motricidade

REVIEW ARTICLE

https://doi.org/10.6063/motricidade.45246

Human interaction matters: personal and relational determinants of adherence and sustained participation in tele-exercise programmes for older adults: an integrative review

Gisela Cruz[1,2], Nuno Domingos Garrido[1,2], Victor Reis[1,2,3], José Vilaça-Alves[1,2,3]

ABSTRACT

An integrative review of the literature was conducted, searching the PubMed, Scopus and Web of Science databases and including studies published between 2015 and 2025. Quantitative, qualitative and mixed-methods studies involving community-dwelling older adults and structured tele-exercise programmes were considered. Study selection followed PRISMA 2020 transparency principles where applicable, and findings were analysed using narrative and thematic synthesis. Five studies were included, predominantly pilot or feasibility designs, involving monitored asynchronous tele-exercise and self-managed asynchronous tele-exercise modalities. Findings indicated that adherence and sustained participation were more consistent in interventions with structured professional monitoring, albeit delayed, compared with self-managed programmes, in which greater variability and a decline in practice over time were observed. The continuation of exercise appears to depend on the interaction between personal determinants, such as motivation, perceived benefits, and self-regulation, and relational determinants, such as support, feedback, and perceived follow-up. Technological barriers and limited digital literacy emerged as cross-cutting factors affecting sustained participation. It is concluded that tele-exercise is a viable approach to promote physical activity among older adults; however, maintenance of participation is strongly influenced by the level of human interaction and professional support. These findings should be interpreted as indicative behavioural trends rather than definitive causal evidence, reinforcing the need for participant-centred tele-exercise models with appropriate follow-up strategies and standardised metrics to evaluate adherence and sustained participation.

KEYWORDS: tele-exercise; exercise; older adults; adherence; technology; monitoring.

INTRODUCTION

Population ageing is one of the main public health challenges of the 21st century. According to the World Health Organization (2020), by 2050, the number of people aged 60 years or older is expected to exceed 2 billion, with a direct impact on the prevalence of conditions associated with loss of function, such as sarcopenia, frailty and increased risk of falls (Billot et al., 2020). These changes compromise autonomy, reduce quality of life and substantially increase healthcare costs.

Regular exercise is recognised as an effective intervention to mitigate the effects of ageing (Cabrolier-Molina et al., 2025; Izquierdo et al., 2025). Despite the scientific evidence supporting the benefits of exercise, adherence and sustained participation among older adults in exercise programmes remain limited, particularly in medium- and long-term interventions (Yang et al., 2024).

Multiple factors contribute to this low adherence, including individual barriers such as fear of injury, low motivation,

[1]Universidade de Trás-os-Montes e Alto Douro – Vila Real, Portugal.
[2]Research Center in Sports Sciences, Health Sciences & Human Development – Vila Real, Portugal.
[3]Research Group in Strength Training and Fitness Activities – Vila Real, Portugal.
*Corresponding author: QTA de Prados – 5000-801 – Vila Real, Portugal. E-mail: c.gisela.sc@gmail.com

Conflict of interests: nothing to declare. Funding: This work was supported by National Funds by FCT - Foundation for Science and Technology, under the projects UID/04045/2025 (https://doi.org/10.54499/UID/04045/2025), UID/PRR/04045/2025 (https://doi.org/10.54499/UID/PRR/04045/2025) and UID/PRR2/04045/2025.(https://doi.org/10.54499/UID/PRR2/04045/2025) and NORTE2030-FEDER-01489700 and co funded by European Union, under Notice MPr-2023-7 – Incentive System for Research and Development – Business R&D – Co-Promotion Operations – Other Territories, integrated in the Innovation and Digital Transition Program
Received: 29th January 2026. Accepted: 19th April 2026.
Edited by: Pedro Forte ISCE DOURO- Higher Institute of Education Sciences of Douro – Penafiel, Portugal.

and reduced perceived competence, as well as contextual constraints related to transport, weather conditions, family responsibilities and access to appropriate facilities (Kilgour et al., 2024; Yang et al., 2024). These obstacles hinder the establishment of regular practice routines and highlight the need for more flexible and accessible intervention models for community-dwelling older adults (Coletta et al., 2025).

In this context, tele-exercise has emerged as a promising strategy to broaden access to exercise, enabling remote prescription, follow-up and monitoring through digital technologies (Fabbrizio et al., 2023). Recent studies demonstrate that remotely delivered exercise interventions can produce significant improvements in physical fitness, balance, function, quality of life and psychological well-being in older adults (Izquierdo et al., 2025).

However, tele-exercise is not a homogeneous model. Interventions differ substantially in the levels of human interaction and professional support they provide. Whereas synchronous programmes allow real-time contact between professional and participant, asynchronous formats range from interventions monitored with delayed feedback to self-managed programmes based on digital content with minimal automated support (Garrido et al., 2025; Pettersson et al., 2025; Reis et al., 2024). These differences may decisively influence adherence, continuity and dropout behaviours.

