

Candidate genes in human athletic performance

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Genetics is the study of heredity in general and of genes in particular. To put it simple, discoveries into the nature of genes have shown that genes express proteins that influence our body's structure and function. For that reason, most areas of biological research have a genetic component, and the study of genetics has a position of central importance in biology.

Genetic research has demonstrated that even though we all share the same genes, small DNA sequence variations existence in a gene's structure and can affect how that gene functions in the body. The most common sequence variations, known as single nucleotide polymorphism (SNP), make us unique and different from everyone else. For that reason, genetics has been hailed as the science of the twenty-first century and attracted the attention of many researchers in different scientific fields, including sports sciences. Indeed, sports researchers have been asked for a long time a question that remains unanswered: what makes an Olympic champion? Nowadays, we are for sure that the answer is closer as ever. Nevertheless, we must not disregard one important factor: the environment stimuli interact with common genetic variants to determine individual characteristics including physical performance.

In general, this evidence has been generated using techniques such as: estimation of the limits of heritability of physical traits; genome-wide linkage scan; study of specific candidate genes. Each of these techniques has provided different but valuable information about the influence of genetics on fitness or performance. We will focus our attention on the candidates' genes that seems to influence relevant fitness and performance phenotypes in general and on the I/D angiotensin-converting enzyme (ACE) genetic polymorphism in particular.

Key words: genes; sports, genome, angiotensin

Talent's detection and selection at scholar sports

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Talent constitutes one of the basic conditions to accede the excellence in the sport competition. Accordingly, this study provides a detailed picture of effective goals and systems within talent development in a scholar sport context. A detailed examination of the goals, nature, and systems of 10 coaches with significant experience in scholar sport was carried out across 3 different sports. Data collection was based in semi-structured interview.

When questioned on which factors characterize potential elite athlete, coaches considered (i) motivation, (ii) psychological behaviours, (iii) physical maturation, and, (iv) interests, as the most important, overlapping the technician aspects and physical skills of the athletes in an initial phase. To finish, the interviewed coaches do not use single methods to select and identify potential talents within their context.

Key words: scholar sport, talent development

Expert performance and the “corre com alma” project: From theory to practice

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Expert performance in sport can be defined as the consistent superior athletic performance over an extended period.

In a revision about the factors that influence the acquisition of expert performance, several authors divide these factors into variables having a primary influence on expertise and variables that have a secondary influence through other variables. So, the authors considered Primary factors those who have a direct influence on the acquisition of expert performance and include all elements that an athlete contributes (either intentionally or unintentionally) to their own performance. Generally, they can be categorized into genetic factors, training factors and psychological factors. Secondary factors present an indirect effect over those ones and can be set as socio-cultural factors, such as the importance of a given sport in society, Instrutctional resources and Familial support, and on the other hand, Contextual factors, such as, Sport maturity and Depth of competition.

Knowing that Rio Maior city, a small town with about 15.000 habitants that already present 8 Olympic Athletes and provide a sport complex with excellent conditions, Olympic Preparation centre and a Sport Science School, we present the “Corre com alma” project.

The “Corre com alma” Project goals are, over the developed work and of the building synergies between all the available structures, help all competitive level athletes (fun runner to Olympic) to develop their athletic performance and living joyfully.

Key words: expertise, athletics, running, “corre com alma” project

The excellence in sport: Life story of a top-level volleyball player

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During the last years, the interest in studying the excellent athlete has increased (Williams & Ericsson, 2005). Several authors talk about some interesting topics, even though they deserve further research. This way, it becomes urgent to further investigate this issue, so that it becomes possible to gather more data concerning the athlete's interpretation of his own experience, the principles which guide his actions and the meaning of his behaviors. The aim of this study was to identify the values and the references that guide Willian Reffatti da Costa, a Brazilian volleyball player. As player of the Infantile/Juvenile Male Selection of Brazil (under 17 years old) he won the South American Championship (2004 and 2006) and as player of the Juvenile Male Selection of Brazil (under 19 years old) he won the World Championship in 2007.

The research technique used was "life stories". The data was collected by carrying out in-depth interviews and non-participative observation. The technique employed for this qualitative analysis was the content analysis as well the software QSR NVivo 8 to code the transcripts of the interviews.

Among the concerns that have followed his career, we can highlight his great passion for his activity and proud to play in Selection of Brazil. In terms of ambitions, we can point out the will to do his best every day, with training and suffering, looking for his goals in the way to win all championships. He regards difficulties that arise as being indispensable to a process of perfection. The absence of his family distressed him when he was younger. The most important moments of his career were when he achieved good results and the ones that generate more suffering are those when he had injuries. For him, the sport was and still is a school, where he learns a lot of things important for the life, like responsibility, sincerity and humility.

Key words: volleyball, performance, career

Theoretical and practical performance analysis in game sports

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Experiences from long years of research have led to the insight that one has to distinguish conceptually between theoretical and practical performance analysis. The main task of theoretical performance analysis is the enlightenment of the structure of sports. It produces lawful descriptions and the main methods are modelling and simulation. Recently, methods of dynamical systems theory were more and more frequently applied to solve these tasks.

Practical performance analysis is dedicated to produce practical information for training in sport. Here, we find dominantly contributions achieved by using qualitative research methods. Typically the access to the field is also a dominant problem in this area. To point it out very clearly: theoretical and practical performance analysis are two areas of research that have different tasks, use different methods and look for different results in their work. Especially in game sports the structure of the performance is not simple and straightforward. The observable behaviour has to be considered as the result of a dynamic interaction process between the two opponents (opposing teams). So, neither general laws on the structure of game sports nor practical hints for training are easy to obtain.

The theory of dynamical systems presents a series of conceptual advantages for description and simulation of game sports. It allows to represent dynamical (time variant) properties, and by the model of different attractors also to describe the interaction between the opponents. Classical concepts of dynamical systems theory, like attractors, bi-stable systems or state dynamics find corresponding structures in competition quite easily, at least on a metaphoric level of argumentation. There are already quite a few successful models and simulations in this area: Relative phase, perturbations, and Markov chain modelling.

Insight in the complex nature of the process of generating hints for training from analyses of sports performances has led to a decision for qualitative research methodology in this area. The development of a strategy against an upcoming opponent for example can not be carried out in an algorithmic and deterministic manner, but has to reconstruct behaviour of my own team and the opponent from video, to anticipate the interaction of the two teams, and to develop measures on this base. For this purpose we have developed “qualitative game analysis” using computer based video analysis together with qualitative research methods. There have been successful implementations in handball, beach-volleyball and football so far.

Key words: coaching, performance analysis, dynamical systems, simulation, qualitative game analysis

Explanations for varying opposition effects in sports performance

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Interacting Performances Theory (O'Donoghue, 2009a) is made up of 4 elements, one of which is that different players are influenced by the same opponent types in different ways. Further quantitative evidence has been provided to support this element of the theory (O'Donoghue, 2009b). However, the mechanisms by which the performances of different players are influenced by the same opponent types in different ways have not been explored. A theory should not only identify such patterns but also explain them. Therefore, the purpose of the current investigation was to interview 3 coaches of different individual game sports to discuss preparation for competition as well as tactics and strategy that are developed for matches.

The interviews were transcribed verbatim and analysed using the inductive content analysis approach described by Côté, Salmela and Baria (1993).

Performance between a player and the opponent was reported to be influenced by the relative strengths and weaknesses of the player and the opponent; these include physical, technical and mental strengths and weaknesses. The strengths and weaknesses of different players were reported to arise from genetic talent factors as well as long term and short term preparation for competition. Players also develop sport specific abilities by competing in the sport which has a training effect. Ultimately, a player will choose to play a match in a way that maximises their opportunity to use their own strengths, exploit opponent weaknesses, avoid their own weaknesses and avoid opponent strengths. The interview research has provided complementary evidence to support the performance analysis evidence for Interacting Performances Theory. However, there were limitations to the approach as the coaches were interviewed away from the performance coaching setting.

Future research allowing players or coaches to reconstruct how they prepared for competition, having retrospectively viewed performances and opponents would allow data to be gathered from coaches in a situation closer to that of the sports performance environment.

Key words: coaching, performance, opponents

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Game related statistics in the final result and set's type on male volleyball

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Game analysis (GA) allows the interpretation of the organization of the teams and the identification of the game statistics that compete for the increment of competitive performance. The aim of this study is GA high sport performance Volleyball, namely: the discriminatory power of the Volleyball game moments depending on the result.

The statistics of all the games n=122 games of the European Championship and European League of 2007 (male seniors) were analyzed using the Software Data Volley, having divided the game in three moments (initial set, intermediate sets and final set). For the handling of the data, regression logistics was the resource using the forward stepwise model. The results show that even though the games can vary between 3 to 5 sets, as the end approaches, there are variables with a weight predicting victory or defeat.

In the 1st moment (initial set) the points gained, the opponent errors and the serve errors stand out. In the 2nd moment (intermediate sets) the points gained, the opponent errors, the serve errors and the number of services stand out. In the final model, the 3rd moment of the game - last set (independently of being the 3rd, 4th or 5th set) is a unique game moment, not having to transfer any of previous sets. The result is seven variables regarding the gained points, the opponent errors, the reception errors, the points gained with the block, the percentage of positive receptions, the number of attacks and the points gained with the serve. In this sense, they enhance the game procedures that allow the prediction of the importance of the 3rd moment and last set as decisive to win the game. In general, it was possible to verify that the game statistics discriminate according to the result (victory) and of the game moment.

Key words: game analysis, game statistics, game moments, performance, volleyball

Basketball critical game moments: A special focus on perturbation factors

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Perturbation factors are defined as the game events that can modify the competition's dynamic (Hughes, Dawkins, David & Mills, 1998). They can introduce critical moments on the game and have an instantaneous effect on the balance relationship between teams. This paper aims to study the critical moments of basketball games focusing on perturbation factors defined in the context of this sport game.

Perturbation factors from 80 Portuguese Basketball League games were observed. All of them were reconstructed in their evolution of Points Difference (PD) per Ball Possession (BP). Three different groups of game events were considered as the perturbation factors: Player's Limitations, Intentional Game Interruptions and the Disciplinary Interventions. A critical game moment was registered when a determined PD was associated with a number of BP before and after the events' occurrence in the BP match line. The methodological criteria to identify the critical game moment was supported by a previously study centred on coaches' practical game knowledge (Ferreira, Sampaio, Ibañez & Volossovitch, 2008). Critical moments were compared between three dependent variables: the game quarter of their occurrence (the first three quarters vs. last quarter), the game balance (even vs. uneven games) and the game success (winner teams vs. loser teams).

In the first three quarters, each critical moment was defined by the relationship between 7.04 (+/-1.45) BP and 6.74 (+/-0.96) PD. These values configure a statistical difference ($p \leq 0.01$) for the game quarter occurrence variable ($t=7.43$ $df=265$ for the BP and $t=13.46$ $df=265$ for the PD). No differences were found for the game balance variable. For team success comparison was obtained statistical differences for the first three quarters ($t=3.20$ $df=144$; $p \leq 0.01$) and for the 4th one ($t=2.84$ $df=144$; $p \leq 0.01$).

Despite the methodological differences between the identification process of the critical moments on two main game parts, there are reasons to understand these episodes with different lengths (number of BP) and different consequences (PD implication) when these two temporal blocks are compared. The winner teams have the benefit to provoke more unbalance game episodes. Further studies have to clarify the characteristics of each perturbation factor and the qualitative profile of the critical moment provoked.

Key words: basketball, perturbation, critical moments

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Does the relationship between the past teams' performances during the match and the probability of scoring depend on the match quality?

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The result of the ball possession in sport games is always a consequence of the mutual influence of both playing teams' performances. The present study aimed to evaluate whether the past offensive and defensive performance of handball teams affects the probability of scoring during the match and to examine how this influence varied in function of the match quality, measured by the sum of the rankings of playing teams.

