. Baseline and post-intervention results are as follows:

- PPAQ: Average daily physical activity levels remained the same; average sitting time decreased
- IFIS – overall physical fitness: rated as "average/fair" at baseline/post-intervention (N=15/16), "good" (N=9/12) and "very good" (N=1/3) fitness increased, and the "poor" level decreased (N=6/0)
- IFIS – cardiorespiratory fitness: "good" (N=6/9); "poor" (N=8/11); "average/fair" (N=15/11); "very poor" (N=2/0)
- IFIS - muscular strength: "good" (N=9/12); "poor" (N=9/7); "average/fair" (N=15/12)
- IFIS - speed/agility: "good" (N=12/9); "poor" (N=10/9); "average/fair" (N=9/13)
- IFIS – flexibility: "good" (N=7/12); "poor" (N=12/8); "average/fair" (N=8/10); "very poor" (N=2/0); "very good" (N=2/1)
- 6-min walk test: average distance covered = 0.57 m / 0.49 m; estimated cardiorespiratory fitness = 26.29 mL/kg.min / 22.57 mL/kg.min
- Agility - Time Up & Go over 3 m distance: 2nd trimester=6.47 sec / 3rd trimester = 7.65 sec
- Muscular endurance - repetitions over 30 sec of each test: Chair Sit to Stand Test 12 reps, 5 RPE / 13 reps, 4 RPE; Arm Curl: 13 reps, 4 RPE / 13 reps, 4 RPE; Push Up adapted to the wall: 14 reps, 5 RPE / 15 reps, 4 RPE (RPE = perceived exertion)
- Balance - One Leg Stance Test with the knee flexed backwards: most women completing the test without errors
- Rotatory Stability Test (FMS battery): stabilisation phase 2nd trimester = 2 points / 3rd trimester = 3 points (execution quality rating from 0 to 3 points)
- Flexibility - Back Scratch Test; adapted Sit and Reach test (chair and unilateral): positive differences in range of motion

These preliminary results showed that it is feasible and supports the positive impact of virtual intervention on physical activity and fitness parameters. Compliance with current guidelines is sufficient to achieve the main benefits, and exercise type and intensity should be based on women's previous fitness level.

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Multidisciplinary

Effect of Differential Learning on the Technical Skills of Primary and Secondary Education Students in Basketball and Volleyball

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

The DL methodology is based on creating motor modifications during the learning process, allowing students to adapt movement patterns to their individual characteristics (Schöllhorn, 2003). This approach explores fluctuations within the motor system, promoting self-organisation and the emergence of more efficient movement patterns, as evidenced in the study by Schöllhorn et al. (2012). The study involved 75 students from a Secondary School, divided into an experimental group and a control group. Over six weeks, the experimental group underwent DL interventions, while the control group implemented traditional methodologies. The intervention included the development of the volleyball overhead pass (8th grade) and basketball dribbling (11th grade), with specific performance tests based on the literature (Conte et al., 2018). The results showed that the experimental group demonstrated significant improvements compared to the control group. In the 8th grade, the volleyball overhead pass showed significant gains ($p = 0.05$), while in the 11th grade, basketball dribbling also evolved significantly ($p = 0.02$). Moreover, improvements were observed in the 10m Sprint in the experimental group, highlighting the potential of DL for associated physical skills (Schöllhorn et al., 2006). However, the control group did not show relevant gains, reflecting the limitations

of linear methodologies in time-constrained contexts (Wagner & Müller, 2008). The research reinforces that DL provides motor variations that induce effective adaptations, exploring the natural fluctuations of the motor system. This process promotes self-organisation and the emergence of more efficient movement patterns, which is particularly useful in school contexts with limited time for sports practice. The study's limitations included the small sample size and the use of less precise instruments (e.g., a stopwatch in the 10m Sprint). Additionally, a lack of motivation among some students impacted the results in the control group, reflecting the need for strategies to increase engagement in physical education classes.

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Spin in sports injury risk and prevention research

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Conflict of interest: nothing to declare. **Funding:** CIFI₂D is financed by the Portuguese Foundation for Science and Technology (DOI <https://doi.org/10.54499/UIDB/05913/2020>).

The aims of this work are to: (i) alert to spin in scientific research, i.e., the practice of twisting the words, omitting key information, or lying about the contents of a study; and (ii) propose simple solutions to this problem. Spin may range from selective reporting of a specific result at the expense of other (equally relevant) results, to conveying conclusions unsupported by the methods (e.g., establishing causal relationships where only associations were found), to outright establishing conclusions that contradict the results. The practice of spin is common in science (Chiu et al., 2017; Navarro et al., 2023) and is particularly problematic when present in research titles (the gateways to a publication). Spin is especially worrisome in injury risk and injury prevention studies, as it may waste valuable human, temporal, and financial resources on avenues that lack empirical support. Injury prevention and injury risk are hot topics, and catchy titles including these expressions are prone to grab a wide audience. However, these studies often do not contain injury data. A review on inter-limb asymmetries showed that research often associates such asymmetries with injury risk, despite lacking injury data (Afonso et al., 2022). Similarly, a systematic review assessed randomised controlled trials focused on hamstring injuries (Rudisill et al., 2023): of 108 studies, only 4 had injury data, with all others relying exclusively on surrogate outcomes (risk factors). Assuming injury risk based on surrogate measures is problematic (Afonso et al., 2024), as they often lack empirical support or are specific to each particular injury and sample. A scoping review including 1,390 studies whose titles mentioned “injury prevention” or “injury risk” (Afonso et al., Accepted) showed that the percentage of such studies failing to provide injury data has been steadily increasing, surpassing 20% in studies published from 2016 onwards. When considering titles about “injury prevention”, only ~35% of studies presented injury data. Authors are ethically obligated to deliver trustworthy titles, promoting honesty over hype. Likewise, reviewers and editors should

be more stringent in demanding that research titles match their contents, especially in hot topics such as injury risk and prevention. In the case of sports injuries research, we present specific proposals (Afonso et al., Accepted) that will gladly be shared in the presentation. If the articles deliver honest, rigorous work, they can still be accepted for publication, but reviewers and editors should demand removal of spin, especially in critical locations such as the titles. This will not result in lower publication rates; however, it may make titles less attractive to a larger audience, resulting in somewhat worse metrics (e.g., number of citations, downloads). *Short-term*, this may seem counterproductive, but the alternative will almost certainly result in a *long-term* distrust of science.

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Behavioural Regulation Sport Questionnaire and Sport Motivation Scale – II: A scale comparison

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

The Sport Motivation Scale-II (SMS-II) and the Behavioral Regulation in Sport Questionnaire (BRSQ) are methods for assessing the regulation of motivation in sport, based on the Self-Determination Theory (Deci & Ryan, 1985), which states that humans have a natural tendency for development and growth throughout life, with intrinsic and extrinsic motivation leading to different outcomes in performance and well-being. SDT shifts the paradigm by not only considering motivation in terms of quantity but also examining its quality based on the degree of self-determination along a motivational continuum (intrinsic regulation, integrated, identified, introjected, and external regulation and amotivation). Ryan & Connell (1989) propose a quasi-simplex pattern, where types of regulation closer on the continuum are positively correlated, while those farther apart show weaker or even negative correlations. This research aimed to examine and compare the psychometric properties of both scales.

Methods

The search was conducted in English in the Web of Science, Scopus, and PubMed databases between June and September 2024, covering the period from 2008 to 2024 for the BRSQ and from 2013 to 2024 for the SMS-II. The search strategy used the following terms: (“sport motivation scale” or “SMS-II”) AND (valid* OR “psychometric”) AND (motiv* OR regulat* OR behav*); (“behavioural regulation in

sport questionnaire” or “BRSQ”) AND (valid* OR “psychometric”) AND (motiv* OR regulat* OR behav*). References from the articles found were also reviewed. After evaluation, 34 studies were selected for full analysis.

Results and conclusions

Reliability was accepted in most of the BRSQ validations, but in the SMS-II validations, reliability problems were found in introjected, external regulation, and amotivation. The BRSQ presented convergent validity problems in the integrated and identified regulation factors, since the average variance extracted is lower than 0.50. In addition, discriminant validity (i.e., when the square correlation is higher than the average variance extracted of each factor) issues were also identified between the external and introjected, identified and integrated, integrated and intrinsic, and motivation and external regulation factors. SMS-II revealed convergent validity problems with all the motivation regulation factors and discriminant validity issues with the intrinsic, integrated, identified and introjected, integrated and identified, integrated and introjected, identified and introjected, and introjected and external regulation factors. When analysing the fit of the models, not all of them showed acceptable values at first glance for both scales. In these cases, errors were correlated, items were eliminated, and scales with fewer factors regulating motivation were validated. The invariance of both scales was checked for gender, different ages, team/individual sports, and different sporting levels. The temporal validity of the scales was also tested and validated. The BRSQ also proved to be invariant across different sports and in 5 European countries. Thus, the results of this study will contribute to the further assessment of motivation as a determining factor for practising sports and help continually refine a scale that integrates all types of motivation.

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Biomechanical and functional factors that characterise gait in people with autism spectrum disorder

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Conflict of interest: The authors declare no commercial relationships or conflicts of interest.

Funding: This study is part of the research project ‘Biomechanical and functional factors that characterise gait in people with autism spectrum disorder, funded by the European University of Lisbon

Autism spectrum disorder (ASD) can be diagnosed by the existence of motor deficits, which include abnormal gait, clumsiness, and irregular motor signs. This can be used to analyse the presence of autism at an early age (Teitelbaum et al., 1998). Bennett et al. (2021) found that adolescents with ASD generated 9% more work while walking at both self-selected and standardised speeds compared to controls. These findings suggest increased mechanical effort due to suboptimal gait biomechanics across the entire system. This project aimed to (i) assess physical activity levels (PAL) and functional movement status in ASD subjects, (ii) characterise gait in ASD subjects regarding age groups and its practical implications in everyday life, (iii) investigate which biomechanical factors could be indicators of autism in children. This information will be paramount to better understand walking motor behavior related to ASD. Thirty-six subjects with grade 3 autism (7 adolescents and 29 adults), with a mean age of 35,4 years, weight 79,8 kg, 1,68 m of height, and a mean BMI of 28,1 kg/m², participated in the study. The group of teenagers was all male, while the group of adults had 5 females.

The International Physical Activity Questionnaire (IPAQ-short Portuguese version) was applied only to adults to describe PAL. The Functional Movement Screen (FMS) was used to score seven fundamental movement patterns (Cook et al., 2014). Gait motion data was collected

to assess gait sagittal kinematic variables. This project is in the data processing phase however some previous findings can be reported. Regarding FMS tests, Active Leg Raise (ALR) showed positive correlations with weekly frequency of vigorous physical activity ($p=0,026$) and with time of daily vigorous ($p= 0,015$) and moderate physical activity ($p<0,001$)). There was also a positive association between step type and ALR ($p=0,005$) and trunk stability ($p=0,0026$), with those who walked with a vigorous step having higher scores on both tests. Only one subject was analysed regarding the knee gait kinematic pattern. The mean stance phase duration was slightly higher than the 60% of the total gait cycle reported in the literature. For further conclusions, more data analysis is needed; however, there seem to be some directions that can be further detailed in the future.

Acknowledgments

Authors would like to thank to Portuguese Association for Developmental Disorders and Autism, where all data collection was developed, together with their excellent professionals.

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Basic Psychological Needs Satisfaction and Frustration: Integrating the Need for Novelty

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

In the study of motivation in the context of physical exercise, the assumptions of Self-Determination Theory are often applied (Ryan & Deci, 2017), which emphasises three basic psychological needs common to human beings: autonomy (the need to make one's own choices), competence (the need to feel capable) and relatedness (the need for interaction). However, this theory is not limited to this approach and currently includes six micro-theories that explain extrinsic and intrinsic motivation, taking into account the environment. Studies in this area have revealed new nuances about motivation (González-Cutre et al., 2016, 2020) and a new basic psychological need has been proposed, need for novelty ('the need to experience something that has never been experienced before or that deviates from the daily routine'). The aim of the present study was to translate and validate the basic psychological need for novelty subscale in terms of satisfaction and frustration, to test its predictive validity with enjoyment and life satisfaction, and to analyse gender invariance. This study involved 500 subjects (female=263; male=237) who practised physical exercise in gyms, aged between 18 and 65 ($M=33.72$; $SD=12.81$). The length of practice varied between 1 and 456 months of practice ($M=61.33$; $SD=40.75$), and the weekly frequency varied between 1 and 7 ($M=3.44$; $SD=1.44$).

The results show that the measurement model fitted the data both for the overall sample and for one of the sexes since the adjustment values of the incremental indices were higher than .90 and the values of the absolute indices were lower than .08. In addition, the instrument showed good psychometric properties in terms of composite reliability, convergent and discriminant validity. The measurement model underlying the Basic Psychological Needs Satisfaction and Frustration scale with novelty showed invariance between the sexes ($\Delta CFI < .01$).

Regarding direct effects, the results found that satisfying needs have a positive impact on enjoyment and life satisfaction, while frustrating needs have the opposite effect.

This study provides robust empirical evidence supporting the validity and reliability of the Basic Psychological Need for Novelty subscale in the context of physical exercise. The findings reinforce the relevance of Self-Determination Theory in explaining motivation, particularly by incorporating the need for novelty alongside autonomy, competence, and relatedness. The measurement model demonstrated strong psychometric properties and gender invariance, confirming its applicability across different populations. Furthermore, the results highlight the critical role of satisfying psychological needs in promoting enjoyment and life satisfaction, while need frustration negatively impacts these outcomes. These insights contribute to a more nuanced understanding of motivation in exercise settings, covering the way for future research exploring the dynamic interplay between psychological needs and well-being. Additionally, the present study presents the following practical implications: i) Gym and Fitness Program Design: Fitness professionals should integrate novelty into exercise programs by offering varied and engaging activities that break routine, thereby enhancing intrinsic motivation and adherence; ii) Personalised Training Approaches: Trainers can assess individual psychological needs and tailor workout plans to maximise enjoyment and satisfaction, ultimately improving long-term commitment to exercise; iii) Public Health and Wellness Initiatives: Policymakers and health organisations should consider the need for novelty when designing community-based fitness programs to increase participation rates and promote overall well-being; iv) Gender-Sensitive Interventions: Since the measurement model demonstrated invariance between sexes, interventions can be developed with confidence that the need for novelty is relevant across genders, ensuring inclusivity in motivational strategies; v) Corporate Wellness Programs: Employers can implement diverse and stimulating physical activity initiatives in workplace wellness programs to enhance employees' motivation, enjoyment, and overall life satisfaction.

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Fear of cancer recurrence and progression in breast cancer survivors: Review study of combined interventions

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

As the oncology field evolved, including individualised cancer treatments, preventive programs and early cancer detection, the number of survivors has grown over the years (Nardin et al., 2020; Bergerot et al., 2022). With that, numerous psychological issues have followed the rise, such as Fear of Cancer Recurrence (FCR) and Cancer Progression (CP) (Richter et al., 2022). It has been noted that changes in lifestyle, especially in diet and Physical Exercise (PE), have a significant impact on overall quality of life (Jia et al., 2022; Spei et al., 2019), including a reduction in FCR. This review aims to provide an updated overview of interventions with Breast Cancer Survivors (BCS) on FCR and CP, exploring the relationship with combined interventions with psychoeducation and PE. The main intention is to gather knowledge on existing combined interventions aimed at reducing FCR and CP and to ascertain the effectiveness of these interventions, particularly those that include psychoeducation and PE. Eligibility criteria were established according to the Population, Intervention/Exposure, Comparisons, Outcome and Study type (PICOS) framework. Accordingly, studies will be included according to the following criteria: (1) Population—Adults (18 years or older) with breast cancer diagnosis (survivors); (2) Interventions/Exposure—BCS exposed to combined interventions which evaluate FCR or CP; (3) Comparisons—Comparing combined interventions with psychoeducation and PE and isolated interventions (with psychoeducation or PE); (4) Outcomes—Efficiency of interventions for FCR and CP on BCS; and (5) Study type/design—Quantitative studies. To conduct this study, a search question was formulated:

“What is the comparative effectiveness of psychoeducational interventions combined with physical exercise compared to isolated interventions (psychoeducational only or physical exercise only) in reducing fear of cancer progression and/or fear of recurrence in breast cancer survivors?”.

Regarding our findings, evidence shows that psychoeducation and physical activity, separately, have positive effects on reducing FCR or CP. However, to our knowledge, there is no specific evidence of these combined interventions and FCR or CP. Regardless of the positive impact that these interventions have on the overall quality of life (see Leclerc et al., 2018), clinical implications, and lack of evidence on FCR and CP, we encourage future investigations to explore these combined interventions.

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Economic impact of sporting events in Rio Maior and spectator groups

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Sporting events can shape human development. This type of event is increasingly recognised as an appropriate tool for achieving a wide range of economic, social, cultural, political, environmental and sporting objectives (Kim et al., 2017; Zourgani & Ait-Bihi, 2023), including the promotion of physical activity, exercise and active lifestyles throughout life. Objectives associated with the economy and tourism are often emphasised, namely, creating active lifestyles in host communities. Above all, to justify the investment of public resources in sporting events, the cities which organise the events carry out studies and assessments of their economic and social impact. This study aimed to determine the direct economic impact generated by spectators during the 17 football matches of the professional competition ‘Liga Portugal 1 - Betclic’, in the 2023-2024 sports season in the city of Rio Maior and determine whether there are differences in spectator spending behaviour due to the distance travelled to the venue of the sporting event. The local sports club was Casa Pia Atlético Clube. The individuals surveyed were selected from spectators at football matches at the Municipal Stadium of Rio Maior. A total of 1097 valid responses were registered. The majority of spectators did not live in Rio Maior (53.3%). 72.7% were men, and 73.2% were not members of any of the clubs playing.