Despite the exponential growth of digital interventions, the literature has predominantly focused on the effects of tele-exercise on physical and functional outcomes, such as strength, balance, mobility, and functional capacity (Dawson et al., 2024; De La Vega-Cordero et al., 2023). In contrast, behavioural indicators related to adherence, sustained participation, and retention are often reported as secondary outcomes with heterogeneous definitions, hindering comparisons between studies and the identification of consistent patterns (Ashe et al., 2024; Solis-Navarro et al., 2022).

In addition, in synchronous interventions, the predominance of group sessions introduces specific social determinants, such as group cohesion and shared commitment, which complicate an isolated analysis of the instructor–participant relationship and limit direct comparisons with individual tele-exercise formats (Coletta et al., 2024; Coletta et al., 2025). Thus, important gaps remain regarding the role of personal and relational determinants in older adults' adherence to tele-exercise programmes when comparing modalities with different levels of human interaction and professional support.

Therefore, it is essential to understand not only whether tele-exercise is effective, but how the degree of human interaction influences adherence and sustained participation over time. This understanding is particularly relevant to the development of scalable digital models that balance accessibility, perceived safety, and behavioural engagement.

Given the conceptual and methodological heterogeneity of tele-exercise interventions and behavioural outcomes across studies, an integrative review design was considered the most appropriate approach to synthesise diverse forms of evidence and identify emerging behavioural patterns across tele-exercise modalities.

Within this framework, the present integrative review seeks to answer the following research question: "How do personal and relational determinants of adherence and sustained participation among older adults differ across tele-exercise modalities with distinct levels of human interaction and support, namely synchronous tele-exercise, monitored asynchronous tele-exercise and self-managed asynchronous tele-exercise?".

This integrative review aimed to synthesise the available evidence on personal and relational determinants of adherence and sustained participation in tele-exercise programmes among community-dwelling older adults, to compare modalities with different levels of professional support, and to identify gaps and directions for future research.

METHODS

Type of review and methodological framework

An integrative literature review was conducted to synthesise evidence from diverse methodological designs, enabling a comprehensive analysis of determinants of adherence and sustained participation in tele-exercise programmes among community-dwelling older adults. This type of review is particularly appropriate when studies show high heterogeneity in design, interventions and metrics, allowing an interpretative synthesis of findings (Whittemore & Knafl, 2005).

Although this was not a systematic review, PRISMA 2020 reporting principles were followed for the search, screening, eligibility and study selection processes. Items specific to quantitative synthesis or meta-analysis were not applicable given the review's integrative nature (Page et al., 2021).

Research question

This review sought to answer the following research question: How do personal and relational determinants of adherence and sustained participation among community-dwelling older adults differ across tele-exercise modalities with distinct levels of human interaction and support, namely synchronous tele-exercise, monitored asynchronous tele-exercise and self-managed asynchronous tele-exercise?

Search strategy

The literature search was conducted in PubMed, Scopus and Web of Science, covering studies published between January 2015 and December 2025. Articles written in Portuguese, English, Spanish and French were included.

The search strategy was adapted to each database and structured around three main domains: (i) tele-exercise and digital interventions; (ii) older-adult population; and (iii) adherence, participation and behavioural determinants (see Table 1).

The final search was carried out on 3 December 2025. A manual search of the reference lists of relevant reviews was also performed, and no additional eligible studies were identified.

Eligibility criteria

Studies were included if they met the following criteria: (i) participants aged 60 years or older, community-dwelling, who could present pre-frailty or moderate functional limitations; (ii) structured tele-exercise interventions (defined frequency, duration and intensity); (iii) programmes classified within at least one of the following modalities: synchronous tele-exercise, monitored asynchronous tele-exercise, or unmonitored asynchronous tele-exercise; (iv) studies reporting at least one personal and/or relational determinant associated with adherence; and (v) quantitative, qualitative or mixed-methods studies.

Studies were excluded if they involved: (i) institutionalised older adults or populations with severe clinical conditions where the condition was the main focus of the intervention; (ii) non-digital or unstructured exercise interventions, or blended (hybrid) models; (iii) studies reporting exclusively physiological outcomes without reference to adherence behaviours; or (iv) synchronous sessions delivered exclusively in a group format.

Study selection process

The initial search identified 714 records. After removing duplicates, 503 records remained for title screening. Of these, 33 articles were selected for abstract screening, resulting in 12 full-text articles assessed for eligibility. After applying the eligibility criteria, five articles were included in the final synthesis.

The selection process is presented in the PRISMA flow diagram (see Figure 1). Study selection was conducted by two independent reviewers (CG and JVA) and, in cases of uncertainty, a third reviewer (NDG) performed an independent reassessment and made the final decision.