The data from 32273 observations of ball possessions were pooled from a panel database. This information was obtained from 224 matches from the 17th, 18th and 19th Men's World Handball Championships. It was assumed that matches were independent and each match produced data for two opposite teams. The data were used for the estimation of a linear probability model for the probability of scoring in handball match as a function of the past offensive performance of both teams and the point difference between teams in the last ball possession. The time-varying parameters were modelled according to an auto-regressive process of order one. It was tested how the influence of past performance on the probability of scoring differs in the matches with weaker (lower ranking sum) and stronger (higher ranking sum) teams. The results of model estimation suggest that the probability of scoring does not depend on the past offensive performance of the own team, but depends on the past offensive performance of the opponent (the own team defensive performance) and on the point difference in the last ball possession. The match quality influences the effect of the past teams' performance and the point difference on the probability of scoring during the handball match. In the matches between stronger teams the effect of the efficacy of the opponent on the probability of scoring approaches zero, becoming non-significant, while the influence of the point difference changes sign, becoming negative.

There are numerous studies that had confirmed the differences between game patterns of strong and weak teams (Lidor & Arnon, 1997; Vuleta, Milanovic, Gruic & Ohnjec, 2005). The findings of this study gave evidences that in higher quality matches the teams are more resilient and adapt better to the negative situations of competition. The competitive success of the strong teams is less dependent on the opponent past performance and score advantage. That is why the matches between strongest teams are less predictable.

Key words: game patterns, teams, matches

Lidor, R. & Arnon, M. (1997). Correlational relationships between technical variables and final placing of basketball teams. *Coaching and Sport Science Journal*, 2(2), 39-47.

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Preliminary considerations and results about self-organization in Basketball games

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In the last few years team sports are being studied within a complex adaptive systems approach. From this perspective, the importance of game complexity, team self-organization, non-linear and multidimensional performance models has been growing from micro to macro issues. One interesting topic to investigate is team self-organization in a way to detect behavioural transitions that may define periods of stability and instability in game dynamics. This study has the aim of identifying the variability in confronting teams' efficacy in several different game conditions (outcome, location and final score differences). Play-by-play data was gathered for all 34 regular season games played by one Spanish first level basketball team (2004/2005). Data was introduced in BSK software in order to calculate partial in-game efficacy (points scored per 100 ball possessions) according to all studied contextual factors for confronting teams. Relative phase was calculated by Hilbert transform, as we have considered teams' efficacies as two time-series of two coupled oscillators and quantified their interaction by measuring the phase difference between the signals. Data reliability was high (above 0.90). The obtained results allowed for establishing different stability and instability periods across conditions. Although there was a clear tendency for in-phase behaviour, describing synchronicity between teams' efficacies, there was a large variation between conditions. Most variability in relative phase was identified in the first and in the fourth game periods. There was a contrast between home and away games and winning and losing games. Also, there was a clear interaction between game outcome and game final differences. Although preliminary, the results may suggest that basketball teams' self-organization influences game performance across the different game conditions.

Key words: basketball, self-organization, game periods

Analysis of rugby teams performance that best discriminate between winning and losing teams in IRB and Super twelve competitions

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Currently, the development and competitive level reached by the rugby game has been demanding performance levels to reach a higher standard. In this sense, the acting of the team in training or competition situation should be analyzed to the detail. The analysis of the game has been little explored to characterize, to monitor and to evaluate the performance in rugby games. The aim of the present study was identifying the variables of actions of the game and result that best discriminate between winning and losing teams. Likewise we intended to identify these tendencies for the games that the end result was more balanced, unbalanced and very unbalanced. This type of analysis will be accomplished independently for an IRB and Super 12 group.

The data used in the present study were obtained starting from two bases: 1) Rugby Stats Fair Play Sports Analysis Systems and 2) Rugby Match Analysis and Statistics. The sample was constituted for 342 rugby games. For the effect we formed two groups: (i) Group IRB constituted by 135 belonging games the: Rugby World Cup (RWC) of 2003; Rugby World Cup Sub 21 of 2005; Six Nations of 2004, 2005 and 2006 and tournament of the Tri Nations of 2004 and 2005 and (ii) Group Super 12 constituted by 207 games belonging to the tournaments of the Super 12 of 2003, 2004 and 2005. The games was contain according to their final score difference, trying to investigate that way tend to associate amongst themselves in terms of difference in end result. The variables that were analyzed were subdivided in variables of actions of the game (e.g. passes, penalties conceded, turnovers) and result variables (e.g. tries, conversions, penalty kicks). The statistical procedures i) initial explore analysis, ii) cluster analysis and iii) discriminante analysis, allowed to associate games to each other, having been defined by us as grouping criterion the difference in the game final score. We separated and classified groups of data with the aim of finding a linear function that it defines the maximum separation among groups that is, to evidence which the most powerful variables in the classification of the subjects in the 3 clusters groups.

The results allowed finding that the balanced games happened in larger number and the largest contribution for the game final score occurred of the tries scored. The winners in the balanced games had more tackles made, they made fewer mistakes in the use of the ball and they varied more your game. In unbalanced games, the winners in the group IRB, they won more balls in the lineouts and they were more effective in the defence (less tackles missed). These variables discriminate the groups, IRB ($SC=-0.43$) and ($SC=-0.42$) and Super 12 ($SC=-0.34$) and ($SC=-0.38$). In the very unbalanced games the winners they have more penalties, more penalty conceded and they missed more tackles. The differences in groups (IRB and Super12) it occurred for the values of tries scored and conversions, IRB ($SC=0.53$) and ($SC=0.46$) and Super 12 ($SC=0.72$) and ($SC=0.57$).

To understand the reasons that contribute to the success or failure of the teams in games balanced, unbalanced and very unbalanced, it allows turning the most specific training and it contributes decisively to the improvement of the sport performances.

Key words: rugby, game analysis, categories of games, discriminante analysis

Early sport involvement in Portuguese young basketball players

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At this time, various procedures have been used to examine the activities that promote sport expertise throughout the lifespan. Still, no standardized method with high reliability, high validity, and high discriminatory power has been proposed to collect data and characterize expertise development in team sports. Moreover, the problems are reinforced due to the absence of facts that help a better understanding of the initial stages of development. Thus, the purpose of this study was to analyze the early sport involvement in young basketball players.

To accomplish this, 750 young basketball players filled out a previously validated questionnaire based on retrospective information related to the training activities performed during their involvement in sport. The sample was divided according to the gender and competition group level: A (male n=190; female n=188) and B (male n=233; female n=139). To test for statistical differences among the four groups' answers on their involvement pattern in all long-term developmental variables, non parametric Mann-Whitney U tests were performed. Significance was accepted at 5%. Bonferroni adjustment was applied to correct for multiple tests. All data were analyzed with the statistical package SPSS for Windows, release 16.0 (SPSS Inc., Chicago, IL).

The results supported that long-term player development starting age in all groups occurs preferentially between 6 and 10 years (male: A=87.4% and B=81.5%; female: A=83.0% and B=80.6%). These results are confirmed by the Basketball starting age, as the majority of elements of both groups started practicing basketball between 6 and 10 years of age (male: A=71.1% and B=53.6%; female: A=54.8% and B=46.0%). However, these results suggest the existence of a trend whereas a significant number of players reported started practicing later, e.g. between 11 and 14 years of age (male=38.3% and females=48.9%). Results also confirmed that both male and female of group A have longer seasons, which average 10 months, while the subjects in group B reported practicing during 9 months.

Breath of exposure to other sports during the developmental stages was also examined. However, differences between groups didn't allow us to establish clear distinctions between players when related to the gender and competition group level. One important finding was that, during the initial stage of development, male preferred (besides basketball) other team sport, while female privileged individual sports. Finally, results also suggest that both male and female belonging to the higher group level spent more time practicing. This evidence was identified during the initial early stages of development, initiation and orientation (during initiation, nearly 40% of the male Group A and 50% of the female Group A reported spending more 240 minutes a week, while in Group B barely exceed 30%).

Key words: basketball, young players, training activities

The ecological dynamics of 1v1 sub-systems in association football

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The purpose of this study was to analyze the informational constraints that influence the dynamics of 1v1 situations in football, from an ecological dynamics perspective. Participants were six, U13 level football players (Mean age: 11.8±0.4 yrs), who performed 5 1 v 1 trials each at four different start distances (1, 1.5, 2 and 2.5 meters) between the defender and the ball (5 repetitions x 6 players x 4 distances = 120 1v1 trials). We simulated performance constraints by creating a 1v1 competition. The task consisted of a representative situation in which the attacker tried to destabilize the dyad to create shooting opportunities, and the defender tried to maintain system stability by preventing the attacker from shooting. Players' motion was captured by digital video camera. For image treatment and to extract data on player movement coordinates, we used the TACTO 8.0 software, digitizing action at 25 Hz. The procedure consisted of following with the mouse the working point earlier tested After 7-days of training, the reliability of digitizing action was $r=0.99$ to x , and $r=0.98$ to y coordinates. After the calibration with real measures of six control points, the x and y coordinates of the players were extracted. Subsequently, data were analyzed with MATLAB software. Results showed no statistical differences for all outcome measures analyzed to discriminate differences between the various initial start distances (percentage of time spent in symmetry, anti-symmetry and undifferentiated state; time and distance to the end line of first and last phase transitions; and the number of zero crossings). We defined a potential order parameter as the proximity of the players to the goal in two qualitative states: (1) when the defender was nearer the end line than the attacker, and (2) when the attacker passed the defender and approached the end line. We analyzed the contribution of interpersonal distance and relative velocity to explain phase transitions that occurred between these coordinative states in 1v1 in football. We constructed plots with the time-series of these two control parameters candidates associated with the time-series of players' distance to the end line. Graphical inspection showed in all trials a clear tendency for greater relative velocity and lower interpersonal distance values during phase transitions between coordinative states. To confirm this interpretation, we computed a time-series analysis of Z-scores of relative velocity and interpersonal distance data, and a time-series analysis of Z-score differences between these variables. Mean data showed that maximum peaks in Z-score differences were related to all phase transitions. Results revealed could have several implications for training task design in team games. Players should be encouraged to explore the appropriated information to maintain/destabilize a 1v1 sub-system. At critical values of interpersonal distance, attackers can destabilize dyads by altering the difference between his/her velocity and the defender's velocity. We observed that the same physical variables constrained the dynamics of performer-environment interactions despite variations in the initial start distances between players.

Key words: ecological dynamics, interpersonal distance, relative velocity, informational constraints

Effects of different practice task constraints on fluctuations of player heart rate in small-sided football games

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This paper analyzes effects of different practice task constraints on heart rate (HR) variability during 4v4 small-sided football games. Participants were sixteen football players divided into two age groups (U13, Mean age: 12.4±0.5 yrs; U15: 14.6±0.5), who performed one trial under three different practice task constraints. The task consisted of a 4v4 sub-phase without goalkeepers, on a 25x15 m field, of 15 minutes duration with an active recovery period of 6 minutes between each condition. We recorded players' heart rates using heart rate monitors (Polar Team System, Polar Electro, Kempele, Finland) as scoring mode was manipulated (line goal: scoring by dribbling past an extended line; double goal: scoring in either of two lateral goals; and central goal: scoring only in one goal). Subsequently, %HR reserve was calculated with the Karvonen formula. Data showed that HR during the break after the initial warm-up was similar to the other two rest periods ($P \geq 0.05$). After confirmation of mean differences between active breaks and exercise bouts ($P < 0.05$), rest periods were excluded from analysis. We next performed a time-series analysis of HR for each individual in each condition. To analyze intra-participant variability we used an autocorrelation technique. To examine inter-participant variability we used percentage of coefficient of variation (%CV) and percentage of root mean square difference (%RMSD).