The measuring instrument was a questionnaire adapted from the 'EventIMPACTS' project (UKSport, 2013), applied by interviews carried out by 12 trained volunteer surveyors. The analytical model was used to estimate the direct impact of spectator spending. The ANOVA test observed the existence of differences between groups. The total spending estimated with 95% confidence showed that the direct economic impact of spectators was 667.435,58€. There were statistically significant differences in the total spending of the group of spectators from locations between 0-100 km (25.39€), ($F = 20.13, p < .001$), 100-200 km (37.33€), ($F = 15.45, p < .001$), and more than 200 km (34.48€), ($F = 3.42, p < .05$), for the local city of the sporting event. It was concluded that the total direct spending by spectators was very relevant to the local economy, with a direct economic impact of 667 435,58€. The group of spectators spending the most was the group from locations between 100-200 km away. To increase the level of economic and social impact, including the active lifestyle in the community, it is recommended that the communication dimension is strengthened by drawing up and implementing a communication plan with actions aimed at all groups of spectators, especially the target group of spectators from 0-100 km away who have been shown to spend less.

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Implementation and Educational Significance of “Non-Directive Coaching”: An Examination of Its Application and Learning Effects in University Coaching Courses

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Recent research in sports coaching highlights the importance of fostering athlete autonomy and enhancing intrinsic motivation to improve performance. To achieve this, coaches are expected to utilise four key approaches: instruction, suggestion, questioning, and delegation, depending on the context. University coaching courses introduce these concepts through micro-coaching practice and reflective learning. However, prior coaching experiences significantly influence students, leading them to adopt directive coaching styles unconsciously. This tendency is particularly evident in Japan, where directive coaching remains predominant. Even within university courses, students tend to default to directive coaching, a challenge also noted in coaching certification programs by the Japan Sports Association. As an alternative, non-directive coaching emphasises questioning rather than direct instruction, guiding athletes through open-ended questions (OQ) to encourage independent problem identification and solution exploration. This study examines the effects of introducing non-directive coaching in a university coaching course, particularly among students with limited coaching experience.

Methods

Eight students (six males and two females, aged 21–22) from the sports science program at Ryutsu Keizai University participated in this study. They were enrolled in an advanced coaching course, “Coaching Theory and Practice,” and had little to no coaching experience, although they had prior athletic experience.

Two micro-coaching conditions were compared:

- **Condition 1: Conventional Coaching** – Coaches selected a topic freely and applied the four approaches (instruction, suggestion, questioning, delegation).
- **Condition 2: Coaching in an Unfamiliar Context** – Coaches were assigned to instruct an unfamiliar skill (kendama, three-ball juggling, or double Dutch).

Sessions were recorded, transcribed, and categorised based on coaching approach. Questions were further classified into open-ended (OQ) and closed-ended (CQ) questions.

Results

The analysis revealed notable differences between conditions:

Average number of coaching statements:

- Condition 1: 26.8
- Condition 2: 20.2 (decrease)

Proportion of coaching approaches:

- Condition 1: Instruction (60.2%), Questioning (20.0%), Delegation (10.8%), Suggestion (8.9%)
- Condition 2: Instruction (49.5%), Questioning (26.1%)

Increase in OQ usage:

- Condition 1: 37.8% → Condition 2: 78.1%

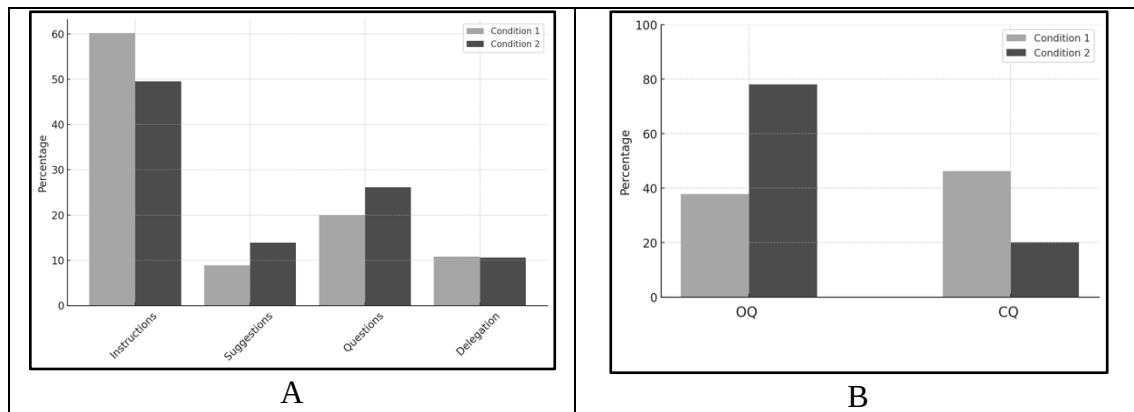


Figure 1: A) Comparison of Coaching approaches; B) Comparison of OQ and CQ

The results indicate a shift toward questioning, particularly OQ, in the non-directive coaching condition.

Discussion

The findings suggest that non-directive coaching influences coaching style, particularly when addressing unfamiliar topics. Students reduced instruction and increased questioning, fostering athlete autonomy. The significant increase in OQ usage highlights its role in encouraging self-directed learning.

Conclusion

Non-directive coaching may promote adaptive coaching strategies by increasing the use of questioning, particularly OQ. Implementing this approach in university curricula and coaching certification programs could develop more athlete-centred coaching methodologies. Further research is needed to explore its application across different age groups and competition levels.

The effects of tapering on soccer players' performance: A systematic review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Tapering has been shown to optimise physiological adaptations, enhance recovery, and improve competitive readiness (Mujika, 2009). Although this strategy has been predominantly applied in individual sports (e.g., swimming) (Bosquet et al., 2007), its use and effectiveness in team sports, such as soccer, remain underexplored and poorly understood compared to individual sports. Therefore, organising the existing evidence is crucial to establish evidence-based guidelines for team sports practitioners to implement this strategy effectively. This study aimed to perform a systematic review to examine the effects of training tapering on performance in soccer players. Four databases were searched (PubMed, Scopus, Web of Science, and SportDiscus), with keywords (tapering, taper, performance, strength, speed, soccer, football, team-sports). Seven studies were included in the final review. The selected studies included 549 male soccer players, rated as low to medium quality on the PEDro scale, and identified 'step',

'exponential', and 'linear tapering' strategies. Distance covered using GPS to assess and quantify physical involvement in matches and training sessions was the most analysed variable. Four studies demonstrated significant improvements in this variable among players during both matches and training sessions. There was only limited evidence of moderate taper-induced improvements in $\text{VO}_{2\text{max}}$ and repeated sprint ability (RSA). Moreover, the exponential strategy was shown to be the most effective taper strategy on performance variables such as $\text{VO}_{2\text{max}}$ and total distance covered. All types of tapering improved the observed performance variables in the different training phases identified (preparatory, competitive, and transition), and it seems that during the competitive phase, tapering has a greater effect on the distance covered among the players compared to other phases. All types of tapering demonstrated significant improvements in psychophysiological status and decreased player stress levels, stress tolerance (ST) and fatigue index (FI). Tapering systems appear effective at improving soccer players' performance levels. Positive physiological, psychological, and performance adaptations accrue after a tapering period between 1 to 4 weeks in different types of tapering. Further studies should compare diverse tapering strategies to examine their differential effects on performance measures and indicators related to the technical, tactical, physiological, and psychological aspects of soccer players' performance.

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Challenges in the Introduction of the Ecological Approach in School Physical Education and Sports Coaching in Japan: Insights from Information Exchange among Stakeholders Involved in Sports Coaching and Physical Education Teacher Education.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

In recent years, the ecological approach has gained attention in the field of sports coaching in Japan. In Japanese school physical education, modified games have long been used in lessons on goal-based sports, and in fitness classes, physical activities and games that students enjoy are incorporated, rather than repetitive, monotonous training. The purpose of this research is to examine the questions and challenges faced by Japanese coaches, teachers, and researchers attempting to incorporate the ecological approach into their practices.

Methods

This study analysed statements from the following discussion sessions where coaches, researchers in the fields of sports coaching and PETE discussed the use of the ecological approach.

1) A face-to-face discussion involving four researchers specialising in sports coaching, conditioning, and PETE focused on the challenges of the exercises and games used in PETE classes from an ecological approach perspective.

2) A symposium published in the journal *Physical Education* (Ueda et al., 2024) featuring a discussion among Fumiya Ueda, a soccer coach and author of "Ecological Approach: A New Theory and Practice of Motor Learning that Drastically Changes the Values of 'Teaching' and 'Learning,'" and four researchers specialising in PETE.

3) An online discussion among three coaches (soccer, basketball, and volleyball) incorporating the ecological approach into their practice. (<https://www.youtube.com/watch?v=8hBsQkavcX8>).

Findings and Implications

Direct Instruction

Both in physical education and coaching, the importance of "not over-teaching by respecting the autonomy and creativity of players or learners" and prompting players or students to think and reflect through questioning was recognised and accepted.

Learning Content

In physical education, there is a strong desire to ensure all students acquire the learning content outlined in the Japanese National Curriculum.

Constraints-led approach

It is common and accepted to use rules to lead and repeat the desired movements. Physical education teachers often design exercises in a simplified and more manageable form to help students succeed in movements they may not be able to execute in real games.

Use of Small-Sided Games

Small-sided games have been used and are actively employed by those adopting the ecological approach. However, some PETE researchers and coaches also raised concerns about how creativity in the game cannot emerge if players have not learned the specific movements of the sport and the difficulty of designing games that allow players to explore. **Verbal Instruction**

Some coaches and PETE researchers questioned whether learning outcomes could be achieved through constraints alone, without verbal instruction.

Motor Learning and Educational Values

PETE researchers pointed out that students acquire not only skills but also knowledge and share it with others as well. Ecological experts considered the idea of teaching skills and performance structures through language and demonstration before training sessions as a decision more aligned with educational values than motor learning principles.

Although there are differences in objectives and values, it is believed that continued exchange of ideas and empirical research among practitioners and researchers involved in coaching and physical education will lead to improvements in student and athlete performance, as well as autonomy, creativity, and personal development.

Effects of Adventure Based Education for Japanese University Students on Emotional Intelligence

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The power of adventure has been recognised and applied to education since the 1970s. This study examined the effects of an adventure-based education class on Japanese university students' emotional intelligence. Participants (N=61: 54 males and 7 females) who were in the “Adventure Program” class, which is a required course for first-year students in Sport Communication course in the Faculty of Health & Sport Sciences at Ryutsu Keizai University in Japan, completed the Emotional Intelligence Scale (EQS; Uchiyama et al., 2001) before and after the fall semester. Analyses of the Paired T-test showed scores in all 3 areas (intrapersonal, interpersonal, situational) of emotional intelligence have increased. All subfactors except flexibility also increased significantly. The results suggest that adventure-based education is valuable for increasing emotional intelligence in university students.

Table 1. Result of Paired Sample T-Test for 3 areas of the construct concept of EQ

Mean Difference	Standard Deviation	Standard Error of Mean Difference	95% Confidence Interval of the Difference	t-Value	Degrees of Freedom	One-Tailed p-Value	Two-Tailed p-Value

Intrapersonal	-10.18	11.32	1.50	-13.18, -7.17	-6.79	56	<.001	<.001
Interpersonal	-10.46	13.19	1.76	-14.00, -6.93	-5.94	55	<.001	<.001
Situational	-8.82	12.81	1.70	-12.22, -5.43	-5.20	56	<.001	<.001

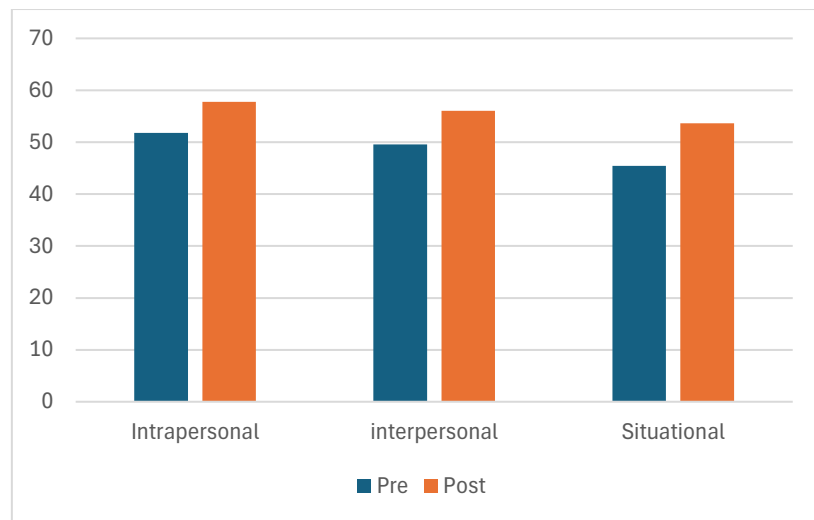


Figure 1. Results of pre-post analysis

Table 2. Result of Paired Sample Test for 9 corresponding factors under the 3 areas of EQ

		Mean Difference	Standard Deviation	Standard Error of Mean Difference	95% Confidence Interval of the Difference	t-Value	Degrees of Freedom	One-Tailed p-Value	Two-Tailed p-Value
Intrapersonal	a. self-awareness	-3.19	2.97	0.39	-3.98, -2.41	-8.13	56	< 0.001	< 0.001
	b. self-motivation	-2.54	4.45	0.59	-3.72, -1.36	-4.32	56	< 0.001	< 0.001
	c. self-control	-4.44	4.89	0.65	-5.74, -3.14	-6.86	56	< 0.001	< 0.001
Interpersonal	d. empathy	-2.91	4.43	0.59	-4.09, -1.74	-4.97	56	< 0.001	< 0.001
	e. altruism	-2.39	3.92	0.52	-3.43, -1.35	-4.6	56	< 0.001	< 0.001
	f. interpersonal-relationship	-5.14	6.03	0.81	-6.76, -3.53	-6.38	55	< 0.001	< 0.001
Situational	g. situational-awareness	-4.56	6.28	0.83	-6.23, -2.90	-5.48	56	< 0.001	< 0.001
	h. leadership	-2.79	4.26	0.56	-3.92, -1.66	-4.95	56	< 0.001	< 0.001
	I. flexibility	-1.47	4.42	0.59	-2.65, -0.30	-2.52	56	0.007	0.015

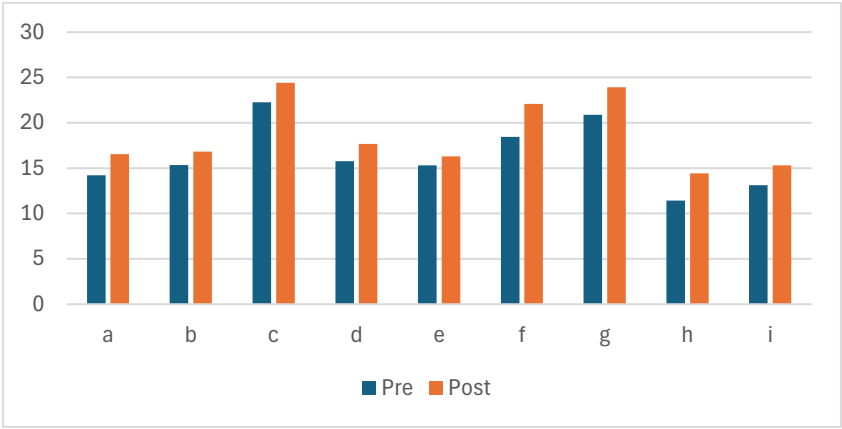


Figure 2. Results of pre-post analysis

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The Impact of a Sensorimotor Training Program on Physical Fitness in Older Women with Diabetes

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Physical exercise is widely recommended for individuals with diabetes mellitus (DM) due to its benefits in managing the condition and improving overall health (Riddell et al., 2017). However, the specific effects of sensorimotor training on physical fitness in older women with diabetes remain largely unknown (Varjan et al., 2024). This study addresses this gap by investigating how a 6-month sensorimotor training program impacts physical fitness in this population.

Methodology

The study involved ten participants divided into the Control Group (CG; 80.00±3.54 years) and the Intervention Group (IG; 74.60±3.78 years). The research spanned 24 weeks, during which all participants underwent evaluations before and after the intervention. Physical fitness

assessments were conducted using the Rikli and Jones (1999) protocol to evaluate strength and flexibility. Agility and speed were measured using timed-up-and-go tests.

Results

Table 1 presents the results of the comparative analysis of variation after the exercise program. To observe the distinct evolution of individuals who underwent intervention and those who did not, we performed a statistical analysis of the variation. We confirmed that there were significant differences in the results of the TUG ($p=0.020$), SA ($p=0.049$), and AE ($p=0.023$) tests, as shown in Table 1.

Table 1. Comparative analysis of variation after the exercise program (CG $n=5$; IG $n=5$).