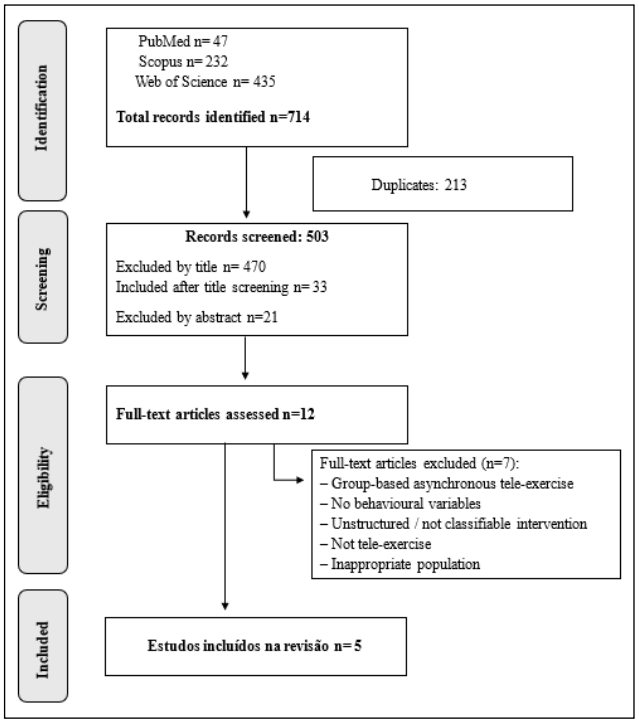


Figure 1. Detailed PRISMA flow diagram of study selection.

Table 1. Search strategy for each database.

Database	Search strategy
PubMed	("tele-exercise"[tiab] OR teleexercise[tiab] OR "tele exercise"[tiab] OR "online exercise"[tiab] OR "remote exercise"[tiab] OR "virtual exercise"[tiab] OR "digital exercise"[tiab] OR "internet-based exercise"[tiab] OR "web-based exercise"[tiab] OR "home-based exercise"[tiab] OR "synchronous exercise"[tiab] OR "asynchronous exercise"[tiab] OR "real-time exercise"[tiab] OR "live exercise"[tiab] OR "pre-recorded exercise"[tiab]) AND ("older adults"[tiab] OR elderly[tiab] OR seniors[tiab] OR geriatric[tiab] OR aging[tiab]) AND (adherence[tiab] OR compliance[tiab] OR participation[tiab] OR engagement[tiab] OR retention[tiab] OR dropout[tiab] OR acceptability[tiab] OR usability[tiab] OR perceptions[tiab])
Scopus	TITLE-ABS-KEY(("tele-exercise" OR teleexercise OR "tele exercise" OR "online exercise" OR "remote exercise" OR "virtual exercise" OR "digital exercise" OR "internet-based exercise" OR "web-based exercise" OR "home-based exercise" OR "synchronous exercise" OR "asynchronous exercise" OR "real-time exercise" OR "live exercise" OR "pre-recorded exercise") AND ("older adults" OR elderly OR seniors OR geriatric OR aging) AND(adherence OR compliance OR participation OR engagement OR retention OR dropout OR acceptability OR usability OR perceptions))
Web of Science	TS=(("tele-exercise" OR teleexercise OR "tele exercise" OR "online exercise" OR "remote exercise" OR "virtual exercise" OR "digital exercise" OR "internet-based exercise" OR "web-based exercise" OR "home-based exercise" OR "synchronous exercise" OR "asynchronous exercise" OR "live exercise" OR "real-time exercise" OR "pre-recorded exercise") AND ("older adults" OR elderly OR seniors OR geriatric OR aging) AND (adherence OR compliance OR participation OR engagement OR retention OR dropout OR acceptability OR usability OR perceptions))

Imagem em baixa resolução. Solicitamos nova aos autores e estamos aguardando.

Data extraction and synthesis

Data extraction was performed using a standardised matrix in which the following information was recorded: sample characteristics, study design, tele-exercise modality, technology used, programme parameters (duration, frequency and intensity), indicators of adherence, sustained participation and retention, as well as reported personal and relational determinants.

Interventions were classified as professionally monitored when structured follow-up was provided throughout the programme, including at least weekly professional feedback, systematic review of performance or individualised adjustment of exercise prescription.

Interventions were classified as minimal support when no regular professional contact occurred after initial orientation, with support limited to automated reminders or occasional technical assistance.

Synthesis and analytical approach

Thematic synthesis followed an iterative procedure involving independent reading of the included studies by two reviewers, open coding of reported determinants, grouping of codes into conceptual categories (personal and relational determinants), and consensus discussion to resolve discrepancies. This process aimed to enhance analytical transparency and credibility of the interpretative synthesis.

Findings were interpreted as trends rather than causal relationships, given the small number of included studies and the existing methodological variability.