Mean data showed that autocorrelation function was associated with more short-range dependence processes in the "line goal" condition, compared to other conditions, demonstrating that the "line goal" constraint induced more randomness in HR response. Relative to inter-individual variability, line goal constraints demonstrated lower %CV and %RMSD (U13: 9% and 19%; U15: 10% and 19%) compared with double goal (U13: 12% and 21%; U15: 12% and 21%) and central goal (U13: 14% and 24%; U15: 13% and 24%) task constraints, respectively. Results suggested that line goal constraints imposed more randomness on cardiovascular stimulation of each individual and lower inter-individual variability than double goal and central goal constraints. Quantifying variability in human movement can lead us to understand how different practice task constraints affect the dynamics of the performer-environment interactions

Key words: task constraints, time-series analysis, fluctuations

Observation and analysis of the game of Rink-Hockey: The game field and the performance of the players

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Rink-Hockey is one of the team sports which make the least use of the expertise of scholars and researchers, fact which may affect the future of the game, because its development depends on technical expertise and research. This study aims to contribute to a better knowledge of this sport, providing information about the game and analyzing the performance of the different players pertaining to shooting, goal scoring, loss of ball possession and repossession of the ball, in the different game field (rink) zones, aspects which are important for coaching, in order to improve the athletes' performance.

The research question of this study is to verify how the rink zones determine the frequency and the efficiency of the rink-hockey players' actions and the proposed hypotheses are the following: 1. The average frequency and efficiency of rink-hockey players' shooting at goal are higher in central than in lateral corridors of the attacking half of the rink zones (goal area, intermediary and central); 2. The average frequency of ball repossession and the average efficiency of ball possession are higher in defensive than in the attacking half of the rink zones (end barrier, goal area, intermediary and central).

The instrument used to collect and process information (RHOP – Rink-Hockey Observation Program) was developed to be applied employing direct observation, using Microsoft Excel. Four categories were selected to carry out the observation (shooting, goal scoring, loss of ball possession and ball repossession) and the rink was divided into eight zones and twenty sectors. In order to test the proposed hypotheses a sample observation, constituted by five rink-hockey games of a Portuguese team (SL Benfica), in the first league 2008-09 season, was carried out. The analysis of the statistical data was founded on typical measures of central tendency (arithmetic mean) and dispersion (standard deviation) and specific efficiency indicators (shooting and ball possession efficiency) to enable a descriptive analysis. In some cases, despite the reduced size of the sample, an inductive analysis was performed using the Student's t-test.

Research findings show that the positioning of the rink-hockey players in the central corridor of the attacking half of the rink zones is a determinant factor in finishing the attacking move, revealed by a higher frequency of the shooting action; the positioning of the players in the opponent team's goal area is connected with higher goal scoring; the positioning in the defensive half of the rink, nearest to the goal area, facilitates ball repossession, trend proved by the highest registered frequencies; and, finally, the rink-hockey players best performances regarding ball possession efficiency are related with their positioning in the defensive half of the rink.

According to the results of this research, some recommendations for rink-hockey coaching purposes are presented regarding the performance of the attacking player in the goal area, decision to shoot, counter-attacking and loss of ball possession.

Key words: rink-hockey, game field, players

Strength in Power Events: Theory and practice

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During the last 30 years, strength and power training has been a major issue for, coaches, athletes and researchers. Unfortunately, despite the increasing professionalization of coaches and athletes, there is little research data concerning performance in top athletes. In fact, experimental studies in high level athletes are very difficult to put into practice for many reasons. However, such considerations ought not to detract from the necessity and importance of this type of research in strength and power events. Many experiments demonstrated that a specific strength training program can improve athletes' maximal force and power production, reduce the incidence of injury, and contribute to faster injury recovery times, thereby minimizing the number of missed practice sessions and competitions. But, to our best knowledge, there is no apparent consensus on the appropriate method of strength and power training to enhance performance, especially in typically power sports. Therefore, the aim of this paper was to ask practical questions: How much strength should be employed? Is maximum strength the main issue? Is power and rate of force development the key? Is periodization of major importance?

Key words: strength, power, periodization

The effects of an in-season resistance program on starters and non-starters in elite male volleyball players

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Team Volleyball requires not only technical and tactical skills but also great deal of physical fitness. The aim of this study was to investigate the changes in physical parameters produced during an in-season resistance training (RT) program and detraining phase in 12 top TVP competing in the elite Portuguese league. Moreover, differences in the adaptive responses between players who played most of the times (starters: S) and players that were mainly used as substitutes (non starters: NS) were analysed.

Twelve elite healthy male TVP voluntarily participated to the study. We monitored the squad throughout a 12-week competitive in-season consisting of 14 games using a longitudinal study design. Apart from normal technical/tactical practice sessions (2-3 hours per day) and weekend competitions, all underwent 12 weeks of RT program. Upper and lower body maximal dynamic strength, jump and ball throw distance were tested at three intervals: before the experimental period (T₁) and after the 12-week experimental period (T₁₂).

Of the grate interest of this research was the lack of any interactions for group (S or NS) by time effects for any of the tests, except for bench press. Here, S demonstrated superior upper body strength values after 12 weeks ($p=0.025$), indicating that both groups responded similarly to the training program.

The combination of a RT and volleyball training resulted in larger improvements in both groups. Thus, while no differences appear to exist in performance between starters and non-starters, it was shown that most performance variables for ST and NS can be improved with a comprehensive strength and conditioning program for top volleyball players.

Key words: maximal dynamic strength, jumping, sprinting, ball-throwing speed

Comparative analyses of dynamical and kinematic variables of different vertical jumps

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The main aims of this preliminary study were: (i) to assess a group of relevant dynamical and kinematical variables to study the vertical jump; (ii) to analyse the differences between vertical jumps with and without counter-movement, based on the abovementioned variables (Stretch Shortening Cycle - SSC versus no SSC) and between different SSCs (longSSC versus shortSSC); (iii) to establish the relations between neuromuscular factors gained during the vertical jumps analysed.

Nine students of the 4th year of the Physical Education and Sport Course, without relevant sports history, performed five times each type of jump [squat jump (SJ), counter-movement jump (CMJ) and drop jump (DP)]. The best jump of each subject in SJ, CMJ and DP was selected, according to the maximal height accomplished. Dynamical and kinematical data were acquired with a force plate AMTI BP2416 with a 1000 Hz of frequency and 2 video cameras JVCg800 with a 100 Hz, being the data analysed with the Software SimiMotion 6.1, using the adapted gravity centre model of Dempster. The results pointed out differences in the performance between different jumps. The maximal height was 48, 44 and 42 cm in the CMJ, DJ and SJ, respectively. Thus, the SSC jumps presented best results in relation to the no SSC jumps. Concerning the displacement, a difference between the longSSC and shortSSC was noticed. The DJ presented a lower decrease of the centre of mass and a difference of 22.8 cm to the CMJ was found. Significant differences between the no SSC jump (SJ) and the SSC jumps in the beginning of the propelling phase were observed. For example, at null velocity, SJ showed only 944 N (corresponding almost to the weight of the subject) and in CMJ and DJ the force was 2.5 and 3.5 times higher. The duration of the lift phase, as expected, was lower in the shortSSC. Concerning the force and muscular power, an increase in the SJ, CMJ and DJ was verified: peak force of 2188, 2131 and 3577 N and mean power of 1977, 2200 and 2884 W, respectively.

With this study we attempted to associate dynamical and kinematic data to vertical jump performance, analysing the relations between the variables of cause-effect and the jump performance. The relations described in previous studies (e.g. Bobbert, Gerritsen, Litjens, & Van Soest, 1996) were verified considering jumps with and without SSC and between longSSC and shortSSC.

Key words: jumps, dynamical, kinematics

Bobbert, M.F., Gerritsen, K.M., Litjens, M.A., & Van Soest, A.J. (1996). Why is counter-movement jump height greater than squat jump height? *Medicine and Science in Sports and Exercise*, 28(11), 1402-1412.

Structure and evolution trends of the external load in uneven bars: Analysis of the rotations in competition routines

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Although the Artistic Gymnastics is referred as a sport associated to high volumes and intensities of training, there are few objective studies to support these conclusions. Purpose of the present study was to characterize and evaluate external load trends in high level uneven bars routine, based on the rotations analysis. Through the observational methodology, we constructed and validated an observation category comprising thirteen variables considered as indicators of the external load in uneven bars. We observed 104 uneven bars routines from world championships and Olympic Games finals between 1989 and 2008. As main results we observed significant increases in forward and backward rotations in support, in longitudinal rotations in support, direct rotations of 360° and in "in bar" elements with longitudinal rotation. We may conclude that: a) gymnasts executed much more backward than forward rotations on the transverse axis in support and in aerial phase; b) volume of the rotations on the longitudinal axis in support position presented a big evolution, increasing the complexity of the movements; d) In the present gymnasts don't execute any longitudinal rotation in hang position.

Key words: women's artistic gymnastics, uneven bars, external load, rotations

Tensiomyography in physical rehabilitation of high level athletes

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The proprieties of a skeletal muscle were examined using the method Tensiomyography (TMG) in team sports (football, rugby, handball and basketball) with high-level athletes who contracted a skeletal muscle injury. This lesion was confirmed by a magnetic resonance image procedure (MRI). The analysis by the TMG is performed during the rehabilitation process. This approach is considered a non-invasive method, allowing the recording of changes in muscle in the following parameters: time of reaction, time of contraction, maximum displacement, time of relaxation and time of during contraction.

This method endorsed to analyze the muscular reaction to the process of rehabilitation training.

TMG measurements should be continuous with the sports teams. The changes in contractile properties of the muscles of each athlete should be examined to allow controlling the training process. This aim could help avoiding injuries and to recover completely from those. The optimization of the training method could be achieved with TMG.

Key words: tensiomyography, performance, evaluation

Effects of physical resisted exercises on functional autonomy of pregnant women

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The resisted exercise, as weight training, has been pointed on pregnant programs as a strategy on reduction of organic alteration due to pregnancy, supporting a better execution of daily life activities (AVDs). The objective of the present study was to investigate the effects of resisted exercises on functional autonomy of pregnant women. During the study, 11 non-trained pregnant women were used and divided randomly, in a balanced way, in an experimental group (GE = 6) and a control group (GC = 5) among patients of the Health School Center of the University of Pará/UEPA. The GE was submitted to a resisted training program during 16 weeks, along three weekly sessions. Both groups were submitted at the beginning and the end of the study to the following proceedings: a) anthropometric valuation, b) strength test, c) stationary march test and d) autonomy valuation test. The statistic test used in order to measure the effect of the treatment was ANOVA, and the results obtained from the experimental and control groups were confronted, determining the alpha level = 0.05 in order to reject nullity hypothesis. All the produced statistic tests were supported by the computer software BioEstat 5.0. The results of the tests applied on pregnant from group GE and GC pointed, respectively, the maintenance and reduction of physical-functional capacity of them on doing ordinary tasks of daily life, like sitting and getting up from the toilet – LSVS ($p= 0.0568$ and 0.0059), going in and out to bed – LCD ($p= 0.0568$ and 0.0059), climbing stairs – SDE ($p= 0.7731$ and $p= 0.0116$); reach, move, walk an set things – ADCD ($p= 0.9994$ and $p= 0.0057$) and crouch, hold and walk – ASC ($p= 0.9474$ and $p= 0.0130$). Besides that, pregnant from group GC showed expressive reduction on right hand strength test – STRENGHT D ($p= 0.0218$) and the strength of left hand – STRENGHT E ($p= 0.0046$) and stationary march – MARCH ($p= 0.0029$). While pregnant from group GE did not show any decrease of STRENGHT D ($p= 0.9173$) and STRENGHT E ($p= 0.2068$), and also obtained expressive autonomy increase on March test - MARCH ($p= 0.0040$). Thus, the test results suggest that pregnant from group GE were physically independent in order to accomplish daily life situations, compared to sedentary pregnant from group GC. Therefore, it is possible to conclude that the program of physical resisted exercises of moderate intensity, applied on pregnant from group GE, three times a week, during close 16 weeks, was able to afford organic alterations in different components of physical aptness and help on the maintenance of functional autonomy.

