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DOI

[10.1016/j.sfr.2025.100982](https://doi.org/10.1016/j.sfr.2025.100982)

Publication date

2025

Document Version

Final published version

Published in

Sustainable Futures

Citation (APA)

Llopis, P., Oviedo-Trespalacios, O., Alonso, F., Faus, M., & Useche, S. A. (2025). Walking apps for active aging? A literature and multi-source review of their impact on older adult users' mobility and wellbeing. *Sustainable Futures*, 10, Article 100982. <https://doi.org/10.1016/j.sfr.2025.100982>

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Walking apps for active aging? A literature and multi-source review of their impact on older adult users' mobility and wellbeing

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ARTICLE INFO

Keywords:

Aging population
Technological tools
User-based interfaces
Active mobility
Healthy aging
Public health

ABSTRACT

Population aging is a macrosocial trend with growing implications for mobility and public health. In the coming decades, many countries are expected to experience a marked increase in the average age of their populations, raising new challenges for healthcare and mobility systems. The promotion of active mobility, widely supported in the literature for its role in maintaining health in later life, has gained visibility. However, it remains unclear whether existing digital tools, such as lifestyle apps, effectively contribute to this goal.

Methods: This study examined the effectiveness of applications and tools designed to promote walking among older adults through a systematic literature review, complemented by additional sources, including sentiment analysis of user reviews.

Results: Many walking apps offer features such as step tracking and personalization, but few address both physical activity and social isolation simultaneously. Available evidence suggests potential benefits in gait quality, balance, and reduced sedentary behavior in specific contexts. User feedback also points to high satisfaction, especially with simple and accessible interfaces. However, the scientific literature supporting these outcomes remains limited in scope and generalizability.

Conclusion and practical insights: This multi-source review suggests that walking apps may support more active lifestyles among older adults, though current evidence is not yet conclusive. Future app development should prioritize usability and incorporate features that address both physical and social well-being, while ensuring accessibility and affordability for a broader range of users.

1. Introduction

The global population is aging at an unprecedented pace, with projections indicating significant demographic shifts in the coming decades. By 2050, the proportion of individuals aged 60 years and older is expected to nearly double, increasing from 12 % to 22 % of the global population. Notably, by 2020, the number of older adults had already exceeded the number of children under five years of age. Furthermore, by 2050, the population of older adults (aged 60 and above) is projected to reach 2.1 billion, surpassing the 2.0 billion adolescents aged 10–24 [1]. The global life expectancy at birth increased to 73 years in 2020, 7 years higher than in 2000 and nearly 30 years more than in 1950. By

2100, life expectancy at birth could exceed 95 years in countries such as Japan, the Republic of Korea, Singapore, and Spain [2].

The population of older adults –particularly those over the age of 80–represents the fastest-growing demographic group worldwide [3]. Europe is expected to remain the most aged region, with 34 % of its population projected to be 60 years or older by 2050 [3]. At the same time, urbanization is steadily increasing: according to recent figures, in 2018, 55 % of the global population lived in urban areas, a proportion expected to rise to 68 % by 2050. In high-income countries, this trend is even more pronounced, with urbanization rising from 59 % in 1950 to 81 % today, and projected to reach nearly 88 % by mid-century [4].

As cities become increasingly populated by older adults, new

Abbreviations: eHealth, Electronic Health; HR, Heart Rate; IP, Internet Protocol; mHealth, Mobile Health; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; RPE, Rating of Perceived Exertion; SERP, Search Engine Results Page.

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<https://doi.org/10.1016/j.sfr.2025.100982>

Received 27 December 2024; Received in revised form 21 May 2025; Accepted 5 July 2025

Available online 14 July 2025

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challenges emerge – mobility being among the most pressing, given its key role in sustaining quality of life, enabling access to essential services, participation in social activities, maintenance of independence, and continued engagement in active aging [5,6]. Beyond reaching destinations, it is currently accepted the idea that mobility also carries emotional and affective significance [7], contributing to older adults' sense of identity, routine, and connection to their environment.

- 'Walking for health' in pedestrian non-friendly cities?

Aging is often accompanied by reduced mobility, which makes walking one of the most frequently recommended health-related activities for older adults [8,9]. However, pedestrians aged 60 or older have higher risk severe/fatal injury than pedestrians <60 when involved in pedestrian crashes or falls [10], as well as, between one-third and one-half of individuals aged 65 or older report difficulties walking or climbing stairs [11]. These limitations can contribute to social isolation, as physical constraints often reduce interaction with family, friends, and the wider community [12]. Importantly, these restrictions rarely stem from a single cause but tend to reflect a combination of individual and environmental factors [13].

A related psychosocial issue further complicates this scenario: social isolation and loneliness are particularly prevalent in older age [12,14], and have been associated with a wide range of negative health outcomes –including psychoendocrine disorders, depression, anxiety, cognitive decline, and increased mortality [25–27]– as well as with chronic conditions such as type 2 diabetes, coronary heart disease, and colorectal cancer [28].

Regarding the urban environment, neighborhood characteristics such as the availability of public transportation, the presence of safe walking paths, and the design of public spaces can strongly influence older adults' mobility. Environments that are not conducive to walking may contribute to social isolation [14,15] and lower levels of physical activity among older people [16]. Reluctance to walk in urban areas may also stem from safety concerns, including fear of becoming victims of crime –especially among women, who tend to perceive a higher risk of assault, robbery, or harassment compared to men [17–19]– as well as difficulties in navigating public spaces during adverse weather conditions [20].

In addition, fear of falling is a key individual factor shaping mobility patterns in later life, particularly in urban settings [21,22]. Combined with other barriers –such as reduced motivation or energy, limited digital literacy, and loss of autonomy– these factors often lead older adults to avoid walking unless accompanied by others during their daily trips [21,23].

The reluctance of many older adults to engage in walking presents a significant challenge, as it contributes to social isolation and limits mobility. Walking not only reduces feelings of isolation by fostering social interaction but also offers substantial health benefits, including improved mobility and physical function. Addressing this issue requires a comprehensive approach that considers the individual and environmental factors influencing older adults' willingness and ability to walk, ultimately promoting both their physical and social well-being.