Variables	CG		IG	
	24-weeks	<i>p</i> value	24-weeks	<i>p</i> value
TUG (s)	1.46	0.221	0.97	0.020
SL (rep)	-2.20	0.051	-1.00	0.298
FA (rep)	-1.40	0.052	0.40	0.646
SA (cm)	5.20	0.079	4.20	0.049
AD (cm)	3.10	0.212	7.4	0.080
AE (cm)	-6.60	0.343	6.00	0.023

Notes: CG: Control Group; IG: Intervention Group; AV1: first assessment; AV2: second assessment; TUG: timed up-and-go test; SL: sit-and-stand test; FA: forearm flexion test; SA: sit-and-reach test; AD: reach behind the back test–right; AE: reach behind the back test–left; *p* value: $p<0.05$ shows significant differences.

Discussion and Conclusion

The findings suggest that the sensorimotor training program was effective in enhancing physical fitness in older women with diabetes. Participants in the IG showed significant improvements in agility, speed and flexibility, demonstrating the potential of sensorimotor training to improve key physical skills in this population. These results underline the importance of incorporating structured sensorimotor exercises in diabetes management programs for older adults.

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Municipal public policies for sports and leisure in rondônia: a study in the Amazon, Brazil

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This study is an excerpt from the research report on the Institutionalisation and Public Policies of Sport and Leisure in Rondônia. The present research was conducted in the postdoctoral program at the University of Beira Interior-Portugal (2022-2023). It aimed to identify, within the scope of the municipal public power, the actions of sport and leisure based on their annual sports calendars.

The State of Rondônia is made up of 52 municipalities, of which, concerning sports institutions and entities and the relationship with the local power, the research identified that the structure of the sports system is constituted by Legislative Commissions of Sports and Leisure of the Municipal Councils, Municipal Councils of Sports, Management Structure - secretariats, autarchies, foundations, departments and coordination of sports and leisure with varied names and structures that cover sport, leisure, tourism and culture, acting in the execution of policies and programs, indicating in their calendars most of the activities related to participation sports,

leisure, culture and grassroots sports. The research has a descriptive-exploratory character, cross-sectional design, and quantitative-qualitative approach, and it can be identified as a multiple case study, given its characteristics. Data collection was carried out documentally and in field research in two stages. The first, in 2019, related to the calendars between 2016 and 2019 and the second in 2023, calendars between 2021 and 2023, individual and sometimes simultaneous contacts online, on the institutions' websites, as well as by email and WhatsApp. Sixteen municipalities were surveyed in the first stage and 22 in the second, of which 13 participated in the two stages, thus enabling reflection on the management and administration systems of Public Policies for Sport, Leisure and Physical Activity of different municipalities in Rondônia, as well as on their specificities and the challenges that comprise sports practices. Regarding the results, the data were grouped by geographic region, identifying the quantity and categories of activities/actions carried out by the municipality in accordance with the calendars, revealing a significant number of very diversified activities, such as: Realisation and participation in official competitions of state events and federations; Conducting/promoting sporting events in various modalities as a participation sport; Sports activities specific to the municipalities, in the various modalities, with the character of sport and leisure, for example, beach festivals, speedboat races, bocce and mesh festivals, among others; Sporting/cultural events commemorating significant dates for the municipality. It is still quite expressive for some municipalities the support for the realisation of sports and/or cultural activities by other institutions. Thus, based on the data obtained in the two stages of the research, it is possible to establish some considerations that at the municipal level, there is a structure similar to that at the state level with regard to commissions, councils and management, safeguarding their autonomy.

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Pedagogical Laboratories: methodological strategy in the Initial Training of Physical Education and Pedagogy Teachers at the Federal University of Rondônia – Brazil

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Pedagogical Laboratories are a methodological approach under development in the context of Initial Teacher Training, specifically in the Physical Education and Pedagogy courses of the Federal University of Rondônia, Porto Velho campus. The main objective of this initiative is to present both theoretical and practical perspectives on Pedagogical Laboratories, highlighting their contributions to initial training and teacher professionalisation. This approach is based on the use of games and play, which enable the exploration of the vast field of playing possibilities, as well as pre-sports activities, thus promoting a dynamic, reflective and interactive learning environment. These laboratories arise, are justified, and are carried out within the scope of the disciplines of Physical Education in Basic Education I and II, in the Physical Education course and Fundamentals and Practices of Recreation and Games, in the Pedagogy course. Such laboratories are developed, in a practical way, in two perspectives: The first, with the use of contents and activities that are part of the programs of the disciplines: Physical Education in Basic Education I and Fundamentals and Practice of Recreation and Games, in the perspective

of exploring games and games for early grades, having as a methodological strategy the use of the following activities: Manufacture of alternative materials; Playing with balloons and balls; Free play and with materials and circuits; Traditional games; Playing with the alphabet; Sung games, stories and memory games and their variations. In theoretical terms, in addition to the National Common Curricular Base, as a guideline, it is also based on the foundation of the child's growth and development processes, considering their characteristics and needs, based on the theories of play, recreation, play, toy and play, with reference to some authors: Benjamin, Kishimoto, Krebs, Tani, Neira, Borges and others. In the second perspective, as in the first, the focus is on the program of the discipline Physical Education in Basic Education II – directed to Elementary School – final grades and High School, with a view to exploring the field of possibilities of combining motor skills, cooperative games and pre-sports games, related to various individual and collective sports and their developments, in which each group of students elaborates a plan going through its characteristics, determining motor elements, space, material and the field of possibilities of activities based on the established modalities, presented in the form of a seminar. Subsequently, the pedagogical laboratories are developed in practice among the students, exploring the pedagogical possibilities to be used in practical classes with students, according to individual and collective modalities. As for the results, after each laboratory and practical classes, field records are prepared, allowing the students to reflect on what they have done, what they have observed in the practices of their colleagues and the participation of the school's students, as well as to observe what changes in the way of thinking and acting of the student-teacher in the process of training and professionalisation. It is concluded that, after this practice, the students are safer in planning and acting in the realisation of internships and their professional performance in schools and outside them.

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Health Education in the Rondônia curriculum framework

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This research is inserted in the context of Basic Education. Concerning national organisation, Brazilian school education is structured at different levels of education, including basic education, which comprises early childhood education, elementary education, high school, and higher education. In addition, there is the Secondary Level Technical Professional Education, which aims to provide general training to the student, preparing him for the exercise of specific technical professions. The document that guides Basic Education in Brazil is the National Common Curriculum Base (BNCC), "a normative document that defines the organic and progressive set of essential learning that must be developed in Basic Education" (Brasil, 2018, p. 7). It consists of a "national reference for the formulation of the curricula of the school systems and networks of the States, the Federal District and the Municipalities and the pedagogical proposals of the school institutions" (Brasil, 2018, p.8). To meet the recommendations, the Government of the State of Rondônia published in 2020 the Curriculum Reference of the State of Rondônia for Early Childhood Education and Elementary Education, aligning the State's school curriculum with the BNCC. In this context, the research aimed to

analyse how the health theme permeates Physical Education in the Rondônia Curricular Reference (RCRO) – Elementary Education. As a methodological approach, it was decided to carry out qualitative research with a descriptive approach, using the Curricular Reference document as a method of data collection and in the light of the content analysis technique, which is widely used in qualitative research (Bardin, 2011). Three thematic units are evidenced that, in different ways, make it possible to approach health-related content: "Manifestations of Body Practices for Collective Health", 'Cultural Manifestations of Body Practices in Society" and "Manifestations of Body Practices for Personal Life" - these include, in their learning objectives, the mobilisation of knowledge related to health. The existence of gaps is observed, such as the lack of description of ways for the actions to be implemented in the pedagogical practice, the presentation of the elements that characterise a healthy lifestyle, and the explanation of how leisure and health are related. A matrix that outlines the purposes and objectives in a systematic way acts as a fundamental guideline in teaching practice, functioning as a compass that guides the direction of pedagogical actions and the management of the educational process. This orientation should not be interpreted as a restriction but as an opportunity to explore new possibilities and promote moments of reflection for educational purposes. However, it is considered essential that this direction be accompanied by serious planning, considering the continuing education of education professionals and investment in material resources and infrastructures of school institutions. Thus, not only is the absence of an adequate emphasis on health something worrisome, considering that this theme tends to be optional, depending on the perspectives of the elaborators of pedagogical projects, but, mainly, the lack of foresight regarding conditions for the minimum of the curriculum to be developed.

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Lifestyle profile of a university community in the Amazonian context

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Quality of life can be defined as the perception of well-being resulting from a set of individual parameters such as heredity and lifestyle and socio-environmental parameters, such as housing, transportation, education, health, basic sanitation and safety, for example, which characterise the conditions in which people live. Thus, lifestyle is a parameter that can positively or negatively influence quality of life. (Nahas, 2017). From this perspective, the research aimed to verify the lifestyle profile of students, technicians and professors at the Federal University of Rondônia. The methodology comprises a quantitative, descriptive approach and the methodological procedures involved in the computerisation of the Lifestyle Profile questionnaire, which evaluates a set of habitual actions that reflect attitudes, values, and opportunities in people's lives. These actions have a great influence on general health and quality of life. Thus, the "Lifestyle profile" questionnaire contains five topics: Physical activity, diet, stress control, relationships, and preventive behaviour.

The questionnaire was answered by a sample composed of 1,360 academics (901 women and 459 men), 68 professors (40 women and 28 men) and 75 technicians (40 women and 35 men) between 19 and 59 years of age (27.4 ± 7.96), 137 females and 86 males. The result of the evaluation of each component occurred according to the score achieved: up to 6 points in a component the respondent fits into the category "ALERT!" which means that he does not have good habits in that area and that it is recommended that a change in behaviour be made in relation to this. If he reaches a score greater than 6 but less than 13, he fits into the category "CAN IMPROVE!" which means that his habits are not too bad, but they also need attention because they are not so favourable to health. If his score is between 13 and 18 points, he fits into the "GO AHEAD!" CATEGORY means that he has a profile that provides him with a good quality of life and is encouraged to stay that way. The results showed the following averages of the variables: Physical Activity: 6.65; Food: 9.43; Stress Control: 8.67; Relationships: 12.31; Preventive Behavior: 12.80. The standard deviation (n-1) varies between approximately 3.30 and 3.81, indicating that there is a variation in the lifestyle profile among the participants in the different components analysed. These results show indices of alertness in physical activity and the need to improve eating habits and stress control. It is concluded that, although the participants present satisfactory averages in areas such as Relationships and Preventive Behavior, there are worrying indices in the categories of Physical Activity, Nutrition and Stress Control, suggesting the urgent need for behavioural changes to improve habits, also emphasising the need for interventions that promote body practices, teach strategies to deal with stress and favour a healthier diet for the community Academic. Institutionally, programs and initiatives aimed at promoting health at the university are necessary to contribute to a healthier academic environment conducive to personal and professional development.

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Fear of Disease Progression in Cancer Survivors in the Beira Interior Region

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

Cancer survivors are more vulnerable to experiencing Fear of Disease Progression (FOP), depressive symptoms, and generalised anxiety than the general population due to the stressors associated with their diagnosis. These factors significantly impact the Quality of Life (QoL) of this population, often posing considerable challenges. The aim of this study was to evaluate the FOP, psychopathological symptomatology and their impact on QoL in cancer survivors from the Beira Interior region.

Materials and Methods

This study included 55 cancer survivors, 69.1% female and 30.9% male, with a mean age of 62.27. The evaluation protocol incorporated: 1) a Sociodemographic, Clinical, and Physical Exercise Questionnaire; 2) PHQ-9 (The Patient Health Questionnaire); 3) GAD-7 (Generalised Anxiety Disorder Scale); 4) FoP- Q-SF (Fear of Progression Questionnaire-Short Form) and 5) QLQ C-30 (Quality of Life Questionnaire Core-30).

Results

The sample revealed normative levels of FOP ($M = 32.18$; $DP = 11.12$), with differences across sex ($M_{female} = 35.45$; $M_{male} = 24.88$, $p = .00$) and education levels ($M_{low\ educational\ level} = 24.50$; $M_{medium/high\ educational\ level} = 37.00$, $p = .00$). Furthermore, a relationship was found between FOP, depressive symptoms ($r_s = .43$, $p < .00$), and anxiety ($r_s = .66$, $p < .00$), as well as negative associations between these variables and QoL (FOP- Quality of Life: $r_s = -.35$, $p < .01$; Anxiety- Quality of Life: $r_s = -.41$, $p < .00$; Depressive Symptoms - Quality of Life: $r_s = -.50$, $p < .00$).

Conclusion

This study highlighted that FOP was within normative levels in the Beira Interior population and was linked to symptoms of anxiety and depression. Additionally, these variables were associated with QoL. These findings underscore the importance of addressing FOP through tailored psychological interventions, further research on its impact, and health policies integrating mental health support into oncology care.

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Factors that Determine Athletes and Fans' Sustainable Behaviour and Future Intentions during a Sports Event

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The relationship between sport and the environment is bidirectional (McCullough *et al.*, 2020). The environment provides natural spaces for physical activity and sports, which are affected by climate change and natural disasters (Bernard *et al.*, 2021). This bidirectional relationship urges sport practitioners to take responsibility for reducing the environmental impacts of their operations and events. At the same time, it harnesses the power of sport to increase environmental awareness and promote an active and healthy lifestyle in harmony with the environment (Inoue & Kent, 2012). For this reason, sports organisations implement initiatives to develop sustainable sports events (Hugaerts *et al.*, 2021; Wendtlandt & Wicker, 2021).

Purpose

This study aims to evaluate the factors that lead to sustainable behaviour of participants and spectators during the Central American Championship of Skating and Skateboarding Races and how these aspects influence behavioural intentions.

Method

In total, 141 participants (58.5% spectators, 41.5% participants, mean age of 30.33 ± 12.9 years) participated in the self-administered questionnaire, which consisted of 40 adapted items from various validated instruments. Data were analysed through a multiple linear regression technique to establish the relationship between the study variables. Two predictive models were evaluated.

Findings

We found that previous sustainable behaviours, internal and external constraints, and perception of sustainable initiatives are key factors that predicted sustainable behaviours during the event. Additionally, sustainable behaviour during the event was found to be a predictor of future sustainable intentions. However, satisfaction with sustainable initiatives did not emerge as a significant predictor.

Conclusion

This study confirms the importance of designing and implementing strategies for engaging spectators and participants in sustainable behaviours to reduce the impact of sports events on the environment.

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Program of Recreational Activities for Guidance on Decision-Making Skills in Adolescents

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The ability to make decisions is considered one of the life skills, forming part of a set of psychosocial competencies and skills aimed at the proper execution of personal and interpersonal actions and the transformation of the environment to promote health (Martínez, 2014). These skills are conditioned by individual motivation and the context in which the person operates. Additionally, it involves an interaction between the motivating factors of knowledge, attitudes, and values with behaviour (Díaz et al., 2013).

Regarding the decision-making process, Álvarez et al (2020) revisit what Janis and Mann stated years ago, referring to the opposing and simultaneous tendencies in a person to accept and reject a particular course of action at the same time. The authors also indicate that to resolve this decision conflict, a person can adopt one of these four decision-making patterns: vigilance, hypervigilance, procrastination, and transfer.

Method

Sixty-six participants were divided into an experimental group (exposed to the program) and a control group (no intervention). Both groups underwent pre- and post-program assessments. A quasi-experimental design was employed with decision-making as the dependent variable, measured using the Melbourne Decision Making Questionnaire. A two-way repeated measures ANOVA was conducted.

Findings

While no significant changes were observed in vigilance, hypervigilance, or procrastination, differences in transfer pattern were found. The experimental group initially showed a higher tendency to transfer decisions than the control group ($p < 0.05$). Following the program, the experimental group significantly reduced their tendency to transfer decisions ($p < 0.05$), while it increased in the control group. Moreover, significant changes from pre-test to post-test were observed in both groups ($p < 0.01$). The results underscore the positive influence of recreational orienteering programs on adolescents' decision-making, particularly in reducing the tendency to transfer decisions. However, caution is advised when interpreting group interactions due to initial differences in this tendency.

Conclusion

The study provides evidence of the potential benefits of recreational orienteering programs in enhancing decision-making among adolescents. Furthermore, it delves theoretically into the relationship between recreational activities, orienteering, decision-making, and adolescence, highlighting the importance of considering recreation as an integral part of adolescent development.

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The impact of a single resistance training set on muscle damage biomarkers in older adults with cognitive impairment

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant numbers BII-5 CIDESD-UBI UIDB/04045/2020, PRT/BD/154638/2023, PRT/BD/154534/2022, and BIPD/UTAD/7/2023, as well as project number UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>) and the Portuguese Institute of Sport and Youth, I.P. (IPDJ) [TRAIN4BRAIN project; reference number: CP/0542/DDT/2023].