Operational definitions

For this integrative review, operational definitions were adopted to ensure consistency in interpreting findings, in light of the conceptual and methodological heterogeneity observed in the literature.

In this context, adherence was defined as the degree of compliance with the prescribed exercise programme, which could include indicators such as the percentage of sessions completed, number of exercises completed, or the proportion of the recommended weekly dose achieved.

Sustained participation refers to the maintenance of exercise practice over time, considering patterns of continuity, stability or decline during the intervention period.

Retention refers to participants remaining in the study until the end of the intervention, regardless of their level of programme compliance.

These definitions are aligned with approaches previously used in studies and reviews of digital interventions and exercise in older adults (Ashe et al., 2024; Solis-Navarro et al., 2022).

RESULTS

Overall characteristics of the included studies

Five studies published between 2021 and 2025 were included, involving community-dwelling older adults with heterogeneous functional and clinical profiles. Pilot and feasibility studies predominated, and one long-duration randomised controlled trial was identified. Two articles analysed the same digital intervention based on the Amazon Alexa virtual assistant, corresponding to four distinct interventions analysed in this review.

Interventions predominantly involved asynchronous tele-exercise modalities, differing in the level of professional monitoring and the type of support provided. All studies reported indicators of adherence, sustained participation or retention, although the metrics were heterogeneous. The main methodological and intervention characteristics are summarised in Table 2.

Findings synthesised by modality

Two main tele-exercise modalities were identified: (i) asynchronous tele-exercise with professional monitoring; and (ii) self-managed asynchronous tele-exercise without structured human follow-up.

No eligible studies of individual synchronous tele-exercise were included according to the predefined criteria. This modality was therefore considered only in a contextual sense in the discussion.

Personal determinants associated with adherence and sustained participation

In monitored asynchronous tele-exercise programmes, personal determinants included perceived physical and functional benefits, motivation associated with technology use, and the ease of use of digital platforms. These factors were associated with high levels of adherence and retention during the intervention period.

In self-managed programmes, identified personal determinants included self-regulation capacity, autonomy in managing training, and clarity of the instructions provided. Initial adherence was generally adequate, particularly in short-term interventions.

Relational and support determinants

In studies with delayed professional monitoring, regular feedback, the possibility of programme adjustment and perceived follow-up were reported as elements associated with

continued participation. Structured monitoring was associated with greater perceived accountability among participants.

In contrast, in self-managed programmes relational support was limited or absent and replaced by automated mechanisms, such as reminders, motivational messages and educational content. In these cases, the absence of human feedback was reported as a factor associated with technical insecurity and a reduced sense of community of practice.

Barriers to sustained participation

The main reported barriers included technological difficulties, limited digital literacy, connectivity failures, and usability issues. Across modalities, a consistent barrier was the lack of real-time feedback, including immediate guidance and corrective reassurance.

The synthesis of personal determinants, relational determinants and barriers identified in each modality is presented in Table 3.

DISCUSSION

This integrative review aimed to synthesise the available evidence on personal and relational determinants of adherence and sustained participation among community-dwelling older adults in tele-exercise programmes, comparing modalities with varying levels of human interaction and support. Findings suggest that although tele-exercise is a viable strategy to promote exercise participation, continuity over time appears to depend on behavioural mechanisms that vary substantially with the degree of professional monitoring.

Overall, the included studies indicate that asynchronous interventions with professional monitoring show high and stable levels of adherence and retention compared with self-managed programmes. This pattern does not appear to result solely from the technological characteristics of the platforms, but mainly from the presence of relational mechanisms that reinforce behavioural engagement.

The higher adherence observed in monitored asynchronous interventions is consistent with findings reported by Daly et al. (2021) and Jansons et al. (2022a; 2022b), in which structured professional feedback reinforced behavioural engagement. In contrast, self-managed formats described by Pettersson et al. (2021) and Vikberg et al. (2022) highlighted autonomy but also reduced relational accountability, contributing to greater variability in sustained participation.

This finding aligns with recent evidence from systematic reviews and meta-analyses showing that digital interventions tend to exhibit greater variability in adherence levels compared with face-to-face programmes or those with structured human support, especially in older populations (Alley et al., 2024; Ashe et al., 2024; Solis-Navarro et al., 2022).

Role of personal determinants

The personal determinants identified (motivation, perceived benefits, routine formation and self-regulation) are consistent with behavioural models widely used to promote physical activity. Evidence from behavioural models indicates that behaviour maintenance depends not only on physical capacity but also on motivation and the perceived opportunity to engage in the activity.