- Some possible alternatives and solutions: a literature-based perspective

In line with public policies aimed at addressing this issue, some existing studies suggest that reducing loneliness and social isolation among older adults requires targeted, well-supported interventions. While no universal solution exists, the most effective approaches often include physical and group-based activities [29–31]. Walking, on the one hand, has been shown to promote social participation and reduce perceived loneliness in older adults [32]. It has also been associated with improvements in mental health outcomes related to isolation, such as symptoms of depression and anxiety [34]. Additionally, it is known that

walking in natural environments may offer further psychological benefits, possibly explained by attention restoration theory, which posits that exposure to nature can help restore cognitive function and lower stress levels [33,35–37].

On the other hand, mobile technologies, including health-related applications, have faced challenges in effectively engaging older adults and supporting sustained behavioral change [24,38]. Nevertheless, the increasing use of digital tools across age groups creates new opportunities to address these barriers. Previous studies have shown that mobile apps can encourage walking in different populations, including general adult users [39] and middle-aged men [40]. Moreover, exercise interventions delivered through digital platforms have achieved relatively high adherence rates, offering a potentially viable way to promote physical activity and reduce fall risk among older adults [41].

While environmental improvements and group-based walking programs are effective strategies to promote physical activity [42,43] they often require logistical coordination, infrastructure changes, or social engagement that may not be accessible or appealing to all older adults.

In contrast, mobile apps offer low-cost, scalable, and personalized interventions that can be accessed on demand, at the user's convenience [44,45]. Moreover, mobile interventions can be especially beneficial for older adults who experience barriers such as mobility limitations, social isolation, or rural living, where group programs or suitable walking environments may be lacking, being apps a bridge to enable physical activity in a safe, private, and controlled manner [46].

The adoption of personal computing technologies among older adults is steadily increasing. In the U.S., 77 % of adults over 50 owned smartphones as of 2019 [47], and 67 % were regular internet users by 2017 [48]. Similarly, in Spain, 60 % of citizens aged 65 to 74 used the internet in 2024 [49]. This trend has been further accelerated by the COVID-19 pandemic, which drove greater engagement with digital tools [50]. In this sense, smartphone ownership has risen from only 10 % of adults older than 65 years using smartphones in 2011 to 61 % in 2021 [51].

As older adults become more digitally connected, mobile apps offer significant potential to promote walking and reduce loneliness, along with its associated consequences. While the benefits of eHealth and mHealth interventions for improving mobility in older adults are well-documented [52,53], there remains a lack of research specifically addressing the accessibility and impact of widely available apps targeting walking promotion in this demographic. Many studies have focused on broad health improvements or have been conducted within clinical or controlled environments, limiting their applicability to the general population of older adults.

This study seeks to address these gaps, given the growing digital connectivity, the importance of mobility for older adults and the potential of mobile interventions.

1.1. Objectives of the study

This paper aims to analyze current mobile apps designed to encourage walking among older adults, focusing on identifying their key features and evaluating the extent to which their benefits are supported by evidence of effectiveness in promoting physical activity and reducing social isolation. The study provides a comprehensive overview of app features, user reviews, and sentiments related to their performance in fostering active lifestyles. By examining the evidence for their impact, this research seeks to shed light on how mobile apps can be effectively utilized to support healthier and more active lifestyles for the aging population.

In addition to describing app features, the study examines older adults' perceptions and experiences with these technologies, with particular attention to acceptance and ease of use. It explores questions that remain insufficiently addressed in the literature, such as which app components are most effective in encouraging walking habits and

reducing social isolation. The analysis also considers which apps have been evaluated through scientific studies to support claims of effectiveness. Finally, it assesses user satisfaction by focusing on aspects such as interface design, user feedback, and perceived benefits, in order to better understand how older adults engage with and respond to these tools.

2. Study methods

This study followed a two-phase design. The first phase involved extensive online searches to identify the population of mobile apps promoting walking among older adults. In the second phase, these apps were analyzed for their effectiveness in encouraging physical activity and reducing social isolation through a combination of literature review and sentiment analysis. Details of each step are provided in the following sections.

2.1. First stage. identification of apps

2.1.1. Definition and scope

The primary aim of this first stage was to identify the population of mobile apps specifically tailored for older adults that encourage users to walk, as well as to obtain comprehensive data regarding their aims and features.

2.1.2. Information sources

To identify mobile applications specifically designed to promote walking among older adults, a two-phase search strategy was implemented. The first phase involved a structured web-based search using the Google search engine including blogs, health websites, app review platforms, and promotional pages. This was followed by a second phase in which the Google Play Store and Apple App Store were consulted directly to locate additional apps not captured through web search alone.

Both searches were performed in September 2024 using a personal device connected to an IP address located in Spain, which may have resulted in the exclusion of apps not available within this geographical region.

2.1.3. Search terms

The terms used in the Google search engine were: “apps” AND “walking” AND “older adults”. These keywords were chosen to capture content related specifically to mobile applications that both promote walking and were targeted toward or suitable for an older adult population. The same search string was used in the Google Play Store and Apple App Store to ensure consistency across both phases of the identification process. In the web-based search, only the first two Search Engine Results Pages (SERPs) were reviewed.

2.1.4. Eligibility

The inclusion and exclusion of mobile applications in this study were guided by conceptual relevance to the research objectives, as well as practical considerations related to the accessibility and applicability of the apps to older adult populations.

Apps were eligible for inclusion if they met the following criteria: (1) explicitly designed to promote physical activity, especially walking; (2) the application was targeted toward older adults, either explicitly or through features relevant to this demographic; and (3) the app was available for download on either the Google Play Store or the Apple App Store.

Apps were excluded if they (1) referred to scientific publications rather than actual apps; (2) described apps where physical activity was not a central focus; (3) lacked any indication of relevance to older adult users; or (4) duplicated applications already identified in earlier steps of the search process.

2.1.5. Data collection

For each identified application, key descriptive and functional characteristics were systematically extracted and organized into a structured table. The variables collected included: (1) app name; (2) platform compatibility; (3) pricing model; (4) whether the app was specifically targeted at older adults; and (5) whether walking constituted a central focus of the app.