Cognitive impairment (CI) is a progressive neurological condition commonly associated with ageing, leading to a decline in cognitive executive functions. This decline can impact an individual's independence, making it difficult to perform daily tasks and diminishing overall quality of life. Resistance training (RT) is an exercise modality that has been shown to enhance cognitive function in individuals with CI. However, the effects of RT on muscle injury markers in older adults with different stages of CI are poorly understood within the scientific community. This study investigated the impact of 8 weeks of single sets of RT on muscle injury

markers in older adults with mild-to-moderate or severe CI. Twenty-eight participants (86 ± 10 years) were randomly allocated to a control ($n = 13$) or single-set ($n = 15$) group. The single-set group underwent an 8 week-supervised RT with two sessions per week, interspersed by 72 hours of rest. Participants performed the leg and chest press, chair squat, and 1-kg medicine ball throw with 1 set of 6-12 repetitions at relative intensities between 40-70% of one-repetition maximum (1RM). Muscle injury markers, including creatine kinase (CK), lactate dehydrogenase (LDH), aspartate aminotransferase (AST), and alanine aminotransferase (ALT), were measured before and after the intervention. A mixed-design ANOVA and non-parametric tests were conducted for data analysis. Creatine kinase (CK) did not present significant changes throughout the analysed period. In contrast, lactic dehydrogenase (LDH) showed a significant increase at time S1, with $p = 0.015$. Aspartate aminotransferase (AST) also showed a significant increase at S1, with $p = 0.005$. The interaction between time and group declared a trend towards significance, with $p = 0.067$, suggesting that this variation may become more evident with a greater number of samples or methodological adjustments. Factor 1, related to time, was significant ($p = 0.035$), confirming the relevant influence of time on the incidences. In addition, alanine aminotransferase (AST) showed a significant increase at S1 ($p = 0.026$), with the time factor also proving to be significant ($p = 0.024$).

The results suggest that the muscular response to resistance training was expected, with changes in biomarkers indicative of effort, but without causing serious muscle damage.

Acknowledgments

We sincerely thank all the residential care facilities (Santa Casa da Misericórdia da Covilhã; Lar de São José, Covilhã; Associação Centro Social Sagrado Coração Maria, Ferro; Centro Social de Nossa Senhora da Conceição, Vila do Carvalho; Centro Social Vales do Rio; Centro de Convívio e Apoio à 3ª Idade, Tortosendo) and participants who agreed to be part of this study.

The Influence of Post-Exercise Feedback on Student Performance in Physical Education Classes

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The aim of this study was to investigate the influence of post-exercise feedback on student performance during a Korfball teaching unit in Physical Education (PE). The study was conducted over six weeks, corresponding to a single didactic unit, with 24 Portuguese high school students (mean age 16.96 ± 0.999 years). Participants were randomly divided into the Control Group (CG) and the Intervention Group (IG). Both groups engaged in small-sided games, but only the IG received structured final feedback after exercises, with feedback provided after all exercises in the lesson plan. This feedback focused on task performance, individual improvement strategies, and tactical execution. The study analysed performance using the Game Performance Assessment Instrument, measuring Decision-Making, Skill Execution, Support Actions, and Guarding/Marking. The results demonstrated significant advances across all variables for the IG ($p < 0.005$) compared to the CG. Notably, post-test results revealed that IG participants achieved higher game performance indices (0.773 ± 0.115) compared to the CG (0.618 ± 0.132), emphasising the efficacy of structured extrinsic feedback

in developing tactical and technical skills. Findings highlight the value of post-exercise feedback as a pedagogical tool, fostering critical reflection, motivation, and skill acquisition in PE settings. Future research should explore its application across diverse sports and educational contexts to validate and generalise these results.

Individual and Combined Effects of Instruction and Demonstration on Tactical Development in Physical Education

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This study examined the individual and combined effects of verbal instruction and practical demonstration on the tactical development of high school students in Physical Education (PE). Teaching strategies in PE have traditionally focused on technical skill acquisition, often overlooking the importance of tactical awareness and decision-making. However, research suggests that verbal instruction and practical demonstration can play a critical role in improving students' ability to interpret game dynamics and execute appropriate tactical responses. The aim of this study was to analyse the impact of verbal instruction and demonstration, individually and in combination, on students' tactical development in a PE setting. A convenience sample of 33 Portuguese high school students (mean age: 17.48 ± 0.87 years) was randomly assigned to three intervention groups: Instruction Group (IG), which

received only verbal instructions emphasising tactical concepts and decision-making cues; Demonstration Group (DG), which relied exclusively on practical demonstrations, allowing students to observe and replicate movements and tactical actions; and Instruction + Demonstration Group (IDG), which combined both approaches, providing verbal explanations alongside demonstrations to enhance comprehension and execution. Over six weeks, participants engaged in small-sided Korfball games, with structured interventions tailored to each group. Tactical performance was assessed using the Game Performance Assessment Instrument (GPAI), evaluating Decision-Making (DMI), Skill Execution (SEI), Support Actions (SI), and Guarding/Marking (GMI). Results indicated significant improvements across all groups, demonstrating the effectiveness of targeted instructional strategies in developing tactical awareness. The IG achieved the highest performance in most indicators (DMI: 0.85 ± 0.10 ; SEI: 0.86 ± 0.12 ; SI: 0.86 ± 0.11 ; GMI: 0.87 ± 0.13), highlighting the importance of structured verbal guidance in tactical learning. The DG exhibited substantial gains in SEI (0.61 ± 0.14), reinforcing the role of modeling in motor skill execution. The IDG demonstrated the highest engagement levels (GI: 71.10 ± 1.65), suggesting that the combination of verbal instruction and demonstration enhances motivation and active participation. The results suggest that while verbal instruction may be the most effective for tactical comprehension, integrating demonstration can increase engagement and motivation. Future research should explore the long-term application of these strategies across different sports and student populations to refine educational practices in PE.

Effect of rule modification in competition on the accelerations of U-10 football players.

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the University of Murcia, grant number FPU 100167/2021.

The aim of this study was to evaluate the effect of rule modification on accelerations in U-10 football players. A quasi-experimental A-B study was developed, where A was a tournament under RFEF regulations and B was a modified tournament. In tournament B, the duration of the match and substitutions were modified (Table 1). In addition, the goalkeeper must play at least one period as an outfield player and direct headers are prohibited. This modification was applied with the intention of ensuring compliance with the recommendations of a formative sport. Forty-five players from four U-10 football teams in Spain participated in the study. The number of accelerations and decelerations, and the distance travelled in acceleration and deceleration in different speed sections, were recorded. These variables were recorded using the Wimu device. Regarding the procedure, informed consent was first collected. Regarding the intervention, two tournaments were held on two non-consecutive days. Each tournament consisted of six matches, with each team participating in three matches. Between each match, there was a 15-minute rest period, which was used to fit the Wimu device. This device was placed on the players' backs. Regarding the statistical procedure, the Jamovi software was used. The results show how the modified tournament reduces the physical demands in terms of accelerations. Specifically, significant differences were found in the variables of distance decelerating in all speed sections and distance accelerating in speed sections between 7.15 and 15.14 m/s². These results seem to show that the modified competition reduces the physical

demands. These high physical demands have been linked to injury risk in some studies. Therefore, it is possible that the proposed modification may reduce the risk of injury.

Table 1. Tournament regulations

	Tournament RFEF	Tournament Modified
Nº of players	8 vs. 8	8 vs. 8
Duration	2 × 25 min	5 × 10 min
Scoring	Goal scored	Periods won
Substitutions	Free	Without substitutions (except for the 5th period)
Special rules		- The goalkeeper must play at least one period as an outfield player. - Direct headers were prohibited.

Table 2. Comparative acceleration variables between tournaments.

	Tournament RFEF Mean±SD	Tournament Modified Mean±SD	P-value
Nº of accelerations	4043.25±1811.7	3618.80±1615.6	.223
Nº of decelerations	3750.95±1029.9	3565.86±1133.6	.534
Decelerating distance (-5.48 y -2.12m/s ²)	647±421.2	444.6±210.8	<.001
Decelerating distance (-2.12 y -0.83 m/s ²)	520.3±520.3	1299.7±376.9	<.001
Decelerating distance (-0.826 y 0 m/s ²)	509.9±692	1335.6±418.8	<.001
Accelerating distance (0 y 2.93 m/s ²)	3324.1±2984.8	2991.1±3172.3	.141
Accelerating distance (2.93 y 6.99 m/s ²)	161±209.94	233±196	.323
Accelerating distance (7 y 15.14 m/s ²)	356.6±25.7	24.7±6.3	<.001

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Translation and validation of the Godin Leisure Time Exercise Questionnaire (GLETQ) in adult cancer survivors – Preliminary study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

Over time, there has been a growing interest in studying physical activity levels, with increased development, translation, and validation of self-report instruments aimed at the general public, specifically cancer survivors.

Objectives

The study aims to translate and validate a preliminary version of a questionnaire that measures leisure-time physical activity, namely the Godin Leisure Time Exercise Questionnaire (GLETQ), and describe its factor structure and associated reliability indices.

Method

The sample comprised 55 cancer survivors aged between 40 and 84 (M= 62.27; SD= 11.91). Data was collected using a sociodemographic and clinical questionnaire, a physical exercise

questionnaire, the GLETQ, and lastly the International Physical Activity Questionnaire - short version (IPAQ-SF).

Results

Among the participants, 27.3% were classified as “moderately active” and 32.7% as “active.”. The instrument's internal consistency analysis indicated weak and limited Cronbach's alpha and inter-item correlations, making it impossible to execute an exploratory factor analysis. Nevertheless, the convergent construct validity of the association between the GLETQ and the IPAQ-SF was confirmed.

Conclusion

The European Portuguese version of the GLETQ for the oncological population did not demonstrate the necessary evidence of psychometric validity, and future studies are recommended to validate it.

Systematic differences between jump height estimations from impulse and flight time via a force platform with jump height estimation from flight time via the Optojump™ system

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant numbers PRT/BD/154638/2023 and BIPD/UTAD/7/2023, and project number UI/04045.

We assessed countermovement jump (CMJ) height estimates derived from impulse and flight time using a force platform, compared to those from flight time assessed via the Optojump™ system. Our study involved twelve active sports science students (three women and nine men; 20 ± 3 years). Each participant executed three CMJs on a force platform (Contemplas GmbH, Kempten, Germany), while Optojump™ bars (Microgate, Bolzano, Italy) were positioned on either side of the platform to capture flight times simultaneously. The devices were linked to separate laptops with their respective software (Templo for Contemplas and OptojumpNext for Optojump™) to record mechanical variables. The OptojumpNext software estimated CMJ height based on flight time, whereas the Templo software estimated it using flight time and impulse. We calculated systematic differences between devices in flight time and CMJ height estimates derived from both methods. Our findings indicated a minor systematic difference in flight time measurements: the force platform recorded 0.50 ± 0.06 s compared to the Optojump™ that recorded 0.48 ± 0.06 s (difference = 0.02 ± 0.01 s; $p < 0.001$; $d = 0.26$). When comparing the CMJ height estimation methods, the data revealed a smaller systematic

difference when estimating using impulse from the force platform (difference = 0.93 ± 1.34 cm; $p < 0.001$; $d = 0.13$) compared to flight time (difference = 1.87 ± 0.79 cm; $p < 0.001$; $d = 0.27$). This study suggests that the Optojump™ system may underestimate flight time, possibly due to the positioning of the light-emitting diodes (0.3 cm above the ground). Furthermore, CMJ height estimates from impulse via the force platform were found to be closer to those from the Optojump™ system.

Acknowledgments

We thank all participants included in this study.

Influence of maturational stage on the kinematic performance of U-10 football players

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Conflict of interest: nothing to declare. **Funding:** This research was funded by the University of Murcia, grant number FPU 100167/2021.

The aim of this study was to evaluate the influence of the maturational stage on the kinematic performance of U-10 football players. The athletes who participated in the study were 45 players belonging to four Spanish football teams. Goalkeepers were excluded from the analysis. A tournament was designed under “Real Federación Española de Fútbol” regulations for the U-10 stage. Thus, all teams participated in three matches. The variables of total distance and at different speed thresholds, maximum acceleration speed and maximum speed were recorded. These variables were recorded with the Wimu device. This device was placed on the players' backs. The height of the fathers and mothers was measured, and the height, weight and date of birth of the players were recorded to estimate the maturational development of the players (Towlson et al., 2021). In this way, three maturational age groups were established: early (7 players), on time (21 players) and late (17 players). Initially, an information meeting was held to collect informed consent and information on height and weight. In the intervention phase, a schedule of matches was established on one day. Before the start of each match, players were fitted with the Wimu recording device. At the end of each match, the Wimu device was removed from the players and placed on the next participating teams. A 15-minute break was established between each match. During this period, the devices were switched off and were being charged.

An ANOVA analysis was performed using Jamovi software. Table 1 shows the descriptive data for the variables analysed. Significant differences were found in the players' distance between 12.3 and 23.1km/h, between the early and late groups ($F=-806$; $p=.006$). Overall, the descriptive data show that the physical demands of competition are higher in players with late maturational development. This high physical involvement can be detrimental to aspects such as enjoyment or technical-tactical learning. Therefore, following the recommendations of different research (Malina et al., 2019), it is necessary to carry out competitions based on bio-banding in the U-10 stages.

Table 1. Influence of maturational stage on kinematic variables

	Total distance (m)	Distance(m) 1- 4,5km/h	Distance(m) 4,6-8,3km/h	Distance(m) 8,3.-12,3km/h	Distance(m) 12,3-23,1km/h	Max. accelerating speed (m/s ²)	Max. speed (km/h)
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD±	Mean±SD
Early	6814±2284	2761±1246	2069±678	1436±455	542±266	11,83±4,16	22,85±4,26
On time	6735±2378	2525±1016	2009±770	1422±670	988±944	11,94±5,01	29,15±27,17
Late	9002±3918	2867±1075	2622±1081	2158±1079	1349±893	14,92±2,31	25,30±4,43

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The Role of the Memo_Move Program in Maintaining Balance Among the Elderly

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Portugal ranks as the fourth most aged country globally, with an ageing index (the ratio of individuals over 65 to those under 15) that increased from 27.5% in 1961 to 186.2% in 2023 (INE, 2024). This demographic trend has economic implications, including a decreasing active workforce and health challenges, as the elderly population experiences physical and cognitive declines, which can jeopardise their functionality and independence. One of the most critical aspects is decreased balance, which can lead to falls and permanent or prolonged loss of mobility (Sturnieks et al., 2008). Physical exercise is an important tool for counteracting the loss of balance and slowing down the decline associated with ageing (Taylor et al., 2004).

The aim of this study was to evaluate the effect of an exercise program (Memo_Move program) on the static and dynamic balance of a community-dwelling population aged over 65. Twenty-two participants in the Memo_Move program (45.5% men and 54.6% women, 77±1.53 years) were assessed pre- and post-intervention using the Modified Clinical Test of Sensory Interaction in Balance (CTSIB) protocol (Shumway-Cook & Horak, 1986) to assess static balance in four sensory conditions: stable surface and eyes open, stable surface and eyes closed,

unstable surface and eyes open, and unstable surface and eyes closed. Each condition included three 10-second tests on static balance using *Physio SenseR*. Dynamic balance was also most of the variables were maintained ($p>0.05$) using the Limits of Stability (LOS) protocol (Juras et al., 2008), which quantifies directional control and the maximum distance the user can reach with their centre of pressure in eight different directions: front, front/right, right, back/right, back, back/left, left, and front/left, also using *Physio SenseR*.

The multicomponent exercise program lasted six months, with sessions held twice a week for 45 minutes each, incorporating aerobic exercises (circuits) interspersed with strength and flexibility exercises. The static balance variables were maintained, with a significant improvement in the average speed of oscillation on a fixed surface ($p<0.001$). Regarding dynamic balance, most variables ($p>0.05$) were maintained, with a significant improvement in the average speed of movement in one of the directions assessed.

This research concludes that the Memo_Move Program contributes to maintaining the static and dynamic balance of its participants, counteracting the expected decline associated with the ageing process.

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Physical Fitness Characteristics of Institutionalised Elderly in Cova da Beira

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., under grant numbers PRT/BD/154638/2023 and BIPD/UTAD/7/2023 and project number UI/04045, and the Portuguese Institute of Sport and Youth, I.P. (IPDJ) [TRAIN4BRAIN project; reference number: CP/0542/DDT/2023].

Physical exercise is fundamental for maintaining health and quality of life in the elderly, since natural transformations occur at this stage of life, such as a decrease in muscle mass, loss of bone density and reduced mobility. The level of physical fitness is essential for maintaining the autonomy of institutionalised elderly people in Cova da Beira. The main purpose of the current study was to explore the physical fitness and health parameters of institutionalised elderly individuals in Cova da Beira. The sample consisted of 47 elderly institutionalised people, 27 female and 20 male (aged between 60 and 95), who participated in the program. A digital scale was used to measure body mass, a stadiometer was used to measure height, and the body mass index (BMI) was calculated. The handgrip test was also carried out with a hand dynamometer to assess muscle strength. Moreover, the following tests were carried out: the stand and sit test and the arm flexion test (maximum repetitions for 30s), the sit and reach test, the reach behind the back test, the stand, walk and sit test, and the 6-minute walk test. Table 1 displays the anthropometric measurements of the participants and the results of the variables in the Senior Physical Fitness Test.

Table 1. Anthropometric and fitness variables (mean, standard deviation, maximum, minimum and confidence interval).