In digital interventions, initial motivation tends to be high, but its maintenance is often limited over time, particularly in the absence of external reinforcement (Pettersson et al., 2025). Recent reviews demonstrate that older adults have greater

Table 2. Methodological and intervention characteristics of the included studies

Study	Design	Sample	Modality	Technology	Duration (weeks)	Adherence indicators
Jansons et al. (2022a)	Single-arm study	15	Asynchronous tele exercise with delayed professional monitoring.	Amazon Echo Show (Alexa) + Buddy Link platform, prescribed and monitored by AEP	12	-Retention: 100% completed. -Adherence mean: 115%
Daly et al. (2021)	pilot study	20	Asynchronous tele exercise with AEP	Physitrack/PhysiApp on tablet or iPad	8	-Retention: 95%. - Mean exercise adherence: 84%
Vikberg et al. (2022)	Feasibility trial	30	asynchronous home-based	Web-based exercise videos + self-report session log and support via email.	10	-Retention: 90% -Adherence to planned sessions (self-reported completion): 80%
Pettersson et al. (2021)	Qualitative study	29	Digital home-based fully self-managed exercise programs	fall-prevention exercise program delivered via videos for computers, smartphones and tablets.	16	Retention: 83%

AEP: Accredited Exercise Physiologist.

Table 3. Findings by tele-exercise modality.

Modality	Studies	Personal determinants	Relational determinants/ support	Barriers
Asynchronous with professional monitoring No. of studies = 3	Jansons et al. (2022a, 2022b)	-Motivation to participate due to conversation-based functionality of Alexa. -Voice interaction and Alexa design perceived as user friendly.	-Reminders motivated the participants. -Social engagement with Alexa.	-Technological barriers (voice recognition failures, connectivity, navigation). -Perceived need for real time objective feedback. -Preference for other technologies (smartphone and tablet). -Privacy concerns (turn off the Alexa device between exercise).
	Daly et al. (2021)	-Enjoyment and facility to use the app. - Perceived benefits and improvements to health.	-Feedback from trainer and performance assessments. -Ability to track and modify program, if needed.	-Lack of clarity around the terminology (the terms reps and sets).
Self-managed (self-guided) asynchronous No. of studies = 2	Vikberg et al. (2022)	-Enjoyment and facility to use the app. -Regulation and autonomy lead to the creation of training routines with self-adaptation of the programme. -Perceived benefits and bodily sensations (feeling stronger, improved function/wellbeing). -Personal motivation (setting one's own goals).	-Instructions given in the training videos and the try-out session increased confidence and feasibility. -The participants perceived the training instructor in the videos as a training friend. No structured human follow-up.	-Lack of feedback during the intervention led to technical insecurity. -Technological limitations and digital literacy.
	Pettersson et al. (2021)	- Autonomy and self-regulation in exercise selection and programme adaptation. - Flexibility to decide when and where to train supported routine formation. -Personal motivation (own goals). -Clear structure and video guidance reduced uncertainty and built confidence.	-Virtual physiotherapist feedback messages could be perceived as supportive -Reminders and planning features supported initiation and "keeping exercise in mind." -App registration and statistics are enabled progress tracking and motivated continuation.	-Creating their own programme felt like too much work and an undesired level of independence. -Technological limitations and digital literacy. -Feedback messages were sometimes perceived as impersonal or delivered too late (post-session). -Need for more social support.

difficulty sustaining autonomous exercise behaviours without ongoing follow-up, particularly in home-based and self-managed programmes (Ashe et al., 2024; Kilgour et al., 2024).

Importance of relational determinants and human support

One of the main contributions of this review is the identification of the critical role of relational support in adherence and sustained participation. Qualitative and quantitative studies indicate that perceived professional follow-up, even when delivered with delay, contributes to a greater sense of safety, commitment and accountability, factors that are particularly relevant for community-dwelling older adults (Jansons et al., 2022b; Pettersson et al., 2021).

Recent reviews of digital interventions further highlight that human support acts as a behavioural mediator and is often the differentiating element between initial adherence and sustained participation (Ashe et al., 2024; Di Pumpo et al., 2025). The presence of technical feedback, individualised adjustments and periodic professional contact has been associated with greater continuation of practice, even in asynchronous interventions (Daly et al., 2021; Geraedts et al., 2017).

Sustained participation in long-term interventions

The findings of this review show a pattern of progressive decline over time. This phenomenon has been widely described in the literature, particularly in digital interventions lasting longer than six months, in which a gradual reduction in weekly exercise dose and increasing heterogeneity in behaviours are observed (Delbaere et al., 2021; Pettersson et al., 2025).

This pattern reinforces the conceptual distinction between initial adherence and sustained participation, which is often neglected in intervention studies. Recent reviews warn that using platform access frequency as the sole indicator may overestimate true adherence to the prescribed programme (Ashe et al., 2024; Solis-Navarro et al., 2022).

Technological dimension and technological barriers

Despite tele-exercise's potential to reduce logistical barriers, technological barriers emerge as a cross-cutting limiting factor. Qualitative studies report that usability difficulties, technical failures, and low digital literacy compromise the user experience and increase the risk of dropout (Costa-Brito et al., 2024; Pettersson et al., 2021).