2.2. Second stage. effectiveness of apps

2.2.1. Sentiment analysis

At a conceptual level, a sentiment analysis consists of carrying out computational technique used to assess the emotional tone behind text data, such as user reviews. This method, widely used in both market research and psychosocially grounded studies from different areas of knowledge categorizes sentiments into positive, negative, or neutral, allowing for a nuanced understanding of user satisfaction and the effectiveness of mobile applications.

In this study, sentiment analysis was applied to app reviews identified in the First Stage to gain insights into the experiences of older adults using walking-promoting apps. Appbot, a tool specifically designed for sentiment analysis of app reviews, was utilized. At an interface level, tools such as Appbot are known to have the capability to process large volumes of user feedback, enabling developers and researchers to identify trends in user satisfaction and areas for improvement. Studies by Sharma et al. [60] and Rahmillah et al. [61] have successfully used Appbot for similar purposes.

Due to limitations in accessing demographic information directly from app store platforms, we were unable to filter the reviews specifically for those provided by older adults. As a result, the sentiment analysis included all available user reviews, regardless of the age group of the reviewer.

2.2.2. Literature review

2.2.2.1. Definition and scope. The primary aim of this literature review is to target publications and scientific evidence that provide a comprehensive overview of the effectiveness of mobile apps in promoting walking behaviors among older adults. The review includes studies on any mobile app designed to encourage walking, not limited to those identified in the initial stage of this research. Particular attention is given to whether the user experience is adapted to meet the specific needs of older adults.

2.2.2.2. Information sources. The review adhered to the guidelines outlined in the PRISMA 2020 report for systematic reviews [54]. Initially, a scoping review was performed to explore the extent and variability of the available literature, which informed the development of the full systematic review. This preliminary mapping phase (see Appendix I for further information) helped define relevant search terms and assess the feasibility of the review’s objectives.

The electronic searches used to gather scientific (peer-reviewed) literature-based data were conducted in Web of Sciences, Scopus and PubMed databases between October 1st, 2024, and December 2nd, 2024. The selected databases are recognized for their quality and relevance within the scientific community. Other sources, like Medline, PsycINFO, CINAHL or Google Scholar, were not included independently for several reasons. First, Medline is largely indexed within PubMed, which rendered a separate search redundant. Second, PsycINFO and CINAHL, while valuable in psychology and nursing respectively, were not prioritized due to the interdisciplinary nature of this review and the expectation that relevant studies would also appear in broader databases such as Scopus and Web of Science. Finally, Google Scholar was avoided due to concerns regarding its overrepresentation of grey literature and lack of scientific precision [54,55].

Reference lists from eligible papers were also examined for relevant studies. However, no additional eligible studies were identified beyond those captured by the primary search.

2.2.2.3. Search terms and Boolean operators. Search terms (both indexed [e.g., Medical Subject Headings] and keywords) associated with all concepts were independently derived by each author in consultation with the same subject matter expert librarian. The collaborative effort ensured a comprehensive approach to the identification of relevant literature covered by the scope of this systematic review.

The review criteria encompassed studies available in English or Spanish. Consequently, key terms and Boolean search operators were tailored to accommodate these two languages (see Table 1).

For each title/abstract, the three qualified reviewers independently screened for eligibility, adhering to a priori inclusion and exclusion criteria. Following title/abstract screening, the same five researchers independently applied the inclusion and exclusion criteria to the remaining full-text records. Articles not directly related to the research focus were excluded during this phase. To manage potential discrepancies in the selection process, all authors individually evaluated a specific set of titles and abstracts before engaging in discussions to reach a scientific agreement.

2.2.2.4. Eligibility. This review will provide insights into the role of mobile technology in promoting physical activity among older adults, with a focus on identifying the key features and effectiveness of mobile apps designed to increase walking behaviors.

To achieve this objective, studies were eligible for inclusion if they met the following criteria: (1) studies focused on mobile applications designed to promote physical activity, especially walking, among older adults, (2) studies that involve eHealth and mHealth solutions, as long as they focus on smartphone apps designed to enhance physical activity or walking behaviors and (3) studies focused on the impacts on health improvements on older adults of mobile apps aimed to promote walking or physical activity.

Studies were excluded if they (1) did not target older adults or lack relevance to this population group, (2) involved mobile technologies that were not smartphone based, and (3) referred to theoretical frameworks rather than actual mobile apps.

In terms of geographical scope, an ‘open criteria’ approach has been adopted to avoid limiting research based on its origin, ensuring the inclusion of high-quality sources. This strategy helps identify regions or countries where more research is being conducted on this topic and allows for a comprehensive documentation of key findings, recognition of study limitations, and in-depth analysis of the results.

Only studies published in English or Spanish were included in this review. This language restriction was applied to ensure accurate interpretation and evaluation of the data by the research team. Publications in other languages were excluded due to feasibility constraints in translation and data validation.

2.2.2.5. Data collection. A descriptive-analytic method, as outlined by Arksey & O’Malley [56], was used to appraise the included studies. The five academic reviewers performed full-text reviews, extracting key data

Table 1
Search strategy for eligible articles.

Search strategy item	Search strategy
Databases	Web of Sciences, Scopus and PubMed
Language filter	English and Spanish
Boolean search operator (title-abstract-keywords)	The identical Boolean search operator was used across all databases. 1. (APP) 2. AND (walk OR pedestrian) 3. AND (older people OR elderly)

such as author(s), publication year, study objectives, methods, sample size, main findings, and limitations. The extracted data were systematically organized in tables for further analysis.

2.2.2.6. Content analysis. The content analysis was conducted to evaluate the outcomes reported in the literature concerning mobile apps aimed at promoting walking among older adults. This analysis focused on synthesizing the findings regarding the effectiveness of these apps.

Each article was subjected to a detailed review, focusing on the following aspects: (1) the specific features of mobile apps designed to promote walking behaviors in older adults, (2) the effectiveness of these apps as reported in the studies, and (3) the methodological quality of the research.

The content was categorized into key themes, such as effectiveness in promoting physical activity, effects on gait, mental health outcomes and usability. This thematic coding allowed for the synthesis of findings across studies and contributed to a deeper understanding of the effectiveness of walking apps for older adults (see Fig. 3).

2.2.2.7. Discursive analysis. We applied discourse analysis using VOSviewer [57] to explore and analyze the existing literature on mobile applications designed to promote walking among older adults. Discourse analysis, in this context, allows us to go beyond simple content summarization and instead focus on understanding how key concepts, themes, and patterns emerge within the scholarly discourse.