Variables	Mean $\pm$ SD	Minimum	Maximum	95% Confidence interval [Lower;Upper]
Body mass (kg)	66.3 $\pm$ 11.7	44.3	96.8	[62.9;69.6]
Height (cm)	153.7 $\pm$ 10.5	135.0	175.0	[150.7;156.7]
Body mass index(kg/m ²)	28.0 $\pm$ 4.0	19.8	37.2	[26.9;29.2]
Appendicular Muscle Mass (kg)	26.2 $\pm$ 4.4	17.6	38.1	[24.7;27.3]
Handgrip Strength (kg)	24.1 $\pm$ 8.4	14.0	52.3	[21.7;26.5]
Chair Stand Test (n)	12.9 $\pm$ 3.4	5.0	21.0	[11.9;13.9]
Arm Curl Test (n)	15.5 $\pm$ 5.9	7.0	47.0	[13.8;17.2]
Sit and Reach Test (cm)	-9.8 $\pm$ 11.5	-42.0	4.0	[-13.1;-6.5]
Back Scratch Test (cm)	-19.8 $\pm$ 11.0	-44.0	15.0	[-22.9;-16.6]
Get up, walk and sit down (s)	9.3 $\pm$ 4.2	4.4	21.8	[8.1;10.5]
Walk Test 6 minutes (m)	273.8 $\pm$ 77.1	100.0	450.0	[251.8;295.9]

The participants showed lower performance levels compared to other populations (e.g., Todde et al., 2016). It is important to acknowledge that poor performance in the evaluated tests (e.g., chair stand test, walking speed) is associated with an increased risk of falls in the elderly (e.g., Jefferis et al., 2014). Regular physical exercise improves physiological parameters related to health, playing a therapeutic role in preventing and mitigating physical impairments. Additionally, it contributes to increased physical activity levels and enhanced quality of life. Given the observed low levels of physical fitness among the elderly, implementing structured training programs is essential to improve mobility, reduce health risks, and promote overall well-being.

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Day camp initiative for children with developmental disabilities and their parents in 2024 : An initiative with students from a sports university aimed at helping children achieve a sense of accomplishment through sports.

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Neurodevelopmental disorders are diverse, and even if a person has the same diagnosis, their developmental characteristics differ from person to person. Even if diagnosis is different, the developmental characteristics may overlap, and if same diagnosis the time when behavioral difficulties appear may differ, making this a pathology that requires detailed treatment. Receiving support in the growth process has a significant impact on a child's growth and development. Receiving support according to the developmental characteristics allows the affected child to live a smooth daily life, reduce daily worries, and maximise the child's abilities. Last year, our university implemented the first development support program in the region, focusing on sports and recreation. Faculty and students from the Faculty of Sports and Health Sciences planned the sports and recreation activities. Courses on expression through aquathlon and dance, as well as outbreaks thought up by students, were also held. These programs were

created with the aim of giving children a sense of accomplishment and allowing them to express their free ideas. While the children and students were participating in the program, the parents worked on LEGO® Serious Play (LSP). In LSP, parents create and visualise works using LEGO blocks in response to a given task, following four steps. The purpose of the program was to share their thoughts and realizations by explaining their works.

Program report and future outlook

The children's reactions immediately after the program started were varied, but by acting with advice from the students, they were eventually able to participate in all of the program. It was an opportunity for the university students to learn about a symbiotic society, and both parties achieved effective results. The parents felt lonely. And they had concerns about childcare on a daily basis, but it became a place where they could share their thoughts and concerns with each other. Cooperation between family, medical care, and education is important for supporting neurodevelopmental disorders. There are regional disparities in developmental support programs in Japan, and it cannot be said that the support we receive in the areas we live in is sufficient. This initiative was a joint project between families and educational institutions. Moving forward, we intend to explore the possibility of incorporating medical institutions into the program.

Acknowledgments

We would like to thank Professor Natsue Nakamoto of Mejiro University's School of Health and Medical Sciences for her kind guidance and advice. We would like to express our sincere gratitude.

Inclusion Strategies in Sports in Portugal: A Systematic Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Portugal ranks as the third country in Europe with the highest percentage of physical inactivity, well above the European average. Lack of time and motivation are cited as the main reasons why people do not exercise, along with having a disability or illness. The responsibility for promoting inclusive activities with suitable strategies falls on the teacher, the school and the community. The objective of this research was to analyse the existing scientific evidence on sports inclusion strategies for people with special health needs in Portugal. To identify the studies, the online database “RCAAP” (Open Access Scientific Repository of Portugal) was used with the keywords “Strategies”, “Inclusion”, “Physical education” and “Sport.” Studies published or not in the last ten years, written in Portuguese and English, which included data on the key variables of the study “Inclusion Strategies in Sports in Portugal” were included. Fifty-nine potentially relevant studies were found. After reading titles and abstracts, 26 were excluded. Thirty-three were considered potentially relevant, but after reading the full content, 24 were excluded. Nine studies were ultimately included in this research. After analysis, most of the studies reported that populations with special health needs experience health, social, cultural, and emotional benefits, among others, from participating in physical education classes. The strategies identified require enhancing the restructuring of sports organisations and implementing tailored strategies by teachers/coaches to accommodate the specific health of each student. Inclusive attitudes must also be promoted among peers. Sport is a tool that enhances social inclusion, integration, and equal opportunities while promoting virtues, values, and skills. The responsibility of promoting inclusive activities with appropriate strategies lies with the teacher, the school and the community. The school must be a multicultural and diverse

space. Based on the analysis of the studies presented, it is also concluded that organisations have a very favourable position towards inclusion in sports. However, they report significant challenges in implementing inclusive measures due to a lack of human and material resources adapted to the specific needs of each sport. Physical education teachers must implement positive, attentive, creative, flexible, and firm strategies when enforcing rules in their classes. They should support, explain, inform, and communicate using both verbal and nonverbal language. Additionally, they need to maintain regular contact with families and other professionals to establish priorities and attainable objectives, ultimately promoting the development of students.

Impact of Muscle Mass and Muscle Strength on Quality of Life of Individuals with Intellectual and Developmental Disabilities

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Conflict of interest: nothing to declare. **Funding:** FCT - Portuguese Foundation for Science and Technology under the following project UI/04045.

The potential benefits of muscle strength in individuals with IDD, and its relationship with perceived quality of life, are still little explored in scientific literature. This study aimed to explore the relationship between muscle strength and perceived quality of life in individuals with Intellectual and Developmental Disabilities (IDD). A cross-sectional study was conducted involving 37 participants, with a mean age of 39.08 years (SD = 0.05), ranging from 20 to 58 years. Participants were evaluated for anthropometric and body composition parameters, as well as muscle strength using a 30-second chair-stand test and isokinetic dynamometry. Quality of life was assessed using the Portuguese version of the Personal Outcomes Scale. Pearson's correlation analyses were performed to examine the associations between muscle strength measures and quality of life. The results revealed significant correlations between muscle strength and quality of life. Specifically, lower limb muscle strength, particularly in flexion (left: $r = 0.450$; $p \leq 0.001$; right: $r = 0.504$; $p \leq 0.001$) and extension ($r = 0.328$; $p = 0.05$), showed positive correlations with quality of life. These findings provide initial evidence suggesting that muscle mass and strength may serve as potential predictors of quality of life in individuals with IDD.

Relationship between body image and physical activity levels in adolescents

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Body image has been widely investigated in health and exercise psychology and is a relevant factor in promoting healthy behaviours and adherence to physical activity (de Campos, 2023). Body image may be defined as a multidimensional construct integrating attitudinal, perceptual, cognitive, affective, and behavioural dimensions. The literature indicates that physical activity participation is associated with improvements in body composition, cardiorespiratory and autonomic function, and psychological and emotional health (Rosado, 2013). In this context, the World Health Organisation has recommended minimum levels of physical activity for health promotion and disease prevention (da Cruz & Molina, 2020). Therefore, the present exploratory study aims to investigate the relationship between body image and physical activity levels in adolescents. The research uses quantitative methods of data collection, including the Multidimensional Body-Self Relations Questionnaire (MBSRQ) (Cash, 2017), to evaluate the subjective perception of attitudes towards the body and the International Physical Activity Questionnaire (IPAQ) (Hagströmer et al., 2006) to

measure the levels of physical activity in different intensities (Hallal & Victora, 2004). The sample consisted of 638 students, attending the 11th and 12th grades of regular secondary education in Portugal, aged between 16 and 18. The objectives of the study include: (i) comparing levels of body image and physical activity according to gender; (ii) correlating levels of body image with age; and (iii) investigating the correlation between levels of moderate or vigorous physical activity and levels of body image. The results are expected to help us understand how body image is associated with physical activity and sociodemographic factors, contributing to the development of strategies that may encourage healthier and more active habits, reduce body dissatisfaction, and promote the well-being of adolescents. The preliminary results indicate that the MBSRQ scales showed acceptable values of good reliability (.66 to .91), except for health orientation (Cronbach's alpha equal to .58). Male adolescents reported higher scores in appearance evaluation ($p=.011$), fitness evaluation ($p<.001$), fitness orientation ($p<.001$), health evaluation ($p<.001$), body areas satisfaction ($p<.001$). Female adolescents showed higher scores for appearance orientation ($p<.001$), illness orientation ($p<.001$) and overweight concern ($p<.001$). The Pearson correlation analysis showed associations, mostly weak and non-significant ($p>.05$), between the variables assessed and activity levels (High and Moderate), age and sedentary time. However, sedentary time was negatively correlated with appearance evaluation ($p=.040$), body areas satisfaction ($p=.026$) and fitness orientation ($p=.013$), while age was negatively correlated with appearance orientation ($p=.013$).

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Motor Competence Levels in Portuguese Children in the 1st Basic Cycle and their Relationship with Academic Performance

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The present study aims to verify the levels of motor competence in Portuguese children in the first basic cycle and the correlation with academic performance. To this end, we developed a quantitative study, with a sample of 250 children aged between 6 and 10 years, divided into 4 years of schooling, of both sexes. The instruments used in the study were the Motor Competence Assessment (MCA) scales to assess motor competence (MC) and a questionnaire to collect academic performance. The results obtained reveal that as the school years increase, children tend to have worse motor skills, presenting values in the 3rd and 4th year of schooling that are much lower than the average for their age. Regarding the correlation between MC and academic performance, this relationship is statistically significant only in the 4th year, with children with good MC presenting excellent academic performance in the Portuguese curricular area.

We can therefore conclude that, on average, only in the 1st Year do children present normal Motor Competence values for their age and as the school year progresses, there is a tendency for worse results, with the relationship between this and Academic Performance only being significant in the 4th year in the Portuguese subject.

These results highlight the urgent need for intervention in primary schools to combat childhood obesity and motor illiteracy.

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Parental support in Portuguese youth football – the view of parents and players

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Parental involvement is widely acknowledged as a crucial factor in children's engagement and development in sports. This work reviews existing knowledge on the perspectives of parents and players regarding parental involvement in youth football. The complex and multifaceted nature of parental support incorporates several key aspects, such as financial investments, emotional reinforcement, logistical help and the creation of an environment conducive to athletic development (Wheeler & Green, 2014). Parental involvement in soccer is a crucial factor that significantly influences the practice and developmental trajectory of young athletes (Castañeda-Vázquez et al., 2019). The parent-child relationship in sports is delicate due to individual differences, so it is essential to examine how athletes of different ages, genders and sporting backgrounds perceive parental support (Gomes, 2010). It is important to note that athletes interpret parental actions within the context of the sport they practice, highlighting the need for professionals in the field to collaborate with parents to foster greater parental engagement in sports (Branco et al., 2024). This study aimed to: (i) analyse the relationship between mothers and the sporting support shown by young soccer players; (ii) analyse the relationship between fathers and the sporting support perceived by young soccer players; (iii) examine young soccer players' perspectives on the sporting support provided by their mothers/fathers; (iv) analyse the perspectives of young soccer players with regard to the sporting support shown by their fathers. Thirty players participated in the study (22 female, age 13 ± 1.05 years; 8 male, age 14 ± 0.99 years) and 32 of the players' guardians (15 female and 22 male). The study used quantitative data collected through the Parental Behaviours in Sports Questionnaire (Gomes, 2006), with separate versions for parents and athletes. The parental questionnaires were administered during their children's training sessions, and the

athlete questionnaires were completed after training. The aim was to assess the dimension of sports support, which included parental support, satisfaction, and interest in their child's sporting activity. This dimension was measured using a five-point Likert scale, with responses ranging from 1 (“Never”) to 5 (“Always”). The main findings indicate that both mothers and fathers perceive high levels of sporting support for their children and that young soccer players also acknowledge receiving strong sporting support from both parents.

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Mental Health Literacy and Well-Being Among University Students: An Integrative Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

In recent years, the mental health of the university population has deteriorated, revealing significant vulnerability to psychological disorders due to the challenges of transitioning to higher education. Thus, mental health literacy as one of its determinants emerges as a relevant area of study. This integrative review aims to examine if there is an association between mental health literacy and the psychological well-being of university students, exploring the variability of this relationship across different courses. Additionally, it analyses whether mental health literacy promotion programs improve students' well-being. The bibliographic research conducted in English and Portuguese intends to include terms such as mental health literacy, psychological well-being, and higher education, consulting databases such as *PubMed*, *EBSCO*, *B-on*, and *Scopus*. Among the included articles will be randomised clinical trials, meta-analyses, and systematic reviews. The expected results aim to identify patterns explaining differences in the impact of mental health literacy depending on the course, as well as limitations in the instruments used to measure it. These instruments may capture only partial dimensions of the construct, justifying the emergence of a new variable: positive mental health

literacy. It is suggested to study the convergent validity of existing instruments measuring each variable to verify whether this theoretical distinction is also confirmed statistically. The conclusions of this review may fill gaps in this field, contributing to a better theoretical framework, improved measurement of variables, and interventions aimed at enhancing university students' well-being.

Impact of Play Therapy on the Neurotoxic Effects of Chemotherapy in Children with Cancer: An Integrative Literature Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Chemotherapy is a primary treatment method in pediatric oncology; however, it is associated with neurotoxic effects that can impair cognitive functions, particularly memory, attention, and executive functions. These impairments significantly affect the quality of life of young patients. Growing concerns about neurotoxicity have led to increased interest in non-pharmacological approaches. One such method is play therapy, which uses play as a therapeutic tool and may help alleviate these negative effects. This integrative literature review aims to examine the effectiveness of play therapy in preserving and restoring cognitive functions that are affected by chemotherapy-induced neurotoxicity in pediatric cancer patients. The research will involve a comprehensive search of electronic databases (B-on, Web of Science, PePSIC, MEDLINE, Science Direct, SciELO, and Google Scholar) using the following keywords: "play therapy," "neurotoxicity," "cognitive functions," and "pediatric cancer," explored in various combinations. Specific filters will be applied, focusing on the subject matter (pediatric cancer),

relevant disciplines (Social and Human Sciences, Psychology, Health and Medicine, and Public Health), and the type of publication (scientific articles with experimental or quasi-experimental methodologies and systematic literature reviews). The time frame for the articles will be limited to 2020–2025, requiring the mandatory inclusion of the terms "play therapy, neurotoxicity, and pediatric cancer" or "play therapy, cognitive functions, and children with cancer" in the abstract. Articles published in English, Portuguese, and Spanish will be considered. This research aims to enhance understanding of the effectiveness of play therapy in mitigating the neurotoxic effects of chemotherapy in children with cancer, potentially supporting its integration into clinical practice in pediatric psycho-oncology.

Association Between Physical Activity and Myopia in a Sample of Adolescents from the Central Region of Portugal

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Myopia has emerged as a global public health concern, drawing increasing attention from researchers and healthcare professionals. This type of refractive error is the leading cause of correctable vision loss among young individuals, and its progression to high myopia increases the risk of vision-threatening complications in adulthood (Du et al, 2024). Identifying and characterising risk factors are essential for implementing prevention and disease progression control strategies (Morgan et al, 2021). The rising prevalence of myopia in children, observed in a context of genetic stability, highlights the significant influence of environmental and behavioural factors in the development of this condition (Morgan et al, 2021; Biswas et al, 2024). In this context, the present study aims to explore lifestyle-related risk factors associated with the development of myopia during school age, focusing on a sample of adolescents from the central region of Portugal.

Refractive measurements were obtained through autorefraction (AR) under non-cycloplegic conditions using an open-field paediatric device (PlusOptix, model A09). The definition of myopia was based on the calculation of the spherical equivalent (SE) of the eye with the highest degree, with $SE \leq -0.50$ D classified as myopia. The explored risk factors (daily outdoor time, weekly physical activity, and daily screen time) were assessed through a questionnaire.

A total of 874 students participated in this study, aged between 10 and 18 years (mean: 12.6 ± 1.4 years). Among the participants, 52.3% were female, 40.2% were in the 2nd cycle of studies, and 32.6% attended rural schools. The estimated prevalence rate of myopia was 22.5% (CI: 19.9% - 25.4%). The mean $\pm$ standard deviation of the spherical equivalent for the group of

students classified as myopic was -2.68 ± 1.84 D, while for the remaining students, it was 0.72 ± 0.89 D.

The univariate logistic regression analysis showed a significant association between myopia and age, school cycle, physical activity, time spent outdoors during the weekend, and smartphone usage time during the week and weekend. The adjusted model reveals that the main explanatory factors are the school cycle, with students in the 3rd cycle being 1.8 times more likely (OR: 1.851; CI: 1.306-2.622) to develop myopia compared to those in the 2nd cycle, and physical activity, which demonstrated a protective effect, reducing the risk of myopia by approximately half (OR: 0.557; CI: 0.384-0.808) in adolescents who engage in physical activity at least twice a week.

Conclusion

The findings of this study highlight the importance of physical activity in reducing the risk of myopia in adolescents, suggesting a significant protective effect, which is consistent with previous reports (Modrzejewska et al, 2022; Harrington et al, 2023). The higher prevalence of myopia among students in the 3rd cycle reinforces the influence of educational and behavioural factors on the development of this condition. Additionally, the association between myopia and variables such as outdoor time and smartphone use underscores the relevance of daily habits in eye health. These findings emphasise the need for strategies that promote regular physical activity and a balanced use of electronic devices to mitigate the progression of myopia in this population.