The digital health literature emphasises that effective interventions in ageing populations should adopt user-centred design principles, with progressive onboarding processes and adequate technical support (Alley et al., 2024; Costa-Brito et al., 2024). When these principles are not considered, technology can become an additional factor of exclusion, undermining the objective of accessibility.

Practical implications and future research

These findings reinforce the need for tele-exercise models that combine technological flexibility with structured professional support. Recent reviews suggest that hybrid approaches have greater potential to balance scalability, perceived safety and long-term adherence (Di Pumpo et al., 2025; Garrido et al., 2025).

The development of intelligent systems capable of providing individualised feedback and motivational reinforcement may mitigate some of the limitations observed in self-managed formats. However, current evidence suggests that such systems should complement rather than replace human interaction, preserving the relational mechanisms essential for behavioural engagement in older adults (Fabbrizio et al., 2023; Izquierdo et al., 2025).

Limitations

This review presents several limitations, including the small number of included studies, the predominance of pilot and feasibility designs, and the heterogeneity of adherence metrics, which limit the generalisability of findings. Additionally, the absence of eligible individual synchronous tele-exercise trials restricts comparison across all tele-exercise modalities. Therefore, findings should be interpreted cautiously as exploratory behavioural trends rather than definitive evidence.

CONCLUSION

This integrative review aimed to synthesise the available evidence on personal and relational determinants of adherence and sustained participation among community-dwelling older adults in tele-exercise programmes, across modalities with varying levels of human interaction and professional support.

The findings indicate that tele-exercise is a viable strategy to promote access to exercise among older adults. However, maintaining participation over time appears to depend less on the technology used and more on the behavioural mechanisms the intervention is able to sustain. Interventions with structured professional monitoring, even when delayed, tend to show more consistent patterns of adherence and participation than self-managed programmes, in which greater variability and a progressive decline in practice are observed, particularly in long-duration interventions.

The continuation of exercise appears to result from the interaction between personal determinants, such as motivation and self-regulation, and relational determinants, namely support, feedback, and perceived follow-up. The absence of these mechanisms may undermine technical confidence, reduce perceived commitment and favour dropout, particularly in populations with greater functional vulnerability or lower digital literacy.

These findings reinforce the need for tele-exercise models that integrate technological flexibility with appropriate professional support, prioritising participant-centred approaches tailored to their needs. In addition, heterogeneity in the definitions and metrics used to assess adherence and sustained participation limits comparability between studies, highlighting the importance of greater methodological standardisation in future research.

Despite the limitations inherent to the small number of included studies and the predominance of feasibility designs, this review contributes to a deeper understanding of the factors influencing sustained participation among older adults in tele-exercise programmes. Future research should prioritise longer-duration interventions, with consistent behavioural metrics and support strategies that allow a more robust assessment of the mechanisms underlying maintenance of practice over time.

These conclusions should therefore be interpreted as indicative behavioural trends rather than definitive causal evidence, reinforcing the need for future long-term controlled studies with standardised adherence metrics.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Gisela Cruz — Data curation; Investigation; Methodology; Visualization; Writing – original draft; Writing – review & editing.

Nuno Garrido — Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Validation; Writing – review & editing.

Victo Reis — Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Software; Validation; Visualization; Writing – review & editing.

José Vilaça-Alves — Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing – original draft; Writing – review & editing.

REFERENCES

Alley, S. J., Waters, K. M., Parker, F., Peiris, D. L. I. H. K., Fien, S., Rebar, A. L., & Vandelanotte, C. (2024). The effectiveness of digital physical activity interventions in older adults: a systematic umbrella review and meta-meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *21*(1), Article 144. https://doi.org/10.1186/s12966-024-01694-4

Ashe, M. C., Santos, I. K., Erome, J., Grant, J., Mollins, J., & Soh, S.-E. (2024). Systematic review of adherence to technology-based falls prevention programs for community-dwelling older adults: Reimagining future interventions. *PLoS Digital Health*, *3*(9), Article e0000579. https://doi.org/10.1371/journal.pdig.0000579

Billot, M., Calvani, R., Urtamo, A., Sánchez-Sánchez, J. L., Ciccolari-Micaldi, C., Chang, M., Roller-Wirnsberger, R., Wirnsberger, G., Sinclair, A., Vaquero-Pinto, N., Jyväkorpi, S., Öhman, H., Strandberg, T., Schols, J. M. G. A., Schols, A. M. W. J., Smeets, N., Topinkova, E., … & Freiberger, E. (2020). Preserving mobility in older adults with physical frailty and sarcopenia: Opportunities, challenges, and recommendations for physical activity interventions. *Clinical Interventions in Aging*, *15*, 1675-1690. https://doi.org/10.2147/cia.s253535