To analyze the discursive structures within the selected studies, the content analysis software VOSviewer was utilized to identify key groupings or clusters of terms present in the full-length articles’ text. This tool is primarily intended for bibliometric analysis and serves as an effective means of condensing and synthesizing the literature, thus providing an insightful overview of the current research landscape on a particular subject based on existing publications. Moreover, its ability to enhance the objectivity of literature analysis [58] has contributed to its growing popularity in recent years, owing to its user-friendly nature and effectiveness in managing and evaluating large volumes of scientific data [59].

After gathering the data, bibliometric details and the text corpus from all chosen documents were exported in RIS format and processed through VOSviewer. This software identifies recurring patterns and relationships, forming clusters of words based on the complete text. Identifying these clusters aids in the clear and efficient recognition of principal themes across the document set. From a research perspective, this methodology substantially enhances the classification and organization of the selected articles. Fig. 4 visually represents the clusters and connections among the terms within the texts, with each selected term appearing in the individual text corpus of each source at least 4 times.

3. Results

3.1. Apps identified

A total of 11 mobile apps were identified through the Google search engine, 12 apps were found in the Google Play Store, and 2 apps in the Apple App Store. After deleting duplicates, the search for mobile applications aimed at promoting walking among older adults identified a total of 18 relevant apps. These applications were evaluated based on several fundamental characteristics, including compatibility (Android and iOS), pricing model (free, freemium¹), and whether they focus specifically on older adults (senior friendly interface) or walking as a primary activity.

The Table 2 summarizes these core characteristics, providing a quick

¹ Business model that works by offering basic services for free, while charging money for other more advanced or specialized services

Table 2
Basic Characteristics of identified Apps.

#	App Name	Compatibility	Price	Focused on Older Adults	Focused on Walking
1	Pacer Health	Android, iOS	Freemium	No	Yes
2	Map My Walk	Android, iOS	Freemium	No	Yes
3	Silver Sneakers Go	Android, iOS	Free	Yes	No
4	Mighty Health	Android, iOS	Freemium	Yes	No
5	WeWard - The Walking App	Android, iOS	Freemium	No	Yes
6	Walking App - Lose Weight App	Android, iOS	Freemium	No	Yes
7	Weight Loss Walking: WalkFit	Android, iOS	Freemium	No	Yes
8	Macadam - Walk and Earn	Android, iOS	Free	No	Yes
9	Senior Fitness 50+	Android	Free	Yes	No
10	Workout for Older Adults	Android, iOS	Freemium	Yes	No
11	Tai Chi Fit Over 50	Android, iOS	Freemium	Yes	No
12	Yoga for Seniors, Old & Elders	Android	Freemium	Yes	No
13	The Walk: Fitness Game	Android, iOS	Freemium	No	Yes
14	Over Fifty Fitness	Android, iOS	Freemium	Yes	No
15	Daily Yoga	Android, iOS	Freemium	No	No
16	Gentle Exercises for Seniors	Android, iOS	Freemium	Yes	No
17	Fitness RPG: Walking Games	Android, iOS	Freemium	No	Yes
18	Google Fit: Activity Tracking	Android, iOS	Free	No	Yes

overview of each app’s accessibility and target audience. Following this, [Table 3](#) details the specific features of each app, highlighting functionalities such as step tracking, reminders, rewards, community engagement, gamification, safety features, personalization, and senior-friendly

Table 3
Core features of walking promoting apps.

#	App Name	Rewards	Reminders	Community Engagement	Step Tracking	Gamification	Personalization	Senior-Friendly Interface	Total
1	Pacer Health	✗	✓	✓	✓	✗	✓	✓	5
2	Map My Walk	✗	✓	✓	✓	✗	✓	✗	4
3	Silver Sneakers Go	✗	✓	✗	✗	✗	✓	✓	3
4	Mighty Health	✗	✓	✓	✗	✗	✓	✓	4
5	WeWard - The Walking App	✓	✓	✓	✓	✓	✗	✗	5
6	Walking App - Lose Weight App	✗	✓	✗	✓	✗	✓	✗	3
7	Weight Loss Walking: WalkFit	✗	✓	✗	✓	✗	✓	✗	3
8	Macadam - Walk and Earn	✓	✓	✗	✓	✓	✗	✗	4
9	Senior Fitness 50+	✗	✓	✗	✗	✗	✓	✓	3
10	Workout for Older Adults	✗	✓	✗	✗	✗	✓	✓	3
11	Tai Chi Fit Over 50	✗	✗	✗	✗	✗	✓	✓	2
12	Yoga for Seniors, Old & Elders	✗	✗	✗	✗	✗	✓	✓	2
13	The Walk: Fitness Game	✗	✓	✗	✓	✓	✓	✗	4
14	Over Fifty Fitness	✗	✓	✗	✗	✗	✓	✓	3
15	Daily Yoga	✗	✓	✓	✗	✗	✓	✗	3
16	Gentle Exercises for Seniors	✗	✓	✗	✗	✗	✓	✓	3
17	Fitness RPG: Walking Games	✓	✓	✗	✓	✓	✗	✗	4
18	Google Fit: Activity Tracking	✗	✓	✗	✓	✗	✓	✗	3
Total		3	16	5	9	4	15	9	-

interfaces.

As shown in [Table 2](#), 16 out of 18 apps are available on both Android and iOS platforms. Only 4 of the 18 apps are completely free, while the remaining 14 offer in-app purchases for advanced features. Furthermore, 9 apps are specifically designed for older adults, and 9 are focused on walking; however, none of the reviewed apps simultaneously target both older adults and walking.

These apps have been evaluated based on core features that support and motivate older adults to maintain physical activity through walking. The analyzed features include rewards (incentives for completing walking goals), reminders (notifications to encourage regular walking), community engagement (the ability to connect with others and participate in challenges), step tracking (monitoring daily steps, distance or calories), gamification (game-like elements to enhance motivation), personalization (adjusting goals based on user health), and a senior-friendly interface.

As seen in [Table 3](#), among the 18 apps analyzed, 16 include reminders, making it the most common feature. This is followed by personalization, present in 15 apps, while step tracking and senior-friendly interface is found in 9 apps, only 3 apps include rewards.