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Transforming Perceptions of Assessment in Physical Education: Insights from Pre-Service Teachers

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Traditionally, assessment is understood as a process of verifying students' learning by assigning grades, with tests (theoretical/practical) being the most common form (Graça et al., 2019). However, the growing demand for more effective practices by teachers has broadened the concept of assessment, which is now recognised as a key driver for learning (Boud, 2007). This approach places the student at the centre of the process, fostering their autonomy and engagement. Thus, student-centred teaching models emerge as pedagogical alternatives (Tannehill et al., 2015). School placement is a crucial opportunity for the development of assessment literacy in pre-service teachers (PSTs); however, there is limited research exploring this concept within this context (Moura et al., 2023). An exploratory-descriptive qualitative study was conducted in collaboration with the University and the School to explore PSTs' perceptions of assessment in Physical Education, both before and after the implementation of an action research within a didactic unit using a student-centred pedagogical model and an assessment-for-learning approach. The study group consisted of 11 PSTs, four females and seven males, aged between 22 and 28, from four school placement cohorts of the Master's in Teaching Physical Education for Basic and Secondary Education at the University of Maia,

during 2023/2024 and 2024/2025. This research reports on a broader investigation based on the procedures of an action research cycle by Elliott (1991), as presented by Koshy (2005). Data of semi-structured interviews subject to a thematic analysis revealed: i) the school placement as an opportunity for developing assessment literacy and perception change; ii) the impact of anticipatory socialisation on the persistence of a traditional view of assessment; iii) the sport education model as a facilitator of assessment and the challenges associated with its implementation; iv) pedagogical strategies employed to enhance student learning and foster autonomy; v) reflection and collaboration as drivers of learning and practice transformation, fostering a more integrated and reflective approach to assessment; vi) the evolution of students' understanding of sports and their recognition of both individual and peer performance; vii) assessment as a tool for learning and the transformation of educational practices; and viii) collaborative and supportive mentoring as a foundation for implementing student-centred practices. Although not all school contexts supported an alternative approach to teaching and assessment, and some PSTs encountered greater challenges in implementing the sport education model due to limited content knowledge, both in the sport and the model itself, the school placement was found to foster the development of assessment literacy and facilitate a shift in perceptions among PSTs. The adoption of learning-focused assessment practices proved essential for developing situated pedagogical knowledge and enhancing student learning. Additionally, the presence of collaborative mentoring and the strengthening of University-School partnerships were found to be crucial for sustaining the transformation of teaching and assessment practices.

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Practitioner Research in Professional Development in Physical Education Teaching and Teacher Education: A Scoping Review

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The term ‘practitioner research’ is commonly used to describe the process through which educators - such as teachers, teacher educators and researchers, investigate and refine their own professional practices (Carr & Kemmis, 2005), and reflects a strong commitment to continuous and meaningful pedagogical and professional development (Casey et al., 2018). The same authors state that practitioner research in physical education (PE) is increasingly recognised as a valuable approach for professional development and enhancing teaching practices. This scoping review (Arksey & O’Malley, 2005) tracks the development of practitioner researchers as noted in the literature without restrictions on publication dates. Using the Boolean operators (“physical education”) and (“practitioner research”) or (“research to practice”) or (“practitioner inquiry”) or (“teacher-led research”) or (“translational research”) or (“school-based research”), searches for peer-reviewed articles were conducted in Academic Search Complete, APA Psycinfo, ERIC, SCOPUS, SPORTDiscus, Teacher Reference Centre and Web of Science electronic databases. A pool of 3048 potentially relevant studies was obtained on November 8th, 2024. After screening the refined results and applying the inclusion criteria to all the citations (i.e., not published in peer-reviewed international journals with an impact factor; did not focus on strengthening the role of practitioner research in PE; were non-empirical works, such as opinion pieces, review articles, editorials, conference proceedings, book chapters, or narrative articles, classified as “grey literature”; or were not available in English), the retrieved articles were imported into the Endnote reference management software, and duplicate references subsequently removed. This resulted in a reduced pool of relevant articles ($N=77$).

Full text copies of each article were obtained, and details were summarised in a table format regarding (a) author(s) and year of publication, (b) study focus, (c) definition of practitioner research, (d) concepts related to practitioner research definition, (e) methodology, and (f) results. Each article was critically assessed. As a result, 57 articles failed to meet the appraisal criteria: 24 were not explicitly concerned with practitioner research, 22 were not related to PE, and 11 were non-empirical studies. The final pool of selected studies ($N=20$) for the in-depth analysis is noted in Figure 1. Based on twenty empirical studies, the main results relate to the following thematic themes: i) *Practitioner Research as a Catalyst for Professional Development* ($N=13$) - studies enhance that practitioner research consistently emerges as a crucial tool for enhancing professional development through action research, bridging the gap between theoretical knowledge and practical teaching experience. Across studies, its role in promoting reflection, innovation, and transformative learning is widely acknowledged.; ii) *Collaborative Inquiry as a Driver for Pedagogical Innovation* ($N=14$) - studies emphasise the second recurring theme, which emphasises the significance of collaborative inquiry in driving innovation in PE. Through partnerships, communities of practice, and participatory action research, teachers and researchers work together to reimagine PE pedagogy, adapting it to meet the evolving needs of education.; iii) *The Integration of Research and Practice in Teacher Education* ($N=12$) - studies address the third theme, which underlines the importance of systematically integrating research and practice as a key element in preparing teachers to become reflective practitioners. Across the studies, this integration addresses the challenge of aligning theoretical knowledge with classroom experiences, promoting inquiry-based learning and fostering professional growth. The findings of the review highlight the transformative potential of PE practitioner research. When properly integrated and supported, practitioner research has the potential to improve teaching practices and enrich students' learning experiences worldwide. Additionally, it brings to light key gaps and challenges within the field that require further attention, enabling educators, researchers, and policymakers to collaborate in building a more reflective, adaptive, and effective teaching profession.

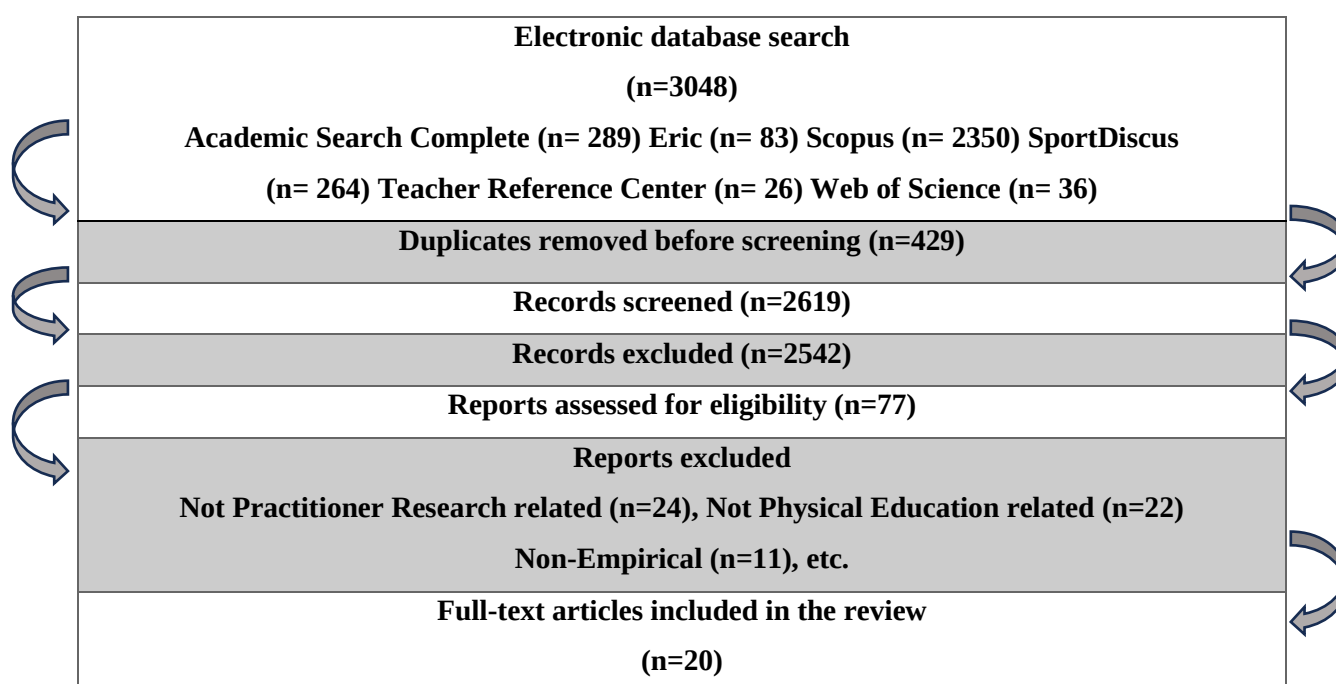


Figure 1. Flow chart of the electronic database search and selection of articles process.

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Effect of Physical Activity, Screen Time, Sleep, Body Composition and Backpack on Neuromuscular Pain in Adolescents

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UID/04045: Research Center in Sports Sciences, Health Sciences, and Human Development; Secretaria Regional da Educação Ciência e Tecnologia, Funchal, Portugal.

Occupational, personal, and behavioural factors have been associated with neuromuscular pain in adults (Balague et al., 2012; Bernstein et al., 2017; Malla et al., 2018; Taylor et al., 2014). However, this relationship remains unclear in pediatric populations, a critical period marked by the growth and maturation of the neuromusculoskeletal system. This study aims to examine the effect of lifestyle, body composition and backpack weight on the prevalence of neuromuscular pain. The study included 687 subjects (337 boys and 350 girls) aged between 10 and 18 years (13.18 ± 2.45). Neuromuscular pain was assessed using the Grimmer and Williams questionnaire (2000), adapted to Portuguese by Araújo (2011), assessing the prevalence of pain in the last three months, frequency, intensity, duration, and its impact. All participants were asked about:

(i) weekly organised physical activity (frequency and duration per session), (ii) time on mobile phone (hours per day), (iii) weight and height, determined the body mass index and categorised according to FITescola[®] (<http://fitescola.dge.mec.pt/HomeTestes.aspx>), and (iv) the participants were evaluated in weight with and without the backpack. The weight of the backpack was determined by the difference between the weight with the backpack and without it. Most participants reported experiencing pain (53.4%). Most were engaged in physical education classes as their only organised physical activity (51.8%) and spent at least 2 hours a day on the phone (59.5%). Additionally, 70.5% reported sleeping a maximum of 8 hours, 66.2% had a healthy weight, and 51.4 % had a backpack weight below 10% of body weight. The most located pain locations were the knee (44.7%), neck (40.9%), lumbar (40.6%), ankles/feet (39.8%), back (36.0%), shoulders (34.9%), thighs/hips (26.2%), wrists/hands (25.1%) and elbows (7.9%). MANCOVA was used to determine the effect of lifestyle factors (organised physical activity, time on mobile phone, and hours of sleep), body mass index, and backpack weight on pain, controlling for age, gender, and school social support. Significant differences were observed between participants with and without pain (Pillar's trace=0.629, $F_{(5,678)}=3.670$, $p=0.003$, $\eta^2=0.023$). A significant effect was found for mobile phone usage ($F_{(1,687)}=9.681$, $p=0.002$, $\eta^2=0.014$) and sleep duration ($F_{(1,687)}=6.822$, $p=0.009$, $\eta^2=0.010$). However, no significant effect were observed for organised physical activity ($F_{(1,687)}=0.428$, $p=0.513$, $\eta^2=0.001$), Body Mass Index ($F_{(1,687)}=3.491$, $p=0.062$, $\eta^2=0.005$), and the weight of the backpack ($F_{(1,687)}=0.390$, $p=0.533$, $\eta^2=0.001$) in the prevalence of neuromuscular pain. These results highlight the need for intervention in pediatric populations, active lifestyle habits, reduction of screen time and school strategies such as the implementation of lockers.

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Perception of Physical Education: Association with Sociodemographic Indicators

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UID/04045: Research Center in Sports Sciences, Health Sciences, and Human Development; Secretaria Regional da Educação Ciência e Tecnologia, Funchal, Portugal.

The scientific literature consistently highlights the low levels of physical activity among the pediatric population, with adolescence being a critical period marked by a decline in physical activity levels. Physical education (PE) is often their only form of organised physical activity (OPA) and serves as a means of promoting an active lifestyle. In this context, the study aims to characterise organised physical activity, assess students' opinions about physical education, and their relationship with sociodemographic indicators, including gender, education cycle, and school social support. The study included 730 children and adolescents of both sexes (353 boys and 377 girls) from elementary school (n=220), middle (n=223), and high school (n=287). The participants completed a questionnaire assessing (i) weekly organised physical activity

(frequency and duration per session), (ii) opinion about physical education (1- I don't like it at all to 5- I really like it a lot), (iii) open question about the objectives of PE, and (iv) sociodemographic data (teaching cycle and school social support). Approximately half of the participants (47.4%) reported engaging in organised physical activity outside of physical education classes, with 40.7% performing a federated practice. The largest number of students' for whom PE is the only form of OPA is: (i) female (46.2% vs 58.6%, $\chi^2=15.867$, $p<0.001$); (ii) high school students' (63.4%, $\chi^2=25.008$, $p<0.001$), and (iii) those with higher school social support ($r=-0.142$; $p<0.001$). The majority reported enjoying PE classes (81.2%), with a greater preference observed among elementary school students (60.9% vs 23% in high school, $p<0.05$) and boys (48.7% vs 35.5%, $p<0.05$). Regarding their perspective on PE, students indicate that: (i) it should be mandatory and include evaluation (59.5%), with stronger support among elementary school (68.6%, $\chi^2=18.733$, $p=0.016$); (ii) it must aim on fostering autonomy and creativity (81.1%); (iii) it should promote movement and energy expenditure (75.1%), and (iv) it should serve as a moment of fun and relaxation (72.5%). Although a high number of students express a positive attitude towards PE, further research is needed to examine its evolution with age, particularly among girls.

Performance and Kinematic Aspects of Paddle Stroke in Young Kayakers: Insights from an Exploratory Study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Athlete performance in sprint kayaking is influenced by various factors, with paddle stroke technique being a key determinant of efficiency and speed. However, research on young kayakers, whose techniques are still developing and are strongly influenced by their maturation status, remains limited. Thus, this study investigated the relationships between performance and kinematic aspects of paddle stroke in young kayakers. This study analysed 13 young sprint kayakers 7 males (3 early mature and 4 on time) and 6 females (all on time) with a maturity offset of 0.34 ± 0.65 years and 1.52 ± 0.23 years, respectively, participating in a national U14 training camp with a mean age of 13.84 ± 0.60 years, height of 167.74 ± 7.05 cm, and body mass of 61.04 ± 7.38 kg. Ethical approval was obtained, and parents or legal guardians provided informed consent. Each athlete performed two on-water tests using their kayak and paddle. A GPS (15 Hz - GPSPORT, Canberra, Australia) with a tri-axial accelerometer (100 Hz) was mounted on the kayak deck to collect data. The first test was a 15 s maximal sprint to assess sprint performance. After a 5 min rest, the athletes completed an intermittent protocol consisting of four 1 min maximal efforts, each followed by a 3 min rest. The analysed variables included mean distance travelled, peak and mean velocity, peak and mean stroke rate, stroke displacement, technical index (TI) (calculated by trial and multiplying velocity and displacement per stroke), and fatigue index (FI) (calculated by trial and considering the peak velocity and the minimum velocity at the end of the trial (1 s mean), in %). The data was analysed using a validated custom-made MATLAB (version 2023a; Mathworks Inc.,

Massachusetts, US) algorithm (Fernandes et al., 2021). Data distribution and descriptive statistics were assessed. Spearman's correlation coefficients (r_s) were calculated and classified as very high (0.9–1), high (0.7–0.9), moderate (0.5–0.7), low (0.3–0.5), and negligible (0–0.3) (Mukaka, 2012). Significance was set as $p < 0.05$. Statistical analysis was performed using IBM SPSS Statistics 29.0 (IBM Corporation, New York, 197 USA). Findings revealed significant correlations between sitting height and performance metrics in both sexes. Sitting height strongly correlates with distance covered ($r_s = 0.855$, $p = 0.014$), mean velocity ($r_s = 0.899$, $p = 0.006$), and peak velocity in the intermittent test ($r_s = 0.982$, $p < 0.001$), as well as in sprint ($r_s = 0.929$, $p = 0.003$). In the intermittent test, boys and girls roughly paddle at the same frequency, 111.71 ± 3.64 spm and 107.33 ± 7.84 spm, respectively. A high correlation was found between sitting height and the technical index ($r_s = 0.786$, $p = 0.036$) in female and male athletes, suggesting that this trait may be linked to better overall technical performance. This study shows that athletes with a higher sitting height are more likely to reach and maintain higher speeds, giving them a competitive advantage. The strong association between sitting height and technical index suggests that young kayakers with this trait may be technically superior, possibly due to biomechanical advantages. These insights underscore the importance of considering this specific anthropometric factor when evaluating kayaking performance and offer valuable information for coaches to customise the training better and design more adjusted talent identification programs.

Acknowledgments

We sincerely thank the Portuguese Canoe Federation and all the athletes involved in this study.