Cabrolier-Molina, J., Martín-Rodríguez, A., & Clemente-Suárez, V. J. (2025). The effects of exercise intervention in older adults with and without sarcopenia: A systematic review. *Sports*, *13*(5), Article 152. https://doi.org/10.3390/sports13050152

Coletta, G., Noguchi, K. S., Beaudoin, K. D., McQuarrie, A., Tang, A., Ganann, R., Phillips, S. M., & Griffin, M. (2025). Older adults' perspectives on participating in a synchronous online exercise program: Qualitative study. *JMIR Aging*, *8*, Article e66473. https://doi.org/10.2196/66473

Coletta, G., Noguchi, K. S., Beaudoin, K. D., McQuarrie, A., Tang, A., Griffin, M., Ganann, R., & Phillips, S. M. (2024). A live online exercise program for older adults improves depression and life-space mobility: A mixed-methods pilot randomized controlled trial. *PLoS One*, *19*(11), Article e0312992. https://doi.org/10.1371/journal.pone.0312992

Costa-Brito, A. R., Bovolini, A., Rúa-Alonso, M., Vaz, C., Ortega-Morán, J. F., Pagador, J. B., & Vila-Chã, C. (2024). Home-based exercise interventions delivered by technology in older adults: A scoping review of technological tools usage. *International Journal of Medical Informatics*, *181*, Article 105287. https://doi.org/10.1016/j.ijmedinf.2023.105287

Daly, R. M., Gianoudis, J., Hall, T., Mundell, N. L., & Maddison, R. (2021). Feasibility, usability, and enjoyment of a home-based exercise program delivered via an exercise app for musculoskeletal health in community-dwelling older adults: Short-term prospective pilot study. *JMIR mHealth and uHealth*, *9*(1), Article e21094. https://doi.org/10.2196/21094

Dawson, R., Oliveira, J. S., Kwok, W. S., Bratland, M., Rajendran, I. M., Srinivasan, A., Chu, C. Y., Pinheiro, M. B., Hassett, L., & Sherrington, C. (2024). Exercise interventions delivered through telehealth to improve physical functioning for older adults with frailty, cognitive, or mobility disability: a systematic review and meta-analysis. *Telemedicine Journal and E-Health*, *30*(4), 940–950. https://doi.org/10.1089/tmj.2023.0177

De La Vega-Cordero, E. M., López-Teros, M., García-González, A. I., Rosas-Carrasco, O., & Castillo-Aragon, A. (2023). Effectiveness of an online multicomponent physical exercise intervention on the physical performance of community-dwelling older adults: A randomized controlled trial. *Geriatric Nursing*, *54*, 83–93. https://doi.org/10.1016/j.gerinurse.2023.08.018

Delbaere, K., Valenzuela, T., Lord, S. R., Clemson, L., Zijlstra, G. A. R., Close, J. C. T., Lung, T., Woodbury, A., Chow, J., McInerney, G., Miles, L., Toson, B., Briggs, N., & van Schooten, K. S. (2021). E-health StandingTall balance exercise for fall prevention in older people: Results of a two year randomised controlled trial. *BMJ*, *373*, Article n740. https://doi.org/10.1136/bmj.n740

Di Pumpo, M., Miatton, A., Riccardi, M. T., Graps, E. A., Baldo, V., Buja, A., & Damiani, G. (2025). Digital health interventions to promote physical activity in community-dwelling older adults: A systematic review and semiquantitative analysis. *International Journal of Public Health*, *69*, Article 1607720. https://doi.org/10.3389/ijph.2024.1607720

Fabbrizio, A., Fucarino, A., Cantoia, M., De Giorgio, A., Garrido, N. D., Iuliano, E., Reis, V. M., Sausa, M., Vilaça-Alves, J., Zimatore, G., Baldari, C., & Macaluso, F. (2023). Smart devices for health and wellness applied to tele-exercise: An overview of new trends technologies such as IoT and AI. *Healthcare*, *11*(12), Article 1805. https://doi.org/10.3390/healthcare11121805

Garrido, N. D., Reis, V. M., Vilaça-Alves, J. M., Lucas, G. C., Godinho, I. L., Peixoto, R., Fucarino, A., Cantoia, M., Iuliano, E., Giorgio, A., Fabbrizio, A., Suasa, M., Zimatore, G., Baldari, C., & Macaluso, F. (2025). Impact of tele-exercise on quality of life, physical fitness, functional capacity and strength in different adult populations: A systematic review of clinical trials. *Frontiers in Sports and Active Living*, *7*, Article 1505826. https://doi.org/10.3389/fspor.2025.1505826