The most feature-rich apps are Pacer Health and WeWard – The Walking App, each offering 5 features. Both apps share the features of reminders, community engagement, and step tracking. However, WeWard also includes rewards and gamification, while Pacer Health features personalization and senior friendly interface. The most common combination of features across the analyzed apps is reminders and personalization, which appears in 11 apps. When analyzing the combination of 3 features, the most common features are reminders, personalization and step tracking, present in 6 apps.

3.2. Effectiveness of walking apps in older adults

3.2.1. Sentiment analysis

The apps selected (see [Table 2](#)) for in-depth analysis received a total of 1313,932 reviews between 10th July 2008 and 15th October 2024 across various languages, with 715,193 (54.4 %) written in English. Regarding sentiment scores, of the English reviews, 80 % of users (581,254) expressed a positive sentiment toward the apps, while 4 % (32,251) provided neutral feedback, 3 % (21,427) had mixed opinions, and 12 % (90,265) offered negative feedback. The average star rating was 4.4 out of 5, reflecting an overall high level of user satisfaction. A deeper analysis of the review content, performed using Appbot’s

machine learning algorithms, provided further insights. The most frequently mentioned word was “steps”, appearing in 0.2 % of the reviews, followed by “track”, “helps”, and “motivated”, each appearing in 0.1 % of the reviews. All of these terms were associated with positive sentiments.

A word cloud (see Fig. 2) was created to visually represent the most frequently mentioned terms in user reviews. The color coding reflects the general tone associated with each word – green for positive mentions and red for negative ones. While this graphic offers a quick glimpse into the most recurring topics, it was complemented with a more detailed sentiment analysis and a closer qualitative examination to better understand users’ evaluations and experiences.

When analyzing three-word phrases, those related to step tracking were the most common, with phrases like “steps per day” and “steps every day” appearing in 0.4 % of the reviews. Other frequent phrases included “use every day” and “works really well”, each appearing in 0.1 % of the reviews. These phrases consistently conveyed a positive sentiment, with positivity rates ranging between 70 % and 93 %.

Regarding the main topics of user feedback, which could not be filtered by language, showed that the most discussed topic was “Satisfied Users” which appeared in 45.1 % of the reviews (606.232), with 94 % of these reviews expressing positive sentiment. Similarly, “Design and UX” was addressed in 12.1 % of the reviews (162.419), where 80 % of users shared positive opinions about the usability and interface of the apps. In addition, “Customer Support” came up in 1.6 % of the reviews (21,644), 70 % of which were positive.

In contrast, negative feedback emerged around certain topics. “Payment” was raised in approximately 1 % (11.592) of the reviews and had 59 % negative sentiment, such as topics with a relation like “Pricing”, present in 2.8 % (35.776) of the reviews and 28 % of negative sentiment or “Advertising” present in 0.8 % (10.356) with 40 %. Also, “Gaming” was mentioned in 1.3 % of the reviews (17,167), with 53 % of negative reviews. “Sign Up & Login” appeared in 0.4 % of the reviews (5.103), with 75 % negative sentiment. Similarly, “Notification & Alerts” came up in 0.5 % of the reviews (6109), with 52 % of users leaving negative feedback. Finally, “Rewards” was mentioned in less than 0.1 % of the reviews (136), but 70 % of this feedback was negative (see Table 4).

3.2.2. Literature review flow

After deleting duplicate articles from the search process, a total of 44 potential articles were collected for inclusion in the study. Of these, 25 were excluded after reviewing their titles and abstracts because they were not related to the objectives of the review. Subsequently, a more thorough manual screening was performed, resulting in the identification of 10 articles fully meeting the pre-defined eligibility criteria for the

Table 4
Sentiment breakdown of apps main topics (N = 1313,932 reviews). Percentage values correspond to the total number of reviews.

Topic	% of Reviews	Positive Sentiment	Neutral Sentiment	Mixed Sentiment	Negative Sentiment
Satisfied Users	45.1 %	94 %	4 %	2 %	0 %
Design and UX	12.1 %	80 %	5 %	2 %	12 %
Pricing	2.7 %	54 %	12 %	7 %	28 %
Customer Support	1.6 %	70 %	5 %	5 %	20 %
Gaming	1.3 %	29 %	12 %	6 %	53 %
Payment	1 %	20 %	11 %	10 %	59 %
Advertising	0.8 %	39 %	11 %	9 %	40 %
Notification & Alerts	0.5 %	29 %	10 %	9 %	52 %
Sign Up & Login	0.4 %	10 %	6 %	9 %	75 %
Rewards	<0.1 %	32 %	8 %	4 %	57 %

study, as synthesized in Table 5. Fig. 1 illustrates the process of searching and selecting data sources.

3.3. Content analysis

3.3.1. Outcome analysis

The content analysis regarding the app-based results, i.e., ratings and impressions from users as per documented in literature, yielded the following insights:

Effectiveness in promoting physical activity: Several studies have reported a reduction in sedentary behavior following the use of different apps [68,70], as well as a significant improvement in physical performance [62]. However, since these studies were conducted within clinical populations, extrapolating these results to the broader population of older adults would be misguided.

Effects on gait: The use of apps have been shown positive to impact gait quality, Chan et al. [62] found that using the NIKE+ app enhanced balance and walking speed, while Zhong & Gao [63] reported better gait stability and rhythm in those walking over 1 km per day with the Pocket Gait app.

Mental health outcomes: A study by Frei et al. [64] explored the impact of walking apps on mental health. However, it did not result in significant improvements in mental health indicators, such as depression, anxiety, or perceived social support. The authors suggested that this lack of impact on mental health outcomes might be due to the intervention’s broad approach, without specifically addressing mental health constructs.

Usability: Usability has generally been rated positively across different apps aimed at older adults, with certain design features improving user experience. Zhong & Rau [65] found that larger font sizes and the inclusion of reference values for gait parameters enhanced usability. Similarly, Barisch-Fritz et al. [66] reported high usability ratings with technical assistance. However, as noted in Imoukhome, Weeks & Abidi [67], usability may still be a challenge for some older adults, particularly those with limited tech experience. Easy operation (reduced operation, effective interaction, voice), easy understanding and easy trust (feedback, personalized service) are pointed out by Niu et al. [69] as key factors that promotes app agreement in the older adult’s population.