Key words: resisted exercise, pregnancy, functional autonomy, physical tests

Workplace gymnastics: A contribution to the health and well-being of the worker

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Workplace gymnastics (WG) comprises physical exercises carried out in the workplace with the aim of reducing the strain of repetitive movements and incorrect posture, alleviating stress and improving the quality of life of the workers.

The study objective was to confirm how WG can contribute to the health and well-being of the worker by means of noting changes in stress levels, and the intensity and topography of pain. Group Study: five female individuals, workers at the care home Lar Jorge Reis, Porto/Portugal. Execution of the Programme: the application of stretching and relaxation exercises for twelve weeks, with three weekly sessions of between fifteen and twenty minutes each. Used: 'Questionário de Topografia e Intensidade da Dor' (Questionnaire for the Topography and Intensity of Pain), a Questionnaire on Occupational Stress, designed for the USA Community and Public Sector, and a semi-structured interview.

Results of the group, noticed a drop in stress levels; a reduction in both the intensity and number of cases of bodily pain, principally in the shoulders, neck and lumbar region; all members of the group noticed an increase in integration with colleagues and an improvement in mood.

In this case study it was confirmed that there was a reduction in stress, a lessening of pain and fatigue, and an improvement in both mood and disposition to work. It can be noted therefore that (WG) makes a positive contribution towards the quality of life and health of the subjects depending on the extent that businesses adopt programmes aimed at improving the quality of life of their employees.

Key words: workplace gymnastics, health, workers

Modelling swimming hydrodynamics to enhance performance

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Swimming assessment is one of the most complex but outstanding and fascinating topics in biomechanics. Computational fluid dynamics (CFD) methodology is one of the different methods that have been applied in swimming research to observe and understand water movements around the human body and its application to improve swimming performance.

CFD has been applied attempting to understand deeply the biomechanical basis of swimming. Several studies have been conducted willing to analyze the propulsive forces produced by the propelling segments and the drag force resisting forward motion.

CFD technique can be considered as an interesting new approach for evaluation of swimming hydrodynamic forces, according to recent evidences. In the near future, as in the present, CFD will provide valorous arguments for defining new swimming techniques or equipments.

Key words: CFD, swimming, evaluation

Can 8 weeks of training in female swimmers affect active drag?

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Hydrodynamic drag is the force that a swimmer has to overcome in order to maintain his movement through water and is influenced by velocity, shape, size and the frontal surface area. Thus, the aim of this study was to assess the effects of 8 weeks of training on active drag in young female swimmers.

Eight females age group swimmers belonging to the same swimming club participated in this study. Active drag measurements were conducted in two different trials: at the beginning of the season and after 8 weeks of training. The velocity perturbation method was used to determine active drag in front crawl swimming.

After 8 weeks of training, mean active drag decreased, although no significant differences were found between the two trials. No significant differences were observed in swimming velocity between the two trials.

It seems that 8 weeks of swimming training were not enough to allow significant improvements on swimming technique. One can recommend that specific training sets concerning technique correction and improvement in young swimmers should be a main aim during training planning.

Key words: young swimmers, technique, drag, training effects

Longitudinal assessment of swimming performance in the 200-m freestyle event

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Several studies have been carried out in order to identify the factors that can predict swimming performance. However, all these studies only analyzed determinant factors in a single time moment. It was not taken into account the longitudinal stability and change, as a result of individual development, new training methods and technological sophistication. The aim of this study was to track and analyze the stability of the 200-m freestyle performance throughout the swimmer's career, from children to adult age.

Twenty nine Portuguese male swimmers were analyzed for seven consecutive seasons between 12 and 18 years old.

Swimming performance was collected using the best personal time in the 200-m Freestyle event in each season. Performances were collected from official competitions, on a short course pool (regional, national or international level). The official times were consulted on rankings tables provided by the Portuguese Swimming Federation and in an internet database (www.swimrankings.net, March 2009). At the age of 18, 7 were international level swimmers, 15 national level ones and 7 regional level.

Longitudinal assessment was made based in two approaches: (i) mean stability; (ii) normative stability. For mean stability quartiles, means plus standard deviations were computed for each chronological age.

There was a trend for a performance improvement throughout the swimmer's career from children to adult age. Significant variations in the mean swim performance were verified [$F(1,28) = 11815.908$; $p < 0.01$]. Post-hoc test verified significant variations between all chronological ages analyzed ($p < 0.01$) except for the pair wise comparison between 16-17 years old and 17-18 years old that were not-significant.

As a conclusion, the prediction of adult swimmer's performance level, based on children performance is moderate. However, it seems that the change from 13 to 14 years old can be a milestone. At moment the ability to predict the swimmer's performance level increases strongly.

Key words: swimming, performance, evaluation

Heart rate and perceived exertion responses to a body attack routine

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Body Attack is a cardiovascular training program inspired in many sports to improve cardiovascular and strength conditioning. These routines of high-intensity interval training combine athletic aerobic skills with strength and balance exercises. It is not known if this form of routine is as effective as other traditional modes (aerobic high and low impact, step, cycling and running). The purpose of this study was to investigate the heart rate and perceived exertion responses during a Body Attack routine.

The sample for this study comprised ten voluntary young females Physical Education and School Sports students (Age mean=21.5±1.6; Height mean=1.65±0.06; Weight mean=60.3±5.19; BMI=22.1±1.89). The routine comprised a warm up track; seven cardiovascular tracks, three strength tracks and flexibility and relaxation track. The heart rate was measured during the routine using Polar Team System and perceived exertion using Borg's 6-20 scale, immediately after each track. Repeated measures analysis of variance test was used to compare tracks.

The heart rate mean of all routine was 148±16bpm and differences were obtained within performed tracks ($F=701.7$ $p=0.000$). These results were within the cardiovascular target training zone mean from all tested subjects (133±1.2 to 174±1.3). The subjects were near the cardiovascular superior limit (166±16.7bpm) in track 4 and inferior limit in track 3 (135±21bpm). Perceived exertion mean values were 14±2, between the 12-15 suggestions to elicit a training effect. The perceived exertion assessment was higher than other studied modes. Body-attack activity has potential to improve aerobic fitness of its participants.

Key words: cardiovascular, training, evaluation

The influence of obesity, sarcopenia and the characteristics of menopause in the maximum oxygen intake of postmenopausal women

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The objectives were to analyze the variation of maximum oxygen intake (VO₂max) in postmenopausal women, considering: fat mass (%FM), skeletal muscle mass index (SMMI), hormone therapy (HRT) and the time of menopause (TM).

Thirty two women aged 60 to 73 performed a reproductive history and Vo₂max was assessed by a modified Bruce treadmill protocol. Skeletal muscle mass, basal metabolic rate (BMR) and %FM were evaluated by octopolar bioimpedance being the first expressed as SMMI. The cut-off points to obesity and sarcopenia were: FM \geq 35% and SMMI \leq 28%. Student's t test for independent samples and ANOVA with Bonferroni correction were used to compare groups.

The averages of VO₂max and BMR were, respectively, 33.36 ml/kg/min, and 1275.27 kcal/day. In the absence of HT, the women with TM>10 years revealed ($p<0.05$) a lower VO₂max, (-8.38 ml/kg/min), noting that the HT has a beneficial effect in this variable in the presence of TM>10 years (+10.28 ml/kg/min). The obese/sarcopenic women presented average levels of VO₂max inferior ($p<0.01$) to those registered to non-sarcopenic with obesity (-7.88 ml/kg/min) and without obesity (-15.27 ml/kg/min). In the presence of a normal muscular condition, the obesity negatively influenced the VO₂max.

Obesity and its overall combination with sarcopenia create a lower VO₂max. in postmenopausal women, therefore benefiting the use of HT, in the presence of an amenorrhea period superior to 10 years. In the absence of HT, the TM worsens the aerobic capacity.

Key words: maximum oxygen intake, obesity, sarcopenia, hormone therapy and time of menopause

Effect of the verbal interaction of the coach, decrease of the space and number of players in the cardiac frequency and in the subjective perception of the effort in Futsal

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The aim of this study was to examine the impact of changes in pitch size/number of players on heart rate responses, subjective effort perception and technical requirements of small-sided futsal games.

Eight male futsal players participated in the study (mean \pm S.D.; age 11 ± 0.9 years). All players participated in small-sided games on two different pitch sizes/number of players (SSG1 3x3, 12m x 20 m; SSG2 4x4, 16m x 20 m). Games consisted of 4x4 min of game play, interspersed by 3 min of active recovery. Heart rate measurements were made using a Polar Team System and for the registering of subjective effort perception it was used the OMNI- Resistance Exercise Scale. Each game was also filmed to evaluate the technical actions. These tapes were analysed using a hand notation system. Data were analyzed through independent samples t-tests. Statistical significance was set at 5%. All data were analyzed with the statistical package SPSS for Windows, release 16.0 (SPSS Inc., Chicago, IL).

Mean \pm S.D. heart rates for the two games were not significantly different between conditions (SSG1: 171 ± 8 ; SSG2: 165 ± 9). The technical actions that changed as a result of changes in pitch size/number of players were the number of passes (SSG1: 14 ± 4 ; SSG2: 11 ± 3.6 , $p < 0.05$) and receptions (SSG1: 10 ± 4.8 ; SSG2: 8 ± 3.3 , $p < 0.05$).

The main conclusions of this study are that the reduction of the number of players and the dimension of the field promoted an increase in heart rate and a larger number of technical actions of the players in 3x3 in comparison to 4x4.

Key words: coaching, futsal, evaluation

Changes in aerobic ability during a macro cycle of training in swimming

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It seems that critical velocity and critical stroke rate are associated with aerobic performance. The aim of this study was to analyse the changes of critical velocity and critical stroke rate during 12 weeks of training in a group of young competitive swimmers.

Fourteen age group male swimmers took part in this investigation. The evaluation took place in two different trials. The first one was conducted at the beginning of the season and the second one after 12 weeks of training. For each subject the critical velocity and the critical stroke rate were determined in both trials.

The main result was that critical velocity increased, whereas critical stroke rate decreased between the first and second trials. It seems that technical ability was improved during the 12 weeks of training. The swimmers were able to perform at the same physiological intensity at higher velocities and with less stroke rate.

Key words: age group swimmers, aerobic capacity, technique, training effects

Evolution in swimming “Science” research

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The aim of this study was to analyze the evolution of the swimming “science” research in the last decades.

The content of all the 622 papers published in the Proceedings books of the Symposiums of Biomechanics and Medicine in Swimming from 1971 to 2006 was analyzed. It was adopted the procedures described for content analysis by Queirós and Botelho (in press).

The main “scientific area” applied for the study of the aquatic activities, in all manuscripts, was considered as being the category to analyze. It was defined the following sub-categories (adapted from Clarys, 1996): (i) Biomechanics; (ii) Psychology; (iii) Sociology; (iv) Pedagogy/Teaching; (v) Biochemistry; (vi) Physiology; (vii) Thermoregulation; (viii) Hydrodynamics; (ix) Electromyography; (x) Anthropometry; (xi) Equipments/Methodologies; (xii) Clinical Medicine/Traumatology and; (xiii) Interdisciplinary assessment. Intra-assessment reliability (test and re-test) was very high.

There was an increasing number of papers published within the period of time analyzed (ranging from 23 papers in 1971 to 145 manuscripts in 2006. “Biomechanics” was the area of assessment most often (ranging from 27.3% in 1988 to 60% in 1979) with 37.7% of the papers, followed by the “Physiology” with 17.20%. Since 2003 it is verified an increasing number of “interdisciplinary assessment” manuscripts (e.g., 9.7% in 2003 and 21.4% in 2006, shifting from the third to second area of interest) and representing 8.52% of overall papers within the period of time analyzed.