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Impact of a work-related exercise program on stress levels, burnout and quality of life of radiology technicians: a systematic review protocol

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Warburton, Nicol, and Bredin (2006) state that physical activity plays a vital role in maintaining health throughout one's life. As society advances technologically, lifestyles are increasingly passive and with little activity. Regular physical activity is an important strategy to counter these trends, promoting both physical and mental benefits. This systematic review aims to analyse the impact of a work-related exercise program on stress levels, burnout and quality of life of radiology technicians without a history of cardiovascular and psychiatric diseases. This protocol adheres to the Preferred Reporting Items for Systematic Review and Meta-Analysis for Protocols (PRISMA-P) statement (Moher et al., 2015). The systematic review protocol was registered in the Prospective Register of Systematic Reviews (PROSPERO) with registration number: CRD420251000263. The search will be carried out in three electronic databases (Web of Science, SCOPUS and PubMed) according to the PICO strategy (Methley et al., 2014) and includes a combination of free text and MeSH terms. Eligible studies will respect the following criteria: Population (Radiology Technicians with no history of cardiovascular and psychiatric

diseases); Intervention (Laboral exercise program); Comparison (non-exercise control group); Outcome (Stress, Burnout and Quality of Life). The collected data will be imported into EndNote X9, and all duplicates will be removed. The article selection process will be carried out by two independent reviewers based on titles and abstracts, and then reviewed based on eligibility criteria. Disagreements will be resolved by consensus or by involving a third reviewer. Data extraction will be carried out independently by the reviewers. The “Downs and Black checklist” scale will be used to evaluate the methodological quality and risk of bias of randomised and non-randomised studies through 27 items focusing on 5 dimensions: a) way of reporting results (items 1 to 10); b) external validity (11 to 13); c) internal validity/bias (14 to 20); d) confounding factors/selection bias (21 to 26); e) study power (27) (Downs & Black, 1998). To our knowledge, this will be the first systematic review to address the impact of work exercise programs on stress, burnout and quality of life of radiology technicians’ health units. The findings may contribute to the development of evidence-based organisational policies aimed at promoting employee well-being.

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Evaluation of the Efficacy of a Relaxation Program in Health Professionals: A Quantitative Study of Longitudinal and Randomised Design

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Healthcare professionals are vulnerable to stress and burnout due to the demands this profession requires. With this purpose, the present study aims to implement a relaxation program for healthcare professionals, with the aim of assisting and improving their mental health and promoting professional satisfaction in a post-pandemic period in which they have been so sacrificed. Thus, the present investigation is based on a randomised study, which aimed to evaluate the effectiveness of a relaxation program in 43 health professionals, allocated in three research groups – Experimental Group (GE), Active Control Group (GCA) and Passive Control Group (GCP). The EG was subjected to an adaptation of the Schultz protocol, while the GCA was exposed to listening to relaxing music during the same period and the GCP was placed in a waiting group (on a waiting list). All groups completed the Anxiety, Depression and Stress Scale, the Self-Compassion Scale, the Copenhagen Burnout Inventory, the Difficulties in

Emotion Regulation Scale and the Minnesota Job Satisfaction Questionnaire at pre-test, post-test and follow-up. One statistically significant difference was found between groups, with the GE showing higher levels of job satisfaction compared to the GCP on follow-up ($p = .043$). In conclusion, Shultz's Autogenous Training appears to present promising results in the dependent variables of professional satisfaction, self-compassion and emotional regulation. In addition, due to the lack of statistically significant differences between GE and GCA, it is worth noting that listening to relaxing music may also have an equally promising effect.

Cross-Cultural Perceptions of ADHD: Development and Validation of a Vignette-Based Methodology

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental condition whose perception varies across cultures, influencing awareness and diagnostic practices.

Aims

This study, conducted in collaboration with an international team of researchers (e.g., Poland, Portugal, Iran), presents the development and initial validation of a vignette-based methodology designed to assess how individuals from different cultural backgrounds classify ADHD symptoms as "normal" or "abnormal."

Methods

The vignettes were refined through a multi-step validation approach, including linguistic validation (back-translation), statistical validation (Exploratory Factor Analysis, Confirmatory Factor Analysis, Principal Component Analysis, Network and Cluster Analyses), and conceptual validation (content analysis). This validation process was conducted on an initial sample of approximately 1,000 participants from 7 different countries.

Conclusion

The study provides a structured methodology for examining cultural variations in the classification and conceptualisation of ADHD symptoms. Full-scale data collection is still underway to investigate these perceptions across cultural contexts further.

Perceived vs. Actual Aquatic Competence in Primary School Children: Age and Sex Effects

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Conflict of interest: nothing to declare. **Funding:** This work (ALFAC - Aquatic Literacy For All Children) is a project funded by the European Commission under the Erasmus+ programme (ERASMUS-SPORT-2021-SCP, ID: 101049889).

Drowning incidents can result in severe consequences, including death or permanent health impairments, and can be reduced through the development of aquatic competence (Garrido, Costa, & Stallman, 2016). A core objective of the European project “Aquatic Literacy For All Children” (ALFAC) is to characterise the protective skills essential for survival in aquatic environments under the concept of aquatic literacy. This study analysed the relationship between perceived (PAC) and actual aquatic competence (AAC) in primary school children, examining the effects of sex and age on aquatic literacy. A total of 80 children aged 6 to 11 years ($n=40$ boys; $n=40$ girls; 8.89 ± 1.04 yrs old), enrolled in four elementary schools in Portugal were assessed on their AAC using the ALFAC test battery tools (Van Droogenbroeck, Mekkaoui, & De Martelaer, 2024): a parent questionnaire, a child questionnaire evaluating psychosocial and cognitive competencies (including perceived aquatic competence), and real-life aquatic tests measuring nine isolated tasks. Pearson correlation coefficients, independent t -tests ($\alpha = 0.05$), and generalised linear models with an ordinal distribution ($p < 0.05$) were used to analyse sex and age effects, with effect sizes interpreted using Cohen’s d . Only 8.75% of parents or guardians considered their children safe or very safe in deep water without supervision or flotation aids, despite

children's confidence. Differences were found between PAC and AAC in most isolated tasks, with children generally overestimating their abilities: entry ($p<0.001$, $d=0.732$), exit ($p<0.001$, $d=0.724$), horizontal body rotation ($p<0.001$, $d=-0.453$), treading water ($p<0.001$, $d=0.490$), dorsal propulsion ($p<0.001$, $d=-0.913$), ventral propulsion ($p<0.001$, $d=1.337$), submersion ($p<0.001$, $d=0.814$), and floating ($p<0.001$, $d=0.882$). Correlations between PAC and AAC were modest across all skills. Results suggest that older children demonstrate higher aquatic competence in several aquatic tasks (entry, exit, vertical, horizontal and tilting body rotation, floating, dorsal and ventral propulsion) ($p<0.001$). A sex effect was found in four tasks (entry, exit, ventral propulsion and submersion), with boys outperforming girls ($p<0.05$). Findings highlight the need for structured aquatic education programs tailored to children's developmental stages to bridge the gap between perceived and actual competence and improve water safety.

Acknowledgments

The authors thank all individuals and organisations involved in this study, including the Municipality of Fundão, the Municipal Swimming Pool of Fundão, and the Gardunha and Xisto School Group.

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The Relationship Between Physical Fitness and Sprint Performance in Young Male and Female Kayakers: An Exploratory Study

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Sprint kayaking demands a balanced blend of power, strength, aerobic and anaerobic capacity, and technical proficiency to maximise performance (Bishop, 2000; Gomes et al., 2015). Research highlights the significance of anaerobic power for explosive starts, aerobic endurance for sustained speed, and technical skills to minimise drag and enhance stroke efficiency (Pendergast et al., 1979; Van Someren & Howatson, 2008). This study aimed to explore the relationships between fitness parameters and sprint performance in young kayakers to better understand the determinants that drive success. Thirteen young sprint kayakers (7 male, 5 female), aged 13.83 ± 0.55 years with a mean height of 167.71 ± 7.54 cm and 59.53 ± 7.26 kg of body mass, participated in the study, conducted during a national training camp. Written informed consent was obtained from both participants and their legal guardians, following ethical approval by the local committee in conformity with the Declaration of Helsinki. The athletes completed a 15-s maximal sprint test using a GPS device (GPSport, Canberra, Australia) to measure the mean distance travelled and peak velocity. They also underwent a physical fitness evaluation that included a medicine ball throw, pull-up test, push-up test, sit-

up test, and flexibility test. The key findings of this study indicate that sprint performance is influenced by several factors. Stroke rate showed a very strong positive correlation with the distance covered ($r_s = 0.825$; $p = 0.002$), emphasising the importance of consistent and high pacing. Peak sprint velocity also strongly correlated with distance ($r_s = 0.806$; $p = 0.003$), underscoring the necessity for high-speed capabilities. Upper body strength and endurance, assessed through push-ups, correlated moderately with distance covered ($r_s = 0.635$; $p = 0.017$), suggesting their contribution to performance. Explosive power, measured via the medicine ball throw, displayed the strongest correlation with peak sprint velocity ($r_s = 0.890$; $p = 0.000$), emphasising its critical role in enhancing performance and achieving competitive success in sprint kayaking. Summarising, these findings seem to reinforce the necessity of training programs that focus on explosive power, stroke rate, and muscular endurance to optimise sprint kayaking performances.

Acknowledgments

We extend our sincere gratitude to the Portuguese Canoe Federation and all the athletes involved in this study.

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Learning to Be a Teacher: perceptions of how contradictions affect this process and professional identity development

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Studies on teacher education suggest that pre-service teachers (PST) learn from the tensions, dialogues, reflections, and support that result from interaction with others in practice (Nyuyen, 2017). The knowledge is perceived as the understanding and construction of meanings through a situational and relational process (Gomes, Queirós, and Batista, 2019), where the PST learns to think, to know and to feel like a teacher (Feiman-Nemser, 2008), becoming a different person (Illeris, 2014). According to Vygotsky (1978; 1987), learning stems from human activity, mediated by someone more capable with the use of tools and artefacts, which allow one to operate on the zone of proximal development (ZPD). Cross (2006) proposes the concept of “identity-in-activity” to analyse the relation between learning and professional identity, which happens through the “contradictions” of the human activity systems (Engeström, 2001). This analysis identifies the contradictions arising within and between systems but also allows an understanding of why they emerge and how they may be handled. The present study analyses Physical Education PST’s perceptions of the contradictions that happen in the community of practice, during the Supervised Teaching Practice, and their impact on their learning process and professional identity. Data was collected during a three-week period, one each in the Group of PST of three different schools. Used participation observation (school A) and non-participation (school B and C), with field notes that included informal interviews and one final focus group with all eight PST (with informed consent). There were twelve observations, by three PST (also participants), with accompanied and guided by the main researcher, following relevant themes from the theoretical framework: institutional and activity context; actions of agents involved; interactions; mediation tools; norms and rules; positive and negative

contradictions; and mental functions of PST (accessed in informal interviews - perceptions, meanings, concerns, decisions, etc.). For the final focus group, the main researcher used a semi-structured interview guide, with an emphasis on contradictions, context learning and professional identity. A deductive thematic analysis was used, and two main categories were identified: individual contradictions (with the subject) and collective contradictions (between the subject and the components of the system). Individual contradictions highlighted the juxtaposition of identities. When confronted with their teaching practice, the PST questioned their beliefs about teaching, due to their previous professional experiences. They felt the need to understand their relation to teaching, reconstructing their own conceptions, understandings and strategies. The duality between the roles of teachers and students also generated contradictions, as they felt that the quality of teaching could be compromised due to the high demands of tasks inherent to the role of students. On the contrary, they are also unable to respond to these tasks, compromising their assessment. The collective contradictions with the community, due to the division of responsibilities (between partners) and power relations (mediation of the school's cooperating advisor; and recognition as teachers by the community), as well as teaching tools and the institutional structure (curriculum planning and instructional models), were key factors for SPT' learning and their construction of professional identity. These contradictions led to an internal negotiation process in relation to their identity, which encouraged STs to become better aware of their limitations to learn and to overcome these contradictions. Finally, the learning process does not always translate into progressive transformations in each PST. The way in which each student faces and deals with each contradiction can contribute more or less to their development.

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What influences customer retention in fitness new technologies: A Study design

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

This study employs a quantitative research methodology to measure the effectiveness of customer retention strategies in the fitness industry. Statistical methods will be used to analyse the collected data, identifying patterns and correlations among the studied variables, thereby providing a deeper understanding of retention. The research approach involves administering structured questionnaires to randomly selected fitness centre clients to gather relevant information about their perceptions, preferences, and behaviours regarding retention programs offered by the sector's companies (Baker et al., 2021). The research design aims to explore the impact of motivation strategies on customer retention within the fitness sector. A multiple case study approach will be implemented, covering various fitness centres to ensure data representativeness and diversity. This design includes an initial exploratory phase with

literature reviews to identify key issues, followed by data collection and detailed analysis phases, offering a comprehensive view of how motivation directly influences customer retention in different fitness contexts (Ribeiro et al., 2022; Valentim et al., 2021). The target population consists of fitness centre clients in the Lisbon Metropolitan Area (AML). A simple random sample of 5000 individuals, aged 18-65, both male and female, with varying fitness levels and weekly frequency, will be selected to ensure representativeness. Data collection instruments include structured online questionnaires (BPNESQ, BREQ2, PMCSQ) available for one month, addressing customer satisfaction, expectations, and preferences regarding fitness services and new fitness technologies. Additionally, semi-structured interviews with fitness centre directors and instructors will explore applied motivation practices and identify main challenges (Marinho et al., 2024; Franco, 2025). The data collection process occurs in two phases: online questionnaires to capture customer perceptions on motivation and retention, and in-person interviews to deepen the understanding of loyalty strategies. Data analysis will employ descriptive and inferential statistical techniques, alongside qualitative content analysis, providing a robust and comprehensive analysis of retention strategies in the fitness sector (Ferreira, 2024).

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Neuromuscular Patterns in Stand-Up Paddle: The Influence of Gaze direction on Lower Limb muscular behaviour

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Conflict of interest: nothing to declare. **Funding:** This work was supported by the Portuguese Foundation for Science and Technology (FCT), I.P., project number UIDB/04045/2020 and Grant/Award Number UIDP/04748/2020.

Previous research has shown that attentional focus on different aspects of movement, such as body segments or external objects, can lead to distinct motor patterns and muscle activation strategies (Bull et al., 2023). Attentional focus can significantly influence technique and biomechanical variables (Neumann, 2019), which is particularly relevant in dynamic, balance-dependent sports like stand-up paddle (SUP) (Ruess et al., 2013a). SUP requires the use of a larger board and a paddle, providing increased buoyancy, stability, and increased power stroke (Suari et al., 2018). This activity demands proficient balance and significant engagement of core and lower limb muscles (Ruess et al., 2013b), as maintaining optimal posture activates multiple muscle groups (Tsai et al., 2020). Given the role of attention in movement execution, it highlights the importance of understanding how gaze direction affects neuromuscular patterns

in SUP, as it is essential for board stability. This study aimed to understand the neuromuscular behaviour of the lower limbs in SUP under different gaze directions. Six recreational male paddlers (age: 22.5 ± 7.31 years; height: 1.74 ± 0.035 m; weight: 75.87 ± 20.49 kg; wingspan: 1.83 ± 0.091 m) completed two SUP trials on water at a self-selected pace under different gaze conditions: (1) gaze direction on the board's and (2) free look. Each trial covered a total distance of 65 meters, with a 2-minute rest between trials. Electromyographic parameters were analysed over four stroke cycles, considering both paddling sides. The skin was prepared by shaving, sanding, and cleaning with alcohol to maintain interelectrode resistance below 5 KOhm. Electrodes were secured with waterproof bandages (Hydrofilm®, 10 cm × 12.5 cm, USA). EMG sensors were placed following SENIAM guidelines (Kendall™, ECG electrodes, 57 × 34 mm, gel area 201 mm², sensor area 80 mm², Dublin, Ohio, USA) and recorded using a Wireless Miniwave system (Cometa, Italy) with built-in accelerometers, sampling at 2000 Hz and 16-bit resolution. Surface electromyography (sEMG) was recorded over four stroke cycles from the tibialis anterior (TA) and gastrocnemius medialis (GM) muscles. Data was processed and expressed as a percentage of maximum voluntary contraction (%MVC). Statistical analyses included a paired t-test for normally distributed variables and the Wilcoxon test for non-parametric variables. Effect sizes were calculated using Hedges' g to assess the magnitude of differences between conditions. A significance level of $p \leq 0.05$ was considered. Results indicate that gaze direction influences muscle activation in SUP. The TA showed higher muscular activation in the free look condition (TA: 13.81 ± 3.10 , $p = 0.028$, ES = 1.052), while the GM exhibited lower muscular activation in the board gaze condition (GM: -2.06 ± 2.09 , $p = 0.046$, ES = -0.575). These findings highlight how visual constraints can alter lower limb muscular behaviour, supporting the idea that gaze direction is an important factor in maintaining balance.

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Changes in strength, movement velocity and lactate concentration during and after a set to muscle failure under different load and velocity conditions

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Introduction

Several studies have observed that when each repetition is performed at the maximum possible velocity, the number of maximal repetitions that can be completed in a set is primarily determined by the velocity of the first (best or fastest) repetition. This velocity indicates the level of effort (relative load, %1RM) that the lifted weight represents in relation to the maximum weight that could be lifted (1RM) in a given exercise. Thus, the greater the velocity at which an absolute load (kg) is moved, the lower the relative intensity it represents, and consequently, the higher the number of maximal repetitions that could be completed. However, other factors, such as voluntary execution velocity, may also influence the maximum number of repetitions completed in a set performed to muscle failure.