3.3.2. Discursive analysis

Upon completing the content analysis of the scientific articles included in this systematic review, various themes or ‘categories’ emerge from the discourse examined. These themes have been organized into four main word communities, each characterized by its distinct focus and significance, which are strongly related with the categories described in the results analysis. A specific color code accompanies each community to enhance identification and comprehension, and the continuous curved lines between them symbolize their inter-cluster distances, as shown in Fig. 4. Overall, the uniformity of the color distribution and the reasonably long distances among them suggest good cluster segmentation and differentiation, coherently with the initial assumptions of the outcome analysis.

Specifically, the word community in red centers on gait and mobility characteristics, encompassing key terms such as “age”, “daily walking amount”, “gait”, “gait quality”, “self”, and “step frequency”. This group highlights the relationship between aging and mobility. The inclusion of terms like “self” suggests a focus on self-perception and motivation in maintaining physical activity levels. As commented on the outcome analysis, studies have shown that improved gait quality is associated with increased daily walking.

The community represented in green emphasizes user engagement and intervention effectiveness. Key terms such as “adherence”, “balance”, “data”, “distance”, “min”, and “risk” draw attention to the importance of users’ commitment to interventions. This cluster reflects the literature understanding that adherence to physical activity

Table 5

Structured analysis of the general characteristics of the selected (retained) studies contained in current scientific literature.

Author(s) and year	Core objective	App reviewed	Sample size	Methods	Results (main outcomes)	Limitations
Chan et al., 2014 [62]	To examine the relationship between walking gait, speed, energy consumption, and balance in older adults using the NIKE+ App.	NIKE+	$n = 9$	Track walking data and heart rate, comparing older adults with regular walking habits to those without.	Female participants walked longer distances and had lower fall self-efficacy, indicating less risk of falling.	Small sample size. Without effectiveness evaluation on walking promotion.
Zhong & Gao, 2022 [63]	To investigate how walking state, self-reported daily walking amount, and age affect gait quality in older adults using a smartphone app.	Pocket Gait	$n = 100$	3 walking tests: normal walking, fast walking, and visually impaired walking. Three-dimensional acceleration data for gait were obtained using the smartphone app Pocket Gait.	Walking state, daily walking amount, and age significantly influenced gait quality, with older adults walking more than 1 km/day demonstrating better gait quality	Without effectiveness evaluation on walking promotion.
Frei et al., 2019 [64]	To implement a novel, community-based physical activity (PA) intervention and to evaluate its effectiveness, feasibility, acceptability, and sustainability.	Not defined	$n = 29$	Intervention combined determinants of PA, used smartphone apps to provide feedback/facilitate interaction, and followed a citizen science approach to enable participants to organize walking groups.	No effect was shown for any of the assessed patient-reported outcomes (quality of life, symptoms of depression and anxiety or perceived social support) or daily steps.	Small sample size
Zhong & Rau 2020 [65]	To evaluate the acceptability and usability of the Pocket Gait app for older adults to monitor their gait quality.	Pocket Gait	$n = 128$	Walking using a smartphone with the gait-monitoring app installed and completed an acceptability and usability survey after the walk test.	Larger font size, inclusion of reference values for gait parameters, and inclusion of heart rate and blood pressure monitoring related with a better usability.	Assessed in an artificial environment, with researcher assistance and moderate response tendencies.
Barisch-Fritz et al., 2022 [66]	To evaluate the usability and effectiveness of the InCoPE-App for individuals with dementia.	(Individualized Cognitive and Physical Exercise [InCoPE] app)	$n = 20$	An 18-week individualized multidomain intervention (2×60 min/session) was delivered to an intervention group ($n = 10$) by nursing assistants ($n = 10$)	Usability was rated as high by nursing assistants, effectiveness on physical performance outcomes was positive	App designed to be implemented with nursing assessments. Focused on clinical population. Not available on major platforms.
Imoukhome, Weeks & Abidi, 2020 [67]	To develop a validated mobile app prototype to empower older adults and caregivers to manage falls, and to evaluate its effectiveness.	Not defined	$n = 9$	Patient Health Engagement Model and Rockwood frailty index to develop the app. Evaluation: (5 older adults and 4 caregivers) feedback was asked after the use on the usability, usefulness, and suitability of the app	The app was deemed easy to use, informative and understandable.	Small sample size. Users that were deemed 'not app-savvy' were excluded from the study.
Freene et al., 2020 [68]	To evaluate the feasibility of a behavioral smartphone app (Vire) and a web-based behavior change program (ToDo-CR) to decrease sedentary behavior in cardiac rehabilitation participants.	Vire	$n = 20$	Mean age= 54. Pre-post design on behavioral change program using Vire App and ToDo-CR. 6 weeks and 16 weeks measures.	App and web-based behavior change program appear to be feasible and acceptable in cardiac rehabilitation and may be useful to decrease sedentary behavior in this population.	Small sample size. Focused in adult clinical population. The effectiveness of the app without the ToDo-CR program was not evaluated in isolation.
Niu et al., 2023 [69]	To build a design model of a walking health app for older adults.	Smart Healthy Walking APP	$n = 30$	Likert scale on a sample of 30 people was conducted to evaluate the usability	App designed aligned with easy understanding, easy operation and easy trust is valued as a strongly agreed App.	Small sample size (30) and lack of sample description and geographical diversity of the sample (Beijing).
Grau-Pellicer et al., 2020 [70]	To evaluate the effectiveness of a mHealth app in improving levels of physical activity.	Fitlab	$n = 40$	Chronic stroke survivors were randomized into an intervention group (IG) $n = 24$ and a control group (CG) $n = 17$. IG adhere to Multimodal Rehabilitation Program with mHealth App.	IG significant increase in adherence to community ambulation, and decrease in sedentary behavior	Clinical population with frequent support of caregivers in App use.

measured as stability, distance walked, or time spent are factors commonly used in the literature. The inclusion of “balance” correlates with the outcome analysis which suggests that effective interventions improve balance helping mitigate risks associated with falls.