Key words: swimming, science, papers

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Preliminary attempt to develop a path-flow analysis model for swimming performance in children

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The aim of this research was to develop a path-flow analysis model from young swimmer's performance based on biomechanical and energetic parameters. The theoretical model was developed according to main review papers about these relationships (e.g. Barbosa, Bragada, Reis, Marinho, Carvalho & Silva, 2009).

22 male swimmers (12.67 ± 0.49 years old) with several competitive levels were evaluated. After a maximal 25-m swim with an underwater start it was computed in the middle 15-m the stroke frequency, stroke length, swim velocity, stroke index and propulsive efficiency. Critical velocity was computed based on the swimmers curriculum on the 200m and 800m freestyle events. Swimming performance was assessed by the 200m freestyle event. Path-flow analysis was performed with the estimation of linear regression standardized coefficients between the exogenous and endogenous variables. When appropriate, according to the theoretical model, simple or multiple linear regression models were computed. The standardized regression coefficients (β) were considered and significance of each β was assessed with the t-Student test ($p < 0.05$). The effect size of the disturbance term for a given endogenous variable, which reflects unmeasured variables, was 1-R². To verify the quality of the model, root mean square residuals (RMSR) was also computed.

The confirmatory model explains 54% of swimming performance. RMSR was 0.064. In this sense, the confirmatory path-flow model can be considered as being suitable of the theory presented. As a conclusion, training control and evaluation process of young swimmers can be based on biomechanical and energetic parameters.

Key words: swimming, biomechanical, physiological

Barbosa, T.M., Bragada, J.A., Reis, V.M., Marinho, D.A., Carvalho, C., & Silva, A.J. (2009). Energetics and biomechanics as determining factors of swimming performance: Updating the state of the art. *Journal of Science and Medicine in Sports, in press.*

Interval training over 400m: A case study on the ventilatory parameters

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The interval training on the distance of 400 meters is very popular in Portugal. However, it is verified that the available literature on this theme is neither elucidating nor concordant on which the percentage of request of oxygen consumption and of energy (aerobic and anaerobic) during these training sessions.

For this fact, the present work is the study has the purpose of evaluating the requests at the level of the aerobic (EnAer) and anaerobic (EnAna) energy and the percentage of the oxygen consumption in the sessions of interval training of 11X400 meters accomplished to 101% of the speed associated to the maximum consumption of oxygen ($vVO_2\text{máx}$) (79 second), 7X400 meters to 104.5% of $vVO_2\text{máx}$ (76.4 second) and 5X400 meters to 108% of $vVO_2\text{máx}$ (74.2 second) with an interval of 70 second. The study intends to quantify the energy requested in the repetitions and the percentage of the $VO_2\text{máx}$ during repetitions and pauses.

The subject used in this study was a female, 23 years old, athlete of middle-distance at the national level (9.46 min 3.000 meters and 16.47 min 5.000 m), with maximum oxygen consumption of 68.92 ml/kg/min. The athlete accomplished a sub-maximum test of 5 repetitions from 5 to 6 minutes each, in order to check the standard values at the level of the oxygen consumption ($VO_2\text{máx}$). The supra-maximum test was performed at 111% of $vVO_2\text{máx}$, in order to evaluate the anaerobic capacity, through the quantification of the deficit of accumulated oxygen (DefO₂Ac), and the respective sessions of interval training.

The ventilatory parameters were controlled in the tests and in the training sessions through the gases analyzer Cosmed K4b2. The data of the tests, after treatment, was the following: $O_2\text{máx}$, 68.92 ml/kg/min; $v O_2\text{máx}$, 5.01 m/s (3.19 min/km); DefO₂Ac, 51.73 ml eqO₂/kg. The data of the training sessions was the following: 11X400 meters, 81% of EnAer, 19% of EnAna, 82% of $VO_2\text{máx}$ in the repetitions and 66% of $VO_2\text{máx}$ in the pauses; 7X400 meters, 80% of EnAer, 20% of EnAna and 84% of $O_2\text{máx}$ in the repetitions and 68% of $VO_2\text{máx}$ in the; 5X400 meters, 79% of EnAer, 21% of EnAna, 85% of $VO_2\text{máx}$ in the repetitions and 70% of $VO_2\text{máx}$ in the pauses.

The data concerning the requested EnAna and the percentage of $VO_2\text{máx}$ showed any significant differences. The highest values were observed in the training session 5X400 meters, accomplished to 108% of the $vVO_2\text{máx}$, whereas 70% of request of $VO_2\text{máx}$ was reached in the pauses and 85% of request of $VO_2\text{máx}$ in the repetitions, with the average in the session of 78% of $VO_2\text{máx}$. In this session 21% of the energy requested was anaerobic and 79% was aerobic. The results regarding all training sessions show a low request of the percentage of $VO_2\text{máx}$ and, consequently, a low contribution of the anaerobic energy. These results seem to demonstrate that the interval training of 400 meters, with pauses of 70 second, neither request the maximum potency of the aerobic system nor the anaerobic capacity. However, these sessions seem to request the s threshold identified as the aerobic capacity.

Key words: interval training, oxygen consumption, aerobic power, aerobic capacity, anaerobic capacity

Artistic score for Rhythmic Gymnastics group routines in 2008 Portimão World Cup Series

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The performance in rhythmic gymnastics (RG) is evaluated in competition by a final score that includes 3 sub-scores: Difficulty, Artistic and Execution scores. The main liability of the final score depends on the artistic score. In the Code of points last modifications we could find some improvements that transformed this part of the final score more precisely. The aim of this study is try to see if there is a profile in the type of artistic elements chosen by different groups all over the world to make their choreography for competition routines.

For this study, 32 different routines from 16 different countries from 4 different continents that competed at Portimão 2008 World Cup Series were observed. The groups performed two different routines, one with 5 ropes and other with 3 hoops and 4 clubs. The analysis of the artistic elements of the routines was made using the competitions forms that group have to give in advance to the competition organization. We preferred to study the competition forms instead of the films because in this way the analysis will not be affected by the mistakes made by the group during the competition. The classification used to organize different elements was the official classification used in the FIG (Gymnastics International Federation) Code of Points (FIG, 2007). So we divided the artistic elements in 3 main categories: Mastery (MAST), CAP's (Particular Artistic Characteristics) and Collaborations among gymnasts (COL).

Analyzing the main results we could concluded that for MAST the groups preferred the bonification using throws for both type of apparatus; but when we compare the routines with different type of apparatus we could observed that the bonus for catches were considerably higher in hoop/clubs routines. For COL we concluded that the collaborations more used were the collaborations RR1 in the ropes routines and the collaborations with throw in the hoops/clubs routines. For CAP's we could conclude that for rope the groups preferred to use the jumps through de rope and for the hoop/clubs routine they preferred the handling of the apparatus.

In general we could design a profile for each kind of apparatus, but this profile is not the same for the two routines of the same group.

Key words: rhythmic gymnastics groups, artistic score, evaluation, performance

Difficulty score for Rhythmic Gymnastics group routines in Portimão 2008 World Cup Series

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Final score in Rhythmic Gymnastics (RG) is given by adding 3 sub-scores: Difficulty, Artistic and Execution. The difficulty score represents the body difficulty level that the gymnast or the group can achieve. The aim of this study is to try to understand if there is a common profile in the choice of difficulty elements from different body groups in gymnasts from different countries and/or from different "training schools".

In this study, 32 different routines were observed from 16 different countries from 4 different continents that competed at 2008 Portimão World Cup Series (PWC). All the groups performed two different routines, one with 5 ropes and the other with 3 hoops and 4 clubs. To analyze the difficulty elements we used competitions forms provided in advance to the competition organization. We used the competition forms instead of the films because in this way the analysis will not be affected by mistakes made by the group during the competition. The official classification used in the FIG (Gymnastics International Federation) Code of Points (FIG, 2005-2008) was used to organize different elements. It classifies the body difficulties in 5 categories: Jumps/Leaps, Balances, Pivots, Flexibility/Waves and Exchanges.

The analysis of the 2008 results showed that in the Jumps and for both routines, all groups preferred performing difficulties with different kinds of jeté with turn. In the balances category, the balance with horizontal trunk and different positions of the free leg were the most performed in both competitions. With regards to pivots the most frequently used in 3 hoops/4 clubs routines were the pivots with the leg high (in front or side) and the "fouettés". However, in the 5 ropes routines, only the fouettés were the most frequently used pivot.

The preferred flexibility/wave elements used in the sample observed were the splits with the horizontal positions.

Overall the groups observed have preferably chosen jumps and flexibility/waves in both routines analyzed.

The results show that the majority of the exchange elements were performed without body difficulty elements. However, when they include them, the groups chose jumps in both types of routines. In 3 hoops/4 clubs routines the flexibility/waves were also the most utilized body elements. Furthermore, there was no record of the utilization of pivots in the exchanges in both exercise routines.

Key words: rhythmic gymnastics groups, difficulty score, evaluation, performance

The nutritional supplements consumption by federate athletes in Bragança

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The use of nutritional supplements in sport is a pertinent subject by its indiscriminate application to athletes of many sportive modalities, to improve, apparently, the athlete sportive performance. The study main goal was evaluate the consumption of nutritional supplements by federate sportists in Bragança.

It was built a questionnaire, submitted to a pre-test, and was administered to a population of 120 federate sportists between 9 and 36 years old. With these questionnaire were compared the supplement kinds not only with the age, gender, modality, frequency, timetable, duration of the exercise and origin of the consumption, but also with some anthropometric characteristics and food habits.

Among the 120 sportists (97 male and 23 female) from the several studied modalities, the majority are football players. 25% from the sample consumes nutritional supplements, the vitamins are the most consumed by the both genders (65.5%), we must notice that 44.4% are prescribed by doctors and 26% are self-medicated. To 82.5%, the food has a positive role in the sportive performance.

We found out a bigger ingestion of supplements by male athletes (93.3%), especially football players. The youngest athletes prefer energetic supplements and the oldest ones the vitamins.

Supplements ingestion seems to be related to the gender and modality, and the supplement kind with the age.

Key words: nutrition, athletes, evaluation, performance

Study of proprioceptive sensibility in the motor competence of visual impairment

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The purpose of the present study was to evaluate the manual proprioceptive sensibility in subject's normal and visual impairment, practitioners and non-practitioners of physical activity.

The sample comprises 28 subjects (20-55 years old), 18 visual impairments (12 active and 6 non-active) and 10 normal visually (5 active and 5 non-active). The instrument used was the Test of Discrimination Weights. Statistical procedures included descriptive and inferential statistics (Independent-Sample t Test) using SPSS 16.0. The level of significance was 5% ($p=0.05$).

The main results and conclusions were: i. The normal and visual impairment subjects practitioners of physical activity had better results on manual proprioceptive sensibility in relation to the normal and visual impairment subjects non-practitioners of physical activity on the preferred hand; ii. The subjects with visual impairments practitioners of physical activity had better results on manual proprioceptive sensibility in relation to the visual impairment subjects non-practitioners of physical activity concerning to the preferred hand; iii. The normal subjects practitioners of physical activity had not better results on manual proprioceptive sensibility in relation to the normal subjects non-practitioners of physical activity concerning to the hand preferred; iv. The subjects with visual impairments practitioners of physical activity had better results on manual proprioceptive sensibility in relation to the normal subjects practitioners of physical activity concerning to the preferred hand; and v. The subjects with visual impairments non-practitioners of physical activity had better results on manual proprioceptive sensibility in relation to the normal subjects non-practitioners of physical activity concerning to the preferred hand. The subjects with visual impairments practitioners of physical activity had better results on manual proprioceptive sensibility in relation to the normal and visual impairment subjects non-practitioners of physical activity concerning to the preferred hand.