Geraedts, H. A. E., Zijlstra, W., Zhang, W., Spoorenberg, S. L. W., Báez, M., Khaghani Far, I., Baldus, H., & Stevens, M. (2017). A home-based exercise program driven by tablet application and mobility monitoring for frail older adults: Feasibility and practical implications. *Preventing Chronic Disease*, *14*, Article E12. https://doi.org/10.5888/pcd14.160227

Izquierdo, M., Barreto, P. S., Arai, H., Bischoff-Ferrari, H. A., Cadore, E. L., Cesari, M., Chen, L. K., Coen, P. M., Courneya, K. S., Duque, G., Ferrucci, L., Fielding, R. A., García-Hermoso, A., Gutiérrez-Robledo, L. M., Harridge, S. D. R., Kirk, B., Kritchevsky, S., … & Singh, M. A. F. (2025). Global consensus on optimal exercise recommendations for enhancing healthy longevity in older adults (ICFSR). *Journal of Nutrition, Health & Aging*, *29*(1), Article 100401. https://doi.org/10.1016/j.jnha.2024.100401

Jansons, P., Dalla Via, J., Daly, R. M., Fyfe, J. J., Gvozdenko, E., & Scott, D. (2022a). Delivery of home-based exercise interventions in older adults facilitated by Amazon Alexa: A 12-week feasibility trial. *The Journal of Nutrition, Health & Aging*, *26*(1), 96–102. https://doi.org/10.1007/s12603-021-1717-0

Jansons, P., Fyfe, J. J., Dalla Via, J., Daly, R. M., Gvozdenko, E., & Scott, D. (2022b). Barriers and enablers for older adults participating in a home-based pragmatic exercise program delivered and monitored by Amazon Alexa: A qualitative study. *BMC Geriatrics*, *22*(1), Article 248. https://doi.org/10.1186/s12877-022-02963-2

Kilgour, A. H. M., Rutherford, M., Higson, J., Meredith, S. J., McNiff, J., Mitchell, S., Wijayendran, A., Lim, S. E. R., & Shenkin, S. D. (2024). Barriers and motivators to undertaking physical activity in adults over 70: A systematic review of the quantitative literature. *Age and Ageing*, *53*(4), Article afae080. https://doi.org/10.1093/ageing/afae080

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., … & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, *372*, Article n71. https://doi.org/10.1136/bmj.n71

Pettersson, B., Janols, R., Wiklund, M., Lundin-Olsson, L., & Sandlund, M. (2021). Older adults' experiences of behavior change support in a digital fall prevention exercise program: qualitative study framed by the self-determination theory. *Journal of Medical Internet Research*, *23*(7), Article e26235. https://doi.org/10.2196/26235

Pettersson, B., Lundin-Olsson, L., Skelton, D. A., Liv, P., Zingmark, M., Rosendahl, E., & Sandlund, M. (2025). Effectiveness of the Safe Step Digital Exercise Program to prevent falls in older community-dwelling adults: Randomized controlled trial. *Journal of Medical Internet Research*, *27*, Article e67539. https://doi.org/10.2196/67539

Reis, V. M., Vilaça Alves, J., & Garrido, N. D. (2024). *Manual of tele-exercise for coaches and trainers* (Deliverable 1.5, Version 1.0). Universidade de Trás-os-Montes e Alto Douro. Retrieved from https://www.teleexe4all.com/wp-content/uploads/2024/07/Manuale-for-Tele-exercise-PT.pdf

Solis-Navarro, L., Gismero, A., Fernández-Jané, C., Torres-Castro, R., Solá-Madurell, M., Bergé, C., Pérez, L. M., Ars, J., Martín-Borràs, C., Vilaró, J., & Sitjà-Rabert, M. (2022). Effectiveness of home-based exercise delivered by digital health in older adults: A systematic review and meta-analysis. *Age and Ageing*, *51*(11), Article afac243. https://doi.org/10.1093/ageing/afac243

Vikberg, S., Björk, S., Nordström, A., Nordström, P., & Hult, A. (2022). Feasibility of an online delivered, home-based resistance training program for older adults: a mixed methods approach. *Frontiers in Psychology*, *13*, Article 869573. https://doi.org/10.3389/fpsyg.2022.869573

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, *52*(5), 546-553. https://doi.org/10.1111/j.1365-2648.2005.03621.x

World Health Organization (2020). *Decade of healthy ageing: Plan of action*. World Health Organization. Retrieved from https://www.who.int/publications/m/item/decade-of-healthy-ageing-plan-of-action

Yang, Y., Gao, Y., An, R., & Wan, Q. (2024). Barriers and facilitators to exercise adherence in community-dwelling older adults: A mixed-methods systematic review using the COM-B model and Theoretical Domains Framework. *International Journal of Nursing Studies*, *157*, Article 104808. https://doi.org/10.1016/j.ijnurstu.2024.104808

All content of Journal Motricidade is licensed under Creative Commons, except when otherwise specified and in content retrieved from other bibliographic sources