The blue community focuses on effectiveness in promoting physical activity with terms like “effectiveness”, “Income app”, “intervention”, and “nursing assistant” at its core. This cluster encapsulates the technological advancements in mobility support, particularly through applications designed to promote physical activity.

The word community in yellow highlights health and safety monitoring, incorporating terms such as “sedentary behavior”, “week”, and “cardiac rehabilitation”. The contents of this word community suggest the existence of a broader discourse on health outcomes related to mobility interventions, highlighting the importance that the analyzed scientific literature places on studies focused on clinical populations among older age segments.

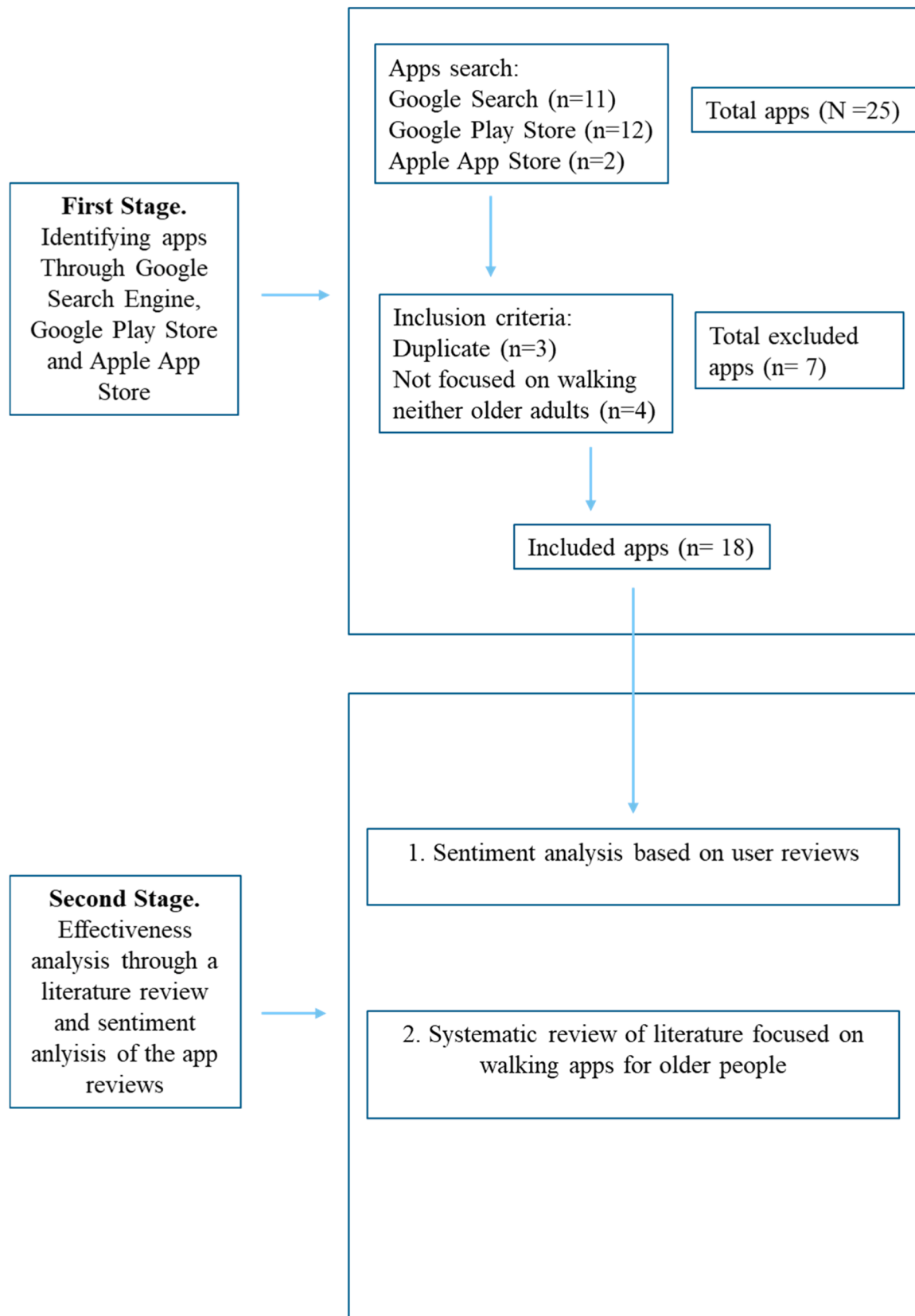


Fig. 1. Key methodological steps of the study (Phases 1 and 2).