Key words: motor learning, manual sensibility, preferred hand

Evolution of body position in uneven bars routines: Influence of “in bar” elements

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As a consequence of changes on the apparatus structure and Code of Points changes, gymnasts should use more the straight body position in Uneven Bars routines. Purpose of the present study was to analyze the influence of “in bar” elements on body position during Uneven Bars routines. Observational methodology was used to construct and validate two observation categories comprising ten variables considered as indicators of the external load in uneven bars. 104 world championships and Olympic Games finals uneven bars routines were analyzed between 1989 and 2008. As main results we observed significant increases in the execution of “in bar” elements, with and without longitudinal rotations, as well as in respective difficulty. Straight body position elements increased from 6.45 to 9.71 up to 2001 and decreased to 8.38 by 2008. Closed body position elements ranged from 8.15 to 8.21 until 2001 and increased to 14.29 by 2008. We may conclude that compulsory use of “in bar” elements and their execution beyond the Code of Points requirements contradicted the trends for a bigger use of straight body position.

Key words: women’s artistic gymnastics, uneven bars, body position, trends

Injury in Portuguese female artistic gymnasts: Influence of anthropometric and maturity characteristics

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The aim of this study was to analyze the influence of anthropometric and maturity characteristics in the occurrence of injury in Portuguese female artistic gymnasts. Sample was composed by 79 female artistic gymnasts, aged between 6 and 18 years old. The anthropometrical measures analyzed were weight, height, tricipital and sub-scapular skinfolds and bicipital perimeter. For determining skeletal age an X-Ray was done to the left hand and wrist. Prospective and retrospective methods were used to identify the menarche onset. As main results was observed: (1) 43% from observed gymnasts presented injury; (2) from all injuries occurred, 58.3% was traumatic and 41.7% of overuse; (3) percentage mean of body fat was 15.23%; (4) majority of percentiles ranged between P10 and P50 (72%); (5) difference between bone and chronological age was in average (-0.33±1.17 years) and; (6) menarche onset was delayed. Based on results, we may conclude that there is a noticeable tendency in injury etiology and in some morphological and maturation characteristics. However, were found significantly differences between groups related with anthropometric and skeletal maturation indicators. Finally, it was observed influence of some anthropometrical indicators (BMI and % and Fat Free Mass) in the injury onset.

Key words: women's Artistic Gymnastics, injury, body composition, maturation

Injury profile characterization in Women's Artistic Gymnastics: a prospective research in female elite gymnasts throughout a season

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Sports practice is not exempt of risks and each sport discipline presents a tendency for a specific type of injury inherent to its practice. The purpose of this study was to analyze and characterize the injuries occurred during the 2006/2007 season in all competitive Portuguese gymnasts. The sample was composed by 79 female artistic gymnasts, aged between 6-18 years and training on average 14.15 h/week. The injuries were categorized according to its etiology, type, anatomic distribution, severity and apparatus occurrence. As main results we point out: (i) 43% of the gymnasts were injured, with a 2.47 lesion rate in training and 1.95 in competition; (ii) the majority of injuries were traumatic (58.3%); (iii) the most common injury was the sprain (21.3%); (iv) lower limbs were the most affected (53.5%); (v) balance beam was the apparatus with the highest lesion incidence (19.7%). We may conclude that there is a visible trend in the nature of injuries both in terms of its etiology and anatomical location. The trend is also evident in relation to the influence of training load (h/week training and years of practice) in the injuries appearance.

Key words: women's Artistic Gymnastics, injuries, females

Ventilatory lung function and aerobic power in physically active smokers and non-smokers

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Smoking habits can cause physiological and metabolic changes in human body systems. The tobacco affects the physical capability in exercise when the inhaled carbon monoxide binds to red blood cells and his effect on sports performance and aerobic power are not clearly defined. This study aim to compare the influence of smoking habits in ventilatory lung function and in aerobic power in physically active people.

Twenty voluntary normotensive physically active men (sports 3 to 5 times per week) participated in the study. The smoker group comprised nine subjects (age mean=21.4, s=3.2 years; weight mean=71.9, s= 8.0 Kg; height mean= 176.2, s=7.7 cm; fat mass mean= 5, s= 1.3%; rest heart rate mean= 62, s=10 bpm) and the non-smoker group comprised ten subjects (age mean=22.0, s=3.5 years; weight mean=73, s= 8.4 Kg; height mean=178, s= 5.7 cm; fat mass mean 4, s=1.2%; rest heart rate mean= 61, s=6 bpm). The maximum voluntary ventilation (MVV), forced vital capacity (FVC) and forced expiratory volume (FEV₁) were measured by MicroQuarck (Cosmed®) and the aerobic power by Astrand-Ryhming nomogram.

The results for FVC and FEV₁ between groups were not different ($p>0.05$). In the smokers group FEV₁ were (FEV₁ mean=4.5, s=0.3 L/min) as in the non-smokers group were (FEV₁ mean=4.3, s=0.4 L/min). Possible causes for this results may be due to the high level of smokers in sports participation, the low number of cigarettes per day (mean of cigarettes=7, s=6 cigarettes per day) or the number of individuals involved in this study. The MVV was different ($p<0.05$) between groups, smokers (MVV mean=172.7, s=19.9 L/min) and non-smokers (MVV mean=174.1, s=19.1 L/min), the non-smokers have higher values compared to smokers as expected. The analysis of the results for the aerobic power between groups, is also in line with the expected, aerobic power of the group of smokers (VO₂máx. mean=40.9, s=6.5 ml/kg/min) is lower than the group of non-smokers (VO₂máx. mean=46.8, s=9.4 ml/kg/min). From these data we suggest that tobacco consumption in physically active individuals do not produces airways obstruction but probably decrease the aerobic power values.

Key words: physical activity, ventilatory lung function, aerobic power, tabagism

The influence of the treadmill gradient in the cardiovascular exercise response

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Factors related to exercise mode like muscle mass mobilization, weight bearing tip and arm and trunk activity can promote different cardiovascular responses. The goal of this study was to evaluate the influence of the treadmill gradient in the cardiovascular acute responses to exercise.

The sample comprised 10 voluntary normotensive female subjects (age mean=19.6, s= 1.1 years, weight mean=55.9, s= 6.2 kg, height mean= 163, s= 0.1 cm and body fat mass mean=17.9, s= 2.6 %). All the subjects performed two 10 minutes exercise bouts, the first with 0% gradient and the second with 15% gradient. The average speed was 6.28, s= 0.25 km/h and all subjects rested for 30 minutes at the end of each exercise periods. Heart rate, systolic and diastolic blood pressure were measured before and after each bout and rest period. Perceived exertion was also measured after exercise.

The repeated measures t-test revealed that the 0% gradient exercise promote an increase in systolic and diastolic mean blood pressure (124.7, s= 15.9 and 68.4, s= 11 mmHg respectively), heart rate mean 144.1, s= 16.7 bpm and perceived exertion 11.4, s= 1.7), but after the subjects performed the exercise with 15% gradient they reached higher values (systolic blood pressure was 145.2, s= 13.3; diastolic blood pressure was 75.1, s= 11.4; heart rate was 171.9, s= 16.6 and perceived exertion was 13.9, s= 1.1) in both exercise bouts $p < 0.05$. At the end of recovery period, both systolic and diastolic blood pressure values weren't different between gradient ($p > 0.05$). At the end of recovery periods, only the heart rate values were significant, after the first period 68, s= 13 bpm and after the second one 72, s= 15 bpm ($p < 0.05$).

Despite the blood pressure differences identified in the exercise periods between the two bouts, the exercise gradient did not accounted for different response in the blood pressure recovery values after 30 min period. Probably the gradient changes do not promote a different hemodynamic response. Varying exercise gradient from 0% to 15% in young normotensive female subjects did not influence the magnitude of blood pressure after 30 minutes recovery.

Key words: cardiovascular exercise, treadmill gradient, blood pressure

Factorial analyzes of the Brazilian version of the CSAI-2: Preliminary findings

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The instrument CSAI-2 (Competitive State Anxiety Inventory-2) is frequently used in studies to verify the state of competitive anxiety. It is composed by three main factors: cognitive anxiety, somatic anxiety and self-confidence. The objective of this study was to verify the internal consistency of the three CSAI-2 factors (alpha of cronbach) in Brazilian athletes. The instrument was administered to one hundred and ninety athletes in two sporting modalities (jiu-jitsu and surfing), an hour before competition. Factorial analysis, in conjunction with a Varimax rotation, suggested the maintenance of the three factors as in the original model, although an item appeared isolated from the three main components ("I am concerned about this competition"). Findings from this study showed a good internal conscience for the cognitive anxiety and self-confidence factors, but insufficient for the somatic anxiety factor. Although the results are preliminary, they provide initial support for the validity and reliability of the instrument in the Brazilian culture. We will carry on the study with a heterogeneous and more numerous samples, including other sporting modalities, to finalize the validation procedures.

Key words: CSAI-2, factorial analyses, competitive anxiety

Anthropometric evaluation of rhythmic gymnasts' athletes

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The present study had as aim respectively to analyze the anthropometric characteristics and body composition in young gymnasts of Rhythmic Gymnastics (GR) in Portugal, with ages between 12.75 ± 1.04 and 17.63 ± 2.39 years old, belong to junior and senior. The athletes were submitted to the evaluation of the anthropometric variable: weight (kg), height (m), body mass index (kg/m^2), skin folds (mm) and perimeters (cm). Through these measures we calculate fat mass in kg MG (kg), according to equation of Silva, the percentage of body fat MG (%), according to equation of Siri, the corporal density (g/m^3) and free mass fat (MLG) through the equation of Silva.

The descriptive statistics was used, using test t of student followed by post hoc Tuckey, with $p \leq 0.05$. After the analysis of the results of the different variables, we can conclude in a general way that there are statistically significant differences between the junior and senior. For this difference essentially contributes the age factor, once the gymnasts a difference of almost 5 years (average of 4.75%). In a specific form, the junior gymnasts present an average of 12.87 whereas the 17.63 years old seniors, while in the first ones 62.5% of the gymnasts are above average, whereas in the second ones the opposite is seen, therefore only 37.5% are above average of the group. In relation to the weight (kg), and looking at the corporal weight averages presented by both groups, an equally significant difference of 15.1 is noticed, once the junior gymnasts present the 36.4 average and senior gymnasts, 51.5%. So that we can have a notion of this difference of corporal weight between both groups, we see that the junior athlete weighs more (42.5), I mean there is a difference of 4.00, compared to the thinner senior athlete (46.5). The junior gymnasts are 37.5% above average of group, whereas the senior gymnasts are found 62.5% above average. Equally according to the LBM (kg), the results are similar and, a considerable difference of 13.6 between the two steps can be equally observed. The average of the junior gymnasts is 26.6 while in the seniors, it is 40.2, remaining the same. In this group 62.5% of the gymnasts are above average, when compared to the junior gymnasts that is 37.5%. The junior gymnast, who presents the highest index (32) does not surpass the lowest index of the senior gymnast (34.3).

Key words: gymnastics, anthropometrics, evaluation

Eating disorders in gymnastics

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The sporting environment represents a subculture that increases socio-cultural pressures for thinness. Due to these pressures, associated to sport, mainly sports that emphasizes low weight, as rhythmic gymnastics and artistic gymnastics, the young athletes become more vulnerable to eating disorders than adolescents non athletes. The aims and purposes of our study are to determinate the presence of eating disorders in rhythmic gymnastics and artistic gymnastics, as verify if the nutritional intake in the competitive period and at the previous day to the competition, are different in both disciplines. We applied the EAT-26 test and an anamnesis at 76 female gymnasts, aged between 7 and 25 years old (mean = 10.59 +2.79 years old), of different Portuguese clubs. The exploratory analyze as been done by the description of the variable on study. In the inferential analyze and to do the multiple comparisons, we used the parametric test One-way Anova, presenting f and p values (0.05). For total results in the EAT-26, we have average 20.24 (+11.94) and, relatively to nutritional intake we verify that only 9.7% of athletes intakes different food in the competitive period [f(72)=0.15; p=0.70], and 8.3% intakes different quantities of food [f(72)=0.71; p=0.40], in that period. Only 13.9% intakes different food [f(72)=0.00; p=1.00] and 12.5% intakes different quantities in the competition previous day [f(72)=0.62; p=0.43]. With this we conclude that a gymnast has a predisposition to develop eating disorders and they don't change they diet in the competitive period neither at the previous day to the competition.