Purpose

the main objective was to compare the mechanic and metabolic stress, and the number of repetitions reached in a set performed to failure against the same relative loads (50 and 70%

1RM) under 2 different velocity conditions: maximal intended velocity (MaxV) and a half of this maximum velocity (HalfV), in the bench press (BP) and squat (SQ) exercises.

Methods

Twelve young, healthy men with previous experience in resistance training participated in his study (mean $\pm$ SD: age: 24.6 ± 3.6 years, 1.76 ± 0.06 m height, 75.8 ± 7.2 kg body mass). Participants carried out an incremental test to determine the force-velocity relationship in both exercises (BP and SQ). Then, each participant performed 8 testing sessions (4 for each exercise) separated by 5-7 days. In each session, participants carried out a maximum number of repetition (MNR) test (i.e., to muscle failure) against 50 and 70% 1RM, and under 2 velocity conditions: executing each repetition at maximal intended velocity (MaxV) or a half of this maximum velocity (HalfV) in both exercises. To analyse the response, the following battery of tests was carried out before and after each REP: blood lactate concentration (LAC), the mean propulsive velocity (MPV) with the load that moved initially at $1.00 \text{ m}\cdot\text{s}^{-1}$ ($1.1 \text{ m}\cdot\text{s}^{-1}$) and the height of CMJ for the SQ exercise.

Results

statistically significant differences between velocity conditions were observed in the mean of the high value of MPV (MPV_{BEST}) reached in each sets and the mean of MPV in the set (MPV_{AV}), but no differences between both velocity conditions (MaxV Vs. HalfV) were found in the total number of repetitions (Rep), percentage of repetitions performed under the 50% of the faster velocity in the set (%Rep) or in the last repetition MPV in the set (MPV_{LAST}) in any exercise. LAC showed statistically significant differences ($p < 0.05$) between velocity conditions against 70% 1RM in the SQ (5.0 ± 1.7 vs. 4.3 ± 1.2 , for MaxV and HalfV, respectively), and 50% 1RM in the BP exercise (5.8 ± 1.2 vs. 4.4 ± 0.9 for MaxV and HalfV, respectively). No significant differences were found between MaxV and HalfV for the rest of variables in both exercises analysed.

Conclusions and practical applications

The main findings of this study were that performing each repetition as fast as possible (MaxV) or deliberately slower (HalfV) allowed for a similar mechanical stress and maximum number of repetitions per set when the set is performed to complete the maximum number of repetitions possible (i.e., muscular failure). However, MaxV showed a slightly higher metabolic stress

compared to HalfV. These findings showed that both velocity conditions allow for the same number of repetitions, but it does not mean that both velocity conditions have the same fatigue degree, especially if the number of repetitions per set is far from muscle failure. Finally, regardless of the velocity conditions against a given relative load, if muscle failure is reached, the degree of fatigue induced is very high.

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Movement variability of Parkour Jump

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Conflict of interest: nothing to declare. **Funding:** CSIC-Udelar financial support.

Movement variability describes the intentional and unintentional adjustments of the body between repetitions within the same strategy (Preatoni et al, 2013). Jumping is a fundamental movement used regularly in sport and is very important in Parkour movement strategies. Traceur is a practitioner of Parkour who moves quickly and skillfully around objects (Feletti et al, 2023). Different jumps are trained in parkour practice that can improve the traceur's performance and movement variability when jumping. The aim was to determine the kinematic variability during the support phase of the Parkour Kong jump.

METHODS

Fifteen male 24.5 $\pm$ 4.1 (years), 1.76 $\pm$ 0.06 (m), 70.2 $\pm$ 11 (kg), overall practical parkour experience of 9 years for the advanced traceurs. They performed five kong jumps, which were approved by the coach, with a high technical quality of movement. In the Kong jump precision, the traceur projects himself above and in front of the wall using both arms as support to propel himself. Experienced athletes position their entire torso horizontally during the support phase of the jump. Eight triaxial accelerometers (Delsys Trigno Wireless), a sampling rate of 1.000 Hz, were adhered to the subject's at C7 level, T12, L5 and arm. After a low-pass filter (at 12 Hz), peak acceleration and peak velocity from the component horizontal (Y) and vertical (Z) axes were obtained (Wundersitz et al, 2015). For the kinematic variability movement, the mean deviation and intraclass correlation coefficients (ICC) were calculated.

RESULTS

Mean ($\pm$ SD) values were consistent with small variations between the axes (x and y). Acceleration values for the Y and Z axes were between 3.41 g ($\pm$ 0.67) and -3.91 g ($\pm$ 0.64). In the same way, velocity values, for both axes, were between 0.44 m/s ($\pm$ 0.09) and -0.37 m/s ($\pm$ 0.06), close to rapid movements in the literature studies (Wundersitz et al, 2015). The main findings of the study were a very low mean deviation of all data, values between a minimum of 5,4% ($\pm$ 1,2) and a maximum of 9,8% ($\pm$ 2,1), showing high repeatability between repetitions within the same kinematic movement strategy. An ICC greater than 0.94 for the data indicates excellent reliability and can distinguish the precision of techniques of advanced performance. Often, parkour movements must be adjusted in a matter of milliseconds (Dai et al, 2020). Minimising the variability of execution allows for more consistent results (Feletti et al, 2023; Preatoni et al, 2013). As a result of this, these movements are highly predictable and precise, allowing one to anticipate what will happen next, providing feedback on technique training, and exploiting this for traceur (Strafford et al, 2022). Results are applicable to providing feedback on daily technique training, modifying training to improve performance and consequently, reducing injury risks. So, it's necessary to train a lot of techniques and seek low movement variability.

CONCLUSION

Low kinematic movement variability during the support phase of Parkour Kong jump implies a high-level practitioner technique to reduce injury risks. Movement variability plays a role in the analysis of sports movement and in the monitoring of the Parkour athlete's skills. Traceurs are athletes who seek to obtain a predetermined outcome with a high degree of certainty and maximum precision.

Acknowledgments

Athletes who participated in the study

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Autonomic nervous system in Ashtanga Yoga beginners

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Conflict of interest: nothing to declare. **Funding:** no funding

Ashtanga vinyasa (AVY) style of yoga, specifically, is a moderate-intensity mode of physical activity. Unlike traditional moderate exercises, it is made up of 3 components: physical postures (asanas) linked in different series, breathing practices (pranayama) and mindfulness (dyna). This characteristic can result in benefits for the autonomic nervous system (ANS), in addition to those already known (Morris et al., 2024). The aim of this study is to compare measures of heart rate variability (HRV), pre- and post-intervention of 20 AVY sessions.

Methods

Participants were 10 volunteers aged 30 ± 12 years, height 1.69 ± 0.08 , mass 69.8 ± 11.4 kg. Everyone had 10 previous AVY sessions, after which HRV was assessed using a frequency meter (Polar H10). Measurements were taken in the supine position, and asanas were standing, seated, and inverted (Dass, 2019). The indices associated with parasympathetic activity (time domain) are: the square root of the mean value of the sums of squared differences of all RR

intervals, the percentage of total consecutive RR intervals discrepancy more than 50 ms from each other. Indices assessing sympathetic activity (frequency domain): low frequencies (LF). Parasympathetic activity in the time domain: rMSSD (Root-mean-square successive difference), pNN50 (percentage of adjacent RR intervals with a duration difference of more than 50ms); in the frequency domain, the HF. The relationship between sympathetic and parasympathetic in the time domain is SDNN (standard deviation of the mean of all normal RR intervals), and in the frequency domain is LF/HF. Twenty sessions were then carried out (2 per week), lasting approximately 60 minutes. They were assessed again in the same way as in the pre-intervention phase (Perrota et al., 2017). A paired t-test was used to compare HRV measures pre- and post-intervention, Jasp.

Results

Results are shown in Table 1. HRV analysis pre- and post-AVY sessions revealed significant changes in autonomic modulation. A decrease in the LF/HF ratio ($p = 0.038$) and a pNNxx (%) increase ($p < 0.001$) post-intervention indicates better autonomic balance and greater parasympathetic dominance. Additionally, RMSSD showed position-dependent variations ($p = 0.021$) regardless of pre- or post-sessions, suggesting the influence of specific asanas on HRV regulation. While SDNN remained stable, reductions in LF and HF suggest lower sympathetic activation and more parasympathetic control, consistent with previous findings on the role of exercise in stress control.

Conclusion

AVY practice regularly enhances ANS function, promoting parasympathetic control and improved stress. Reduction in LF/HF ratio and increase in RMSSD and pNNxx confirm AVY

as a promising strategy for enhancing ANS balance and stress management. The results indicate that ANS modulation occurs, with a positive aspect for the parasympathetic ANS. Postures (asanas) involving control, stability, forward bends, backward bends and twists; breathing controls (pranayama) require mental focus and are an important component of meditation; and the meditative aspect of AVY calms and concentrates the mind (van Aalst, et al., 2020), promoting a shift in the parasympathetic ANS and contributing to ANS modulation.

Table 1. Measurements are presented as mean and standard deviation

	Pre	Post	p
RMSSD (ms)#	47.69 ± 35.56	49.20 ± 29.39	0.021
pNNxx (%)#	23.38 ± 24.23	27.76 ± 23.71	< 0.001
SDNN (ms)	48.37 ± 38.37	46.26 ± 21.48	0.06
LF (ms ²)	2864.14 ± 8920.21	1084.86 ± 1114.68	0.66
HF (ms ²)	1200.30 ± 3256.78	1132.86 ± 2124.71	0.20
LF/HF (ms ²)*	26.86 ± 26.40	18.93 ± 17.97	0.038

Notes: Comparison of HRV parameters pre- and post-intervention, expressed as mean ± standard deviation. * indicates differences between assessment (Pre vs. Post). # indicates differences between positions. ANOVA was used to assess differences. RMSSD (p = 0.021), pNNxx (p < 0.001), LF/HF (p = 0.038).

Acknowledgments

All participants.

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Relationship Between Motor Competence and Physical Activity in Children 6-10 Years Old – A Systematic Review

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Conflict of interest: nothing to declare. **Funding:** This work was funded by National Funds by FCT - Foundation for Science and Technology under the following project UIDB/04045/2020 (<https://doi.org/10.54499/UIDB/04045/2020>).

Motor competence (MC) plays a significant role in predicting physical activity in the youth and is an integral component of youth health and performance. According to Barnett et al. (2009) and Logan et al. (2015), the MC interact with physical activity (PA) during early childhood. This study aimed to synthesise evidence on the associations between MC and PA, training/sports practice, and physical education in children. The review was registered in the PROSPERO and carried out following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines and the GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) framework. 11,294 articles were found in the following databases: PubMed, Web of Science, and Scopus. After the screening phase, the selection was reduced to 18 studies, all of which were randomised clinical trials involving validity and reliability methods, according to the criteria of eligibility. The studies included a total sample of 2858 children aged 6–10 years. As the analysis of the articles revealed, that all the intervention programs were beneficial for the development of MC, regardless of program (duration of program, weekly frequency and session duration) and instrument, as a proposal for

the future, and based on the results of our research, it is proposing an intervention programme lasting 8 to 12 weeks, with sessions lasting 45 to 60 minutes and 2-3 times a week. The TGMD-2, TGMD-3 or KTK could be used as the proposed instrument for assessing motor competence.

Psychosocial and Well-Being Factors in the Portuguese Armed Forces: The Role of Leadership

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Background

International research has demonstrated that negative and destructive military leadership, in conjunction with dysfunctional organisational structures, exerts a significant adverse influence on military personnel. These influences encompass an elevated risk of sexual assault, Post-Traumatic Stress Disorder (PTSD), burnout, and a general decline in health (Britt et al., 2012; Reed, 2004, 2014, 2015; Schuyler et al., 2017). Conversely, positive and constructive leadership, in conjunction with well-structured organisational frameworks, has been associated with enhanced outcomes, including heightened job satisfaction, augmented leader effectiveness, and fortified moral courage (Khan et al., 2020). Leadership and organisational structures have been demonstrated to exert a profound influence on individuals' behaviour, performance, commitment, health, and well-being. In this context, the Portuguese Armed Forces (PAF) assume a pivotal role within Portugal. However, a significant knowledge gap persists concerning the impact of leadership and organisational structures within the Armed Forces on personnel across various domains, including health, Quality of Life (QoL), and professional performance, and the reverse influence of these variables on the leadership and organisational frameworks themselves.

Aims and hypotheses

The main aim is to examine the influence of these leadership styles and organisational characteristics, as well as other relevant factors, on areas such as QoL and the psychological well-being of military personnel.

Methods

This protocol abstract considers the military universe of 20.869 people, which includes Officials, Sergeants and Corporals on active-duty. Online questionnaires will be applied considering leadership variables (e.g., transformational leadership, destructive leadership), psychosocial variables (e.g., burnout, PTSD) and work related variables (e.g., work strain). Both multiple linear and logistic regression analyses will be used to take a closer look at demographics and socioeconomic variables. The Nagelkerke R^2 (Peng et al., 2002) serves as a useful descriptive statistic to assess how well the proposed logistic models fit the data, helping to measure the strength of the relationship between the variables.

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Perception of Health-Related Quality of Life in Franchise Gym vs. Independent Gym in Castelo Branco

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The type of gym a person chooses can impact their motivation and overall well-being, influenced by factors like trainers, structured programs and facilities (NASM, 2018). A franchised gym (FG) operates under a licensed brand, following standardised business models, equipment, and marketing. These gyms benefit from brand recognition and centralised support but must adhere to franchise rules and fees (Dello Russo et al., 2022). An independent gym (IDG) is privately owned and not affiliated with a franchise. This allows flexibility in services, pricing, and equipment but may result in lower brand recognition and limited resources (Budler et al, 2024). Our study aims to explore the differences in perceived motivation and health-related quality of life among clients of franchise gyms versus independent gyms. This study involved subjects from a Franchise Gym (n = 50; 27.3±9.1 years) and from an Independent Gym (n = 30; 27.1±10.5 years), who volunteered to participate in this cross-sectional study. A priori power analysis through G*Power (3.1.9.2) was used to determine the required sample size, considering the following input parameters: (effect size $d = 0.6$; $\alpha = 0.05$; statistical power = 0.70). The required sample size was 54 (27 for each group), which was respected in the

present study. The Shapiro–Wilk test was performed to analyse data distribution. The T-Test for Independent Samples (variables with normal distribution) and Mann–Whitney (variables with non-normal distribution) were used to verify differences between groups. Finally, the effect size (Cohen's d) analysis was used to determine the magnitude of the effect. The motivation was assessed with the Behavioural Regulation in Exercise Questionnaire (BREQ-3), which provided separate scores for amotivation (AM), external regulation (EX), introjected regulation (IJ), identified regulation (ID, integrated regulation (IG) and intrinsic regulation (IM), and the health-related quality of life was assessed with the WHOQOL-BREF that is organised into four domains: physical, psychological, social relationships, and environment. The results suggest that there were no significant differences in motivation between groups. However, the IDG presented higher mean values in all sub-scores of the scale, except for AM and EX. Regarding health-related quality of life, we found differences in physical ($p < .0019$; $\eta^2 = 0.475$; $d_{\text{Cohen}} = 1.901$) and psychological ($p = .002$; $\eta^2 = 0.113$; $d_{\text{Cohen}} = .715$) domains, presenting the FG with higher values. There were no differences in social relationships and environment domains, presenting the IDG with higher mean values. The findings of the present study suggest that the different types of Gyms do not influence participants' perceived motivation but could have a partial influence on the health-related quality of life, particularly the physical and psychological domains.

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Psychological Demands and Challenges of VAR in Football Refereeing

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Conflict of interest: nothing to declare. **Funding:** nothing to declare.

The Video Assistant Referee (VAR) official is a new role in professional football refereeing and may require a high level of responsibility, which can often lead to psychological constraints. Thus, the purpose of this study is to explore the factors and constraints associated with the VAR function in football refereeing. Specifically, this study aims to (1) understand the meaning assigned by referees to the role of VAR in the context of football refereeing, (2) determine the factors that are associated with VAR performance, (3) identify the main barriers associated with the VAR function, and (4) what strategies VARs use to cope with the demands of their role. Participants were 12 Portuguese active professional referees: all full-time VAR in the Portuguese League (n = 8) and VARs in exclusivity during UEFA and FIFA competitions (n = 4). The study has already obtained authorisation from the Refereeing Committee of the Portuguese Football Federation with approval from the Portugal Football School ethics board (ref. n° 11/CEPFS/2021). A thematic analysis approach (Braun & Clarke, 2021) was employed

to explore the context, structure, and meaning of participants' experiences. Thus, individual semi-structured interviews were conducted. Pluralistic guidelines were used to assess the quality of research (Yardley, 2024): (1) sensitivity to the context - the author is immersed in the milieu (i.e., psychologist of the referees); (2) primary analysis were scrutinised by two independent researchers acting as critical friends; and (3) member checking to verify the transcript accuracy and the representation of VARs subjective experiences. The results show that the introduction of VAR is perceived as positive, and several factors (e.g., communication, leadership), difficulties (e.g., subjectivity, bias, scrutiny of the role), and strategies (e.g., emotional regulation, professional development) associated with the role have been identified, which had not been previously reported in the literature. This study contributes to a better understanding of the VAR role through the perspectives of professionals and serves as a starting point for designing potential interventions aimed at enhancing performance and improving the use of the video assistant referee system.

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