Key words: eating disorders, nutritional intake, body image

Methodological observation in sport: Current situation and challenges for the next future

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Observational methods applied to sport are scientific procedures that reveal the occurrence of perceptible motor behaviours, allowing them to be formally recorded and quantified. They also allow the analysis of the relations between these behaviours, such as sequentiality, association, and covariation. In many situations observational methods are the best strategy, or even the only strategy possible.

Assessment in natural sportive contexts through observation is unquestionably complex. In all settings we find a range of behaviours which form a pyramid structure. Starting from the top of the pyramid, we can break down daily sportive life into different situations such as school, leisure, competition, etc., revealing a tree structure with a hierarchical subdivision of situations in which behaviours that tend towards molarity interact with their natural contexts. Towards the base of the pyramid, the perceptible motor behaviours are increasingly molecular.

Key words: methodological observation, sport, behaviours

Research methods support in observation sports laboratory

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The importance of the observation in sport is enormous if given objectivity, accuracy and procedural effectiveness. This project is decisive for the improvement of the observation procedures, in context situation, either in the scientific or technical domain, particularly because it's associated to most physical activities and the daily tasks of the technicians and athletes of all of the sports. Our methodological progresses are connected to the multidimensional designs of sequential type, particularly centred on the recording/coding aspects, quality control and data analysis. In this sense, there were several analysis techniques used. Though, not all the methodological solutions of this knowledge area were implemented to the sport studies. The margin of development of observational designs is very large in this context, leaving margin for enlargement of the investigation. For us to achieve this framing we count on the national and international network. Our objective is to involve the institutions of investigation of Portugal, Spain, Brazil, Autarchies, Sport Federations, among other institutional partners.

Key words: observational methodology, sport, technological advances, research group

Observational Methodology in Football: Development of an instrument to study the offensive game in football

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The following paper introduces a new approach to the analysis of offensive game in football. The aim of this study was to create an instrument for collecting information for the analysis of offensive action and interactions game. The observation instrument that was to meet the main objective of this work consists of a combination of format fields (FC) and systems of categories (SC). This methodology is a particular strategy of the scientific method that has as an objective to analyse the perceptible behaviour that occurs in habitual contexts, allowing them to be formally recorded and quantified and using an ad hoc instrument in order to obtain a behaviour systematic registration that, since they have been transformed in quantitative data with the necessary reliability and validity determined level, will allow analysis of the relations between these behaviours.

Key words: observational methodology, offensive game, football

Coding system and quality review of data in high-level Handball

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The aim of this work was to build an ad hoc observation instrument applied in the study of provision of tactics in counter-attack and quick attack of the selection of Germany in world cup 2007, which associated the formats and field systems of categories. The validation of the instrument contents was conducted by experts in handball, grade 3 coaches from the Federation of Handball and trainees from Master Coach. The observational sample consisted of eight games of the World Cup referenced in the problem and one more a game of the World Cup in 2005.

The use of specific statistical tools as SDIS-GSEG and THEME 5.0 allowed the study of the reliability of the data off this instrument, which showed values of agreement exceeding 95%.

Key words: observational methodology, patterns of behaviour of the game, counter-attack and fast attack, handball

Observational Methodology in soccer: T-pattern analysis of goalkeeper behaviour in the process defensive, during the World Cup 2002

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Despite an extensive technical bibliography about soccer goalkeepers, this position has been somewhat neglected by scientific literature. Observational studies need to expand indices of performance beyond frequencies of occurrence to be able to accurately represent the performances being observed. The analysis for pattern detection in the most critical or representative game actions, tend to be more profitable than adding more quantitative data.

To analyse temporal patterns in goalkeeper behaviour in the defensive process were the main purposes of this study. The focus of the research was the binomial attempt to score/GK, and GK actions in the defensive process (DF).

This study observational design was multidimensional, nomothetic and sequential. The sample was formed on 47 games of the Korea/Japan 2002 FIFA World Cup, corresponding to 1150 DP coded to temporal pattern analysis with THEME 5.0. The GK behaviour was coded through an observational instrument - SOFGr1 and the reliability analysis of this instrument revealed high Cohen's K (values above 0.975 for all criteria).

Four complete t-patterns were detected: i) one in indirect free kick; ii) two in cross plays and; iii) one in shot play score attempt. These four patterns consist in the same GK behaviour. The GK performs with maximum intensity, intercepting the ball in zone L8, blocking it with two hands, and holding the ball at the first contact (no goal scored). The reduced number of complete t-patterns indicates that goalkeeper behaviour in the defensive process is characterized by non-linearity and unpredictability. The results of this study also reveal incomplete t-patterns in corners and indirect free kicks; the ball, in both situations, has a high trajectory and do not change the course allowing the GK enough time to anticipate and prevent the shot.

Key words: observational methodology, T-pattern, goalkeeper, world cup

Observing System for sequence analysis of the behaviour of the goalkeeper in Handball

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The main goal of this study was to observe and characterize the performance of the Goalkeepers of the German Selection in the World Cup in 2007. In a qualitative and sequential dimension, based on the observational methodology, removing the maximum amount of information of the development of the game actions related to the organized attack, quick attack, counter attack and free of seven meters, seeking to identify patterns of behaviour in the defensive process in Handball.

To achieve those objectives a tool for ad hoc observation was built, which associated the field formats and categories systems. The validation of the contents of the instrument was performed by handball specialists, grade 3 coaches from the Federation of Handball. The observational sample consisted of eight games of the World Cup referenced in the problem and one more game of the World Cup in 2005. The use of the specific statistical tool SDIS-GSEG allowed the study of the reliability of this instrument, which showed values of concordance greater than 95.7%. The characterization of the interactions of defence was made of the events observed by detection of hidden patterns (T-pattern), using the software THEME 5.0.

With regard to the sample results produced by 1979 patterns of conduct of which we withdrew 82 incomplete ones to the present study, for a $p < .001$. The high degree of randomness and high number of technical-tactical actions did not allow to find full patterns. The study of incomplete patterns allowed, in a phased manner, to characterize the most usual defensive actions.

Key words: observational methodology, patterns of behaviour, goalkeepers, interaction of the game, handball

Analysis of the defensive system of the Brazilian team in the championship of basketball world women 2006

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The aim of this study is to identify the defensive behaviour of the female Brazilian team for the defence in the game of basketball, using the observational method. In terms of observational sample we selected 9 games of the World Women's Championship 2006, the 36 units were recorded from observation or periods of play, which allowed 653 tag sequences, which resulted in a total of 33,345 multi-events. For observation and data collection, the instrument was used to form mixed-field system with categories for analysis of the defensive system in the game of basketball. The data was submitted to sequential analysis through the SDIS-GSEQ. Through the sequential analysis, it was possible to detect patterns of temporal regularity of the defensive behaviour during the game. As the results the Brazilian team used three defensive systems, including the protection zone and defensive balance is inefficient and the defence presented individual more efficient in the technical-tactical reasons and therefore won the games.

Key words: analysis of the game, observational methodology, defensive system, observation system, basketball

T-pattern detection in score attempt: A soccer study

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Several traditional soccer analyses essentially show quantitative data but not the environment where and when the actions (and interactions) are developed. Observational studies need to expand indices of performance beyond frequencies of occurrence to be able to accurately represent the performances being observed. The analysis for pattern detection in the most critical or representative game actions, tend to be more profitable than adding more quantitative data.

In this sense, the purpose of this study was to detect and analyse inter and intra individual patterns in the cross play and free kick score attempts context.

A multidimensional, nomothetic and sequential observational design was developed. The sample was formed by 47 games of the Korea/Japan 2002 FIFA World Cup, where 55 free kicks and 285 cross plays were coded to temporal pattern analysis with THEME 5.0. In this study was used observational instrument (SofGr1) composed by four criteria: 1) offensive process (OP) characteristics; 2) attempt to score; 3) Gk actions in the defensive process; 4) OP efficiency. The reliability analysis of this instrument revealed high Cohen's K (values above 0.975 for all criteria).

T-patterns were obtained in both free kick and cross play attempts to score. One complete t-pattern was detected in free kick plays and seventeen in cross plays (in both situations no goals were scored) pointing out to the importance of the initial conditions and the game non-linearity. The results also reveal incomplete t-patterns leading to goal and illustrate how important is i) in free kicks to direct the shot to the top corners and don't suffer a course change and ii) reinforce the efficacy of the shots to the low corners and the lateral corridors cross plays.

Key words: observational methodology, T-pattern, soccer

Observational Methodology in soccer: Descriptive analysis of goalkeeper behavior in the process defensive, during the World Cup 2002

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Despite an extensive technical bibliography about soccer goalkeepers, this position has been somewhat neglected by scientific literature.

In consequence, the main purpose of this study was to know how GK acts, what defensive processes he takes part and in which he is more effective. Our research focused the binomial attempt to score/GK, and GK actions in the defensive process (DF).

This study observational design was multidimensional, nomothetic and sequential. The sample was formed by 47 games of the Korea/Japan 2002 FIFA World Cup, corresponding to 1150 DP coded. The GK behaviour was coded through an observational instrument - SOFGr1 and the reliability analysis of this instrument revealed high Cohen's K (values above 0,975 for all criteria). The data analysis was performed with SDIS-GSEQ software.

The offensive processes (OP) detained by the GK was 24.1 (\pm 5.9) and 2.6 (\pm 1.3) goals were scored per game.

We concluded that the GK perform either in the six yard box (42%) or outside this area (58%). In addition, the GK should be prepared to save shots from any area of the field, despite the quantity of shots that take place within the penalty box. The GK takes a very important role in the adversary OP annulment due to the score attempt anticipation. We observed that in 1150 OP, 410 OP (35.7%) expire without shot by GK intervention, either in indirect free kicks or corner kicks either in cross plays. For the two GK of the World Cup final we concluded that both were more influential in its national team's defensive organization because they interrupted more opposition OP than the average of all GK. For these two players a high number of OP is necessary to allow goals compared with the total of all GK; consequentially these GK show a higher percentage of efficiency.

Key words: observational methodology, goalkeeper, SOFGr1, World Cup

Observational Methodology in soccer: Development of goalkeeper behaviour in the defensive process observational instrument - SOFGr₁

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Despite an extensive technical bibliography about soccer goalkeepers, this position has been somewhat neglected by scientific literature. The analysis for pattern detection in the most critical or representative game actions, tend to be more profitable than adding more quantitative data.

The main purpose of this study was the development and reliability analysis of an observational instrument (to detect behavioural patterns) of the goalkeeper behaviour during the defensive process in soccer. This research focused on the binomial attempt to score/GK, and on GK actions in the defensive process (DF).

To collect data was created an "ad hoc" observational instrument (SOFGr₁) combining field formats and categorical systems. Four criteria were observed: 1) offensive process (OP) characteristics; 2) attempt to score; 3) Gk actions in the defensive process; 4) OP efficiency.

The sample was composed by one full game of the Korea/Japan 2002 FIFA World Cup and the reliability observed through Cohen's K (SDIS-GSEQ software).

The reliability analysis of this instrument showed a high Cohen's K coefficient (values above 0.975 for all criteria). The observational instrument revealed an adequate discriminative power this study requests, allowing subsequent studies with this instrument.

Key words: observational methodology, goalkeeper, observational instrument, reliability analysis

Quality analysis of the instrument: Observing system performance in butterfly technique

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The aim of this study was to create an instrument trained for collecting information for the analysis of technical stability in swimming. This instrument is used to make a proper record of the behaviour observed during the implementation of the gesture cycle technique in butterfly. In this context, the analysis focused on a key requirement, which is the validity and reliability of the instrument.

The instrument consists of a set of Field Formats, based on biomechanical models of the Swim, and follows the appropriate structure from the observational methodology, with particular attention to evidence that adding four taxonomic criteria in the form of alphanumeric codes information is critical to describe behaviours that define the art of butterfly.

Perform the analysis of the quality of the instrument down the Kappa index, using the software-GSEQ SDIS, based on the records of six trained observers, and to study the accuracy through experts.

The results of the Kappa index vary between 0.94 and 0.96 to ensure accuracy and objectivity when describing behaviour with this technical instrument. In conclusion we consider that, given the high correlation between the values of the six expert observers, the instrument is suitable for observing the behaviour of technical butterfly swimmers in the state of context, thereby ensuring their construct validity.

Key words: observational methodology, reliability, technical analysis, butterfly

Behaviour observation technical system in crol style

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The present study aims to present the behaviour pattern of eight swimmers of national level, of both sexes, during five cycles of the crawl swimming in a context of competition. We used a observational methodology that allows to scientifically explain the temporal relationships and how the behaviours hierarchically connect and define a motor pattern. It was created an ad hoc instrument through format fields, an open system for coding the technical characteristics considered critical for our evaluations, allowing the insertion of new codes whenever they are seen on video. The behaviour pattern of each swimmer is represented by hierarchical structures, or configurations, representing the flow of technical conduct of the hand cycle. Through this analysis we know the most characteristic of the execution of the swimmers and according to the reference biomechanical framework, seek to show the similarities of the movements and their relationship with competitive effectiveness. The creation of a tool for entering data with various characteristics of output of information is essential to optimize the interpretation of temporal patterns. The sequential analysis of the data is done with software Theme 4.0 which detects motor patterns. The reliability and accuracy are guaranteed. The average total agreement by cycle of all observers presents a very good rate of 93.89%, being the lowest value of 90.91% for inter-observers.

The study showed the swimmers have a temporal pattern, which is represented by the stability of the swimming behaviour. The high degree of complexity of the patterns allows to study the technical variations among individuals. The study showed there are swimmers who despite not having the best score in FINA, they have a high stability of the temporal pattern in almost all stages and times of the swim.

Key words: observational methodology, analysis of technical standards, crol style, swimming

The methodology observational in Handball: Review of offensive actions of selection champion in Europe in 2008

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The primary objective of this study was to observe, analyze and characterize the tactical performance in counter-attack and quick attack of the Selection of Denmark, European Champion in 2007 and compare it with the study conducted with the Champion Selection of the World in 2007, Germany. The study was based on observational methodology and sought to examine, in a qualitative and sequential dimension, the maximum of information on development of the game actions, was to also to find standards of conduct in the process of counter-attack and quick attack.

To obtain the analysis it was adjusted the instrument in order to obtain a greater number of patterns, since their study clashed with a massive dispersion of the data. We removed some elements of the observation in order to achieve greater standardization through the software THEME 5.0.

It was our goal, after obtaining the analyzed data, to establish a comparison with data obtained through the analysis of Germany.

The treatment of the data led to the obtaining of 620 patterns of conduct. The detection of hidden patterns (T-Pattern) helped us to characterize the counter-attack, which without the help of this program would be impossible to characterize by the naked eye.

As for results and conclusions, we achieved 9 patterns of counter-attack direct and supported, but as in the study Champion Selection of the World in 2007, we failed to obtain patterns of conduct of the quick attack. As for comparisons between the performances of the two selections, we conclude that there is a great similarity between the results obtained by both, in areas of completion and in areas of ball recovery.

Key words: handball observational methodology, counter-attack and quick attack, patterns of behaviour, game software THEME 5.0

Patterns of play in soccer-end analysis of situations using observational methodology

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The purpose of this study is to know the context in which the finalization or attempt of finalization of offensive process takes place in soccer.

The game analysis is concerned in obtaining quantitative data of the game actions without taking into account the context where these occur. For this reason we use Observational Methodology and Theme 5.0 to detect behaviour patterns in game finalization in soccer, in the world championship FIFA 2002.

The sample is composed by 47 games of the Korea/Japan 2002 FIFA World Cup, allowing to code 55 finalization plays through the free kicks and 285 from cross plays. The data was subject to sequential analysis, through Theme 5.0, with which was possible to detect the game patterns.

We obtained 1 complete pattern of a free kick and 17 cross plays, all without obtaining a goal, indicating the importance of the initial conditions and the non linearity of the game.

Key words: observational methodology, T-pattern, soccer

Science evaluation methods in Physical Education courses

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The central theme of this study is to verify what sort of evaluation the orientactors teachers of the physical education and sport's of monographs of the University of Trás-os-Montes and Alto Douro in Portugal base their judgement when evaluating (trainee) students of this institution for the subject of seminar.

In relation to the formative evaluation, we may conclude that, generally, the orientactors, in every reunion, makes his or her own conclusions in relation to future classifications, having to do constant feedbacks through a continuous evaluating system, in general. Only 33.3% of the orientactors actually tell their teacher-trainees their find evaluation, which for most of the orientactors, is focused on the conceptual and methodological part of the question. In relation to the reflection that each and every orientactor does about their own vigour, 83.3% realise this during the whole year, whereas 88.9% realise this at the end of the school year.

Most of the orientactors (55.6%) believe that they would be able to do a much better evaluation if they themselves had more time to spend with their trainers. At this moment, they only spend, roughly, an average of one to two ours per week with their students/trainers.

Finally 66.7% of the orientactors believe that all the teaching courses should give higher value to the formation in the area of evaluation because it is important to know how to evaluate correctly (58.3%), so as to be fairer with their students (16.7%). All this, so as to make the teaching system a fair one and so that our students may have more success (33,3%), to learn new evaluation strategies and instruments (8.3%). The remaining orientactors (25%) believe that there are no subjects that actually teach how to evaluate.

Key words: evaluation, orientactors, students, performance, teaching

Bullying physical education: The point of view of the teacher

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Violence grows frightfully in Brazilian urban centers, reaching all social groups, especially young people. Bullying is a form of violence, which occurs mainly in schools and consists of aggressive, intentional and repeated acts. It is characterized by insistent “jokes” made to tease somebody in the group. It happens through repeated acts among the students and also through an unbalance in power. There are four roles played by people involved in bullying: the victim is the one who suffers bullying; the author is the one who attacks, by means of physical or moral acts, intimidating, pursuing, oppressing; the victim-author is someone who acts both ways, sometimes suffering and sometimes attacking; the witness is someone who has knowledge of the fact, does not suffer or practice bullying, but coexists in the environment where it occurs. Bullying can have an extension into adult life, under the form of workplace bullying, as victims, authors or witnesses can give it continuity. Another important aspect to this subject is its presence in the relations that are established between parents and children and teachers and students. Some examples can be seen in those adults who joke, offend, expose the difficulties of the children, teenagers or young people under their responsibility before the group, exclude, make up prejudiced nicknames and have the intention of displaying their superiority and power, which occurs frequently. In current times, bullying can also take a virtual form, which is called cyber bullying. Bullying is investigated internationally, mainly in the United States and in Portugal. In Brazil the research is still recent and rare. The objective of this research was to establish if there is bullying in school Physical Education classes and the proper attitude for teachers in those cases. The present work involved professors of Physical Education, who answered to a half-structuralized type interview. The research was developed using the resources of qualitative analysis of information obtained in the speech of Physical Education teachers on the thematic of bullying during classes. The interviews have been recorded and transcribed completely. The analysis was made based on the technique of content analysis. All the teachers reported cases of bullying in their lessons, with a daily frequency. The majority of the cases involved verbal violence, followed by physical violence. The author of bullying is frequently recognized as extrovert and provoking and the victim is recognized as shy. As actions of combat, acts of prevention and punishment are mentioned, as long as the author is known, leading the school to deal with the phenomenon by means of talking to the groups. Finally, we perceive the necessities of intervention and direct action in educative environments, over all in basic education schools, so as to allow the establishment of a net of prevention and combat against a latent and recurrent problem in current society. Bullying generates pain, distresses and the final consequence – homicides. Physical Education teachers must take preventive actions in agreement with the principles of the school, but also considering the principles of sport as a structural axle of injunctions, inclusion and education, so that values are promoted and personal and social abilities are developed. Bullying is part of an ampler social context. It is not enough to take pedagogical sporting actions pertaining to school, as social interventions are also necessary to promote positive consequence in school.

Key words: bullying, school, teachers, violence

Time management in practice sessions

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The aim of this study was to evaluate time management in practice sessions given by two groups of teachers, novice ($n=9$, age: 22.4 ± 1.0 years and experience: 1.0 year) and experienced ($n=3$, age: 34.0 years and experience: 10.8 ± 8.5 years). In order to perform this study, we observed 2 practice sessions of each teacher, (24 totals). The instruments and the equipment we required for the construction of this study was a registry sheet in which the episodes were observed by duration throughout all the practice session. As dependent variable we used (i) Non Motor Commitment Time (divided in Instruction, Organization and Task Transition) and (ii) Motor Commitment Time (segregated in General Motor Activity, Technical Specific Motor Activity, Tactical Specific Motor Activity and Game).

Results confirmed experienced teachers as more effective on managing practice available time, once they dedicated more time to Motor Commitment Time. Results also revealed that experienced teachers use the practice time quite more effectively on the Motor Commitment Time (77.76%) in comparison to the novice teachers (72.74%). There is a notorious difference in the Tactical Specific Motor Activity, where the experienced teachers combined 44.08%, whereas the novice teachers present only 17.56%, providing a great difference at this component. These results suggest that experienced teachers prefer small-sided games, game situations, where the athletes/students will have a bigger benefit on the technical aspects but especially on the tactical issues, than when using the formal game.

Therefore, we can conclude that if experienced teachers reinforce time dedicated to tactical issues, novice should adapt their management of time available, insisting on game-like situations where participation is more effective and where athletes/students could develop several individual and collective skills at the same time.

Key words: time management, practice, experienced teachers, novice teachers, effectiveness

Validity of an open-ended in-person interview to test how tennis coaches teach technique

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The purpose of this study was to validate an open-ended in-person interview to study how tennis coaches teach technique. The open-ended in-person interview consists of eight questions with the objective to study the pre-interactive decision making related to technique training. I used a dictaphone to record the interview. Analysis of the data showed that most of the results were in conformity with the literature. The coach teach technique has a situational task-solving character, develop it through development stages, admits that the conditioning training is essential to the connection and integration of the technique learning process, and in an advanced stage of technique development, match oriented drills are indispensable. Concluding, this open-ended in- person interview is valid and tests how tennis coaches teach technique.

Key words: interview, tennis, teaching

Relative age effect of Olympic athletes in Beijing 2008

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Research on expert performance field revealed a strong trend in the association of the birth dates of elite athletes to the first trimesters of the year (Wattie, Cobley & Baker, 2008). The aim of this study was to analyze the birth date distribution of all top elite athletes who participated in Olympic Games at Beijing 2008. Athletes ($n = 18.132$) were divided according to gender, continent and sports. The birth dates of the athletes were divided into quarters. To analyze the distribution of the population by quarter we used the Chi-square test. Results showed statistical differences in the distribution for the total population, and for females and males population, showing a trend for athletes to born in the earlier part of the year. Relatively to the continent, statistical differences appear only in Africa, Asia and Europe. In terms of sports, statistical differences were found in the distribution of 6 sports in females (athletics, badminton, basketball, modern pentathlon, rowing, and swimming) and 9 sports in males (athletics, basketball, canoeing, road cycling, football, handball, rowing, swimming, and volleyball). In all cases, distribution showed a higher participation of athletes born in the beginning of the year. These results show a clear influence of the athlete's date of birth in the achievement of expert performance, in several sports and continents.

Key words: sports, birth date, elite athletes

Wattie, N., Cobley, S., & Baker, J. (2008). Towards a unified understanding of relative age effects. *Journal of Sports Sciences*, 26(13), 1403-1409.