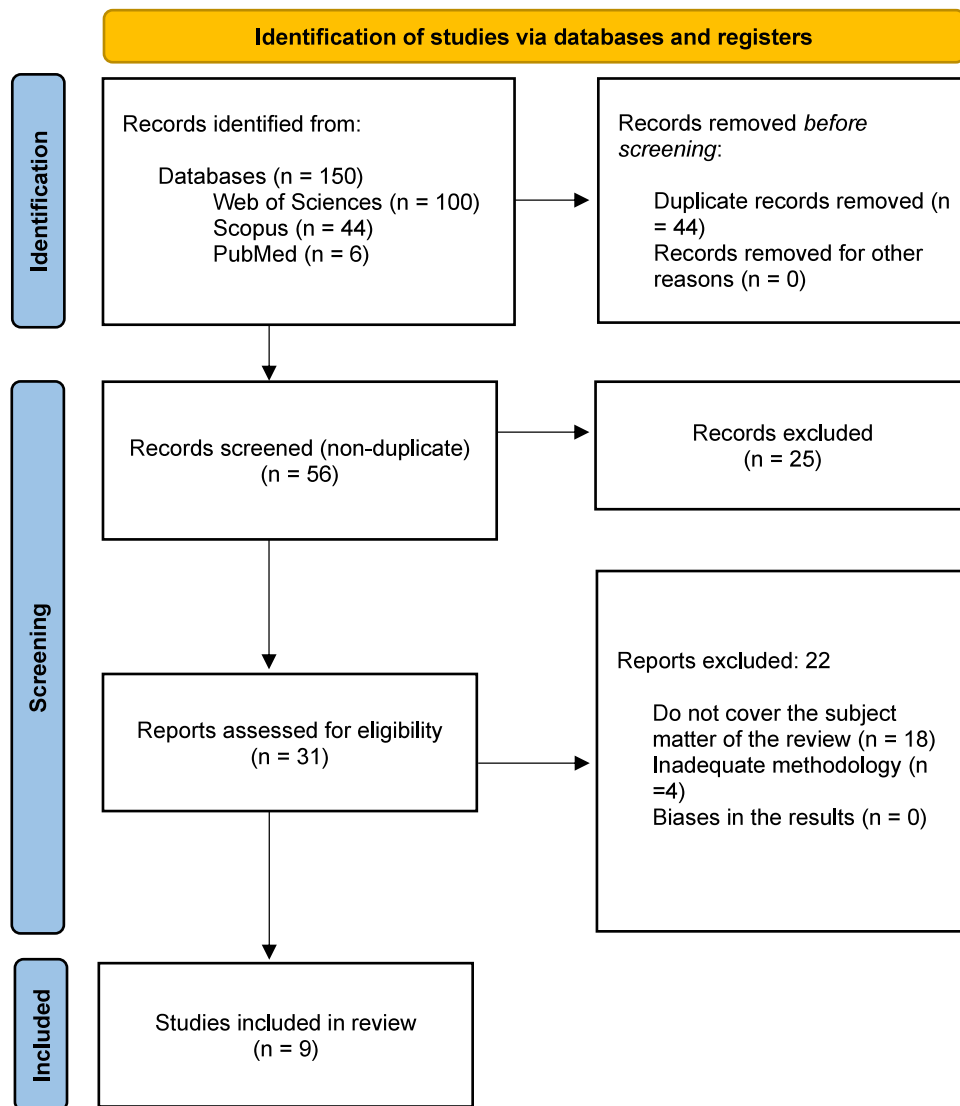


Fig. 3. PRISMA diagram for the systematic review.

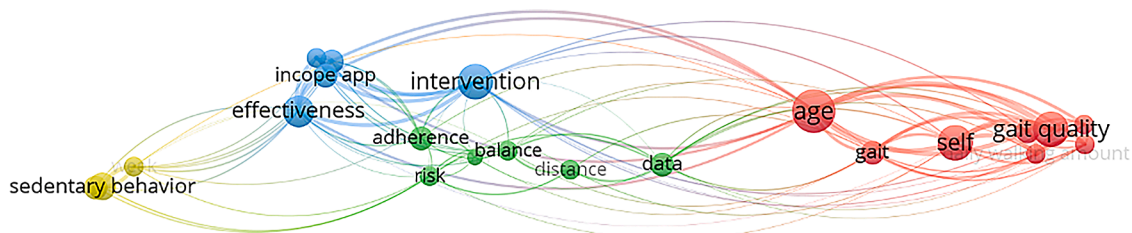


Fig. 4. Network representation of the clustered 'word communities' in the current empirical studies on the topic. Notes: Each color represents one cluster based on the number of commonalities and links identified in the analyzed literature sources, and the continuous curved lines represent the distance between them.

taken or the physical or emotional state.

Beyond physical health, walking apps may also provide mental health benefits by mitigating loneliness and enhancing emotional well-being. For example, guided or simulated walking experiences delivered via mobile apps or digital platforms have shown promise in reducing isolation and improving life quality during periods of limited social contact [73]. However, these outcomes are not consistent across studies. Frei et al. [64] found no significant improvements in perceived social support or mental health indicators among older adults using a community-based walking intervention app. This variability also makes

to think that understanding individual and contextual factors (what most of these experiences indeed do not perform) should be necessary to fully understand both apps' effectiveness for this purpose and other relatable factors to this outcome.

Relevant literature offers valuable insights into achieving meaningful and sustained impacts through walking apps. Tcymbal et al. [74] highlight the importance of app designs that integrate physical activity promotion with psychosocial elements, such as fostering social connections and providing cognitive stimulation. This dual approach leverages both physical activity and social participation to enhance the

overall well-being of older adults. Apps incorporating interactive features, such as group challenges or virtual communities, show promise in addressing these needs. However, their long-term effectiveness remains unexplored, as studies employing longitudinal designs to assess sustained performance are currently lacking in the literature.

The generalizability of app-based interventions remains a challenge. Most studies fail to account for heterogeneity within the older adult population, including differences in mobility levels, technological proficiency, and socioeconomic circumstances, reason that makes us think that further research experience should prioritize representative sampling and longitudinal studies to develop a more complex and long-lasting comprehensive view of how these apps influence physical and mental health across diverse aging populations.

4.3. User engagement and satisfaction

While it was anticipated that the number of available evidence in this regard remains limited, the sources analyzed in this study regarding these apps (i.e., previous papers and user review testimonials) suggest that they have generally received positive feedback from users, with sentiment analysis revealing an average rating of 4.4 out of 5 across more than 1.3 million reviews. The most frequently mentioned phrases, such as “steps per day” and “use every day”, contribute to highlight the value users place on step-tracking features. These tools effectively support routine formation and motivate users to maintain or increase physical activity. Positive engagement was particularly evident in app functionalities that allowed users to set personalized goals and monitor progress.

However, dissatisfaction with specific app features has also been reported. Pricing models, intrusive advertising, and poorly designed notification systems contributed to negative sentiment in up to 40 % of reviews. This is congruent with studies that indicate the variables that favor an application, regardless of its typology and characteristics, to succeed in a market saturated with options [75]. Issues with in-app purchases and limited free functionality disproportionately affect older users, many of whom operate on fixed incomes [76].

Moreover, and as aforementioned in the literature review of this paper, for older adults, usability of some technological tools remains paramount, and overall challenging according to literature [40,77]. In this regard, some apps have shown to fall short in accommodating the unique needs of this demographic, such as limited technological familiarity and age-related physical or cognitive challenges, and tend to lose persuasive power [40].

In addition, other existing studies emphasize the importance of senior-friendly features, including larger fonts, simplified navigation, and straightforward onboarding processes. Indeed, some previous studies have highlighted how apps that incorporate these design elements are more likely to retain older users and sustain long-term engagement [78,44]. On a practical level, facilitating the navigation of this group of users is especially important as difficulty in using the applications is related to an increased risk of frustration and abandonment, with the consequences this has on adherence to the established walking or physical exercise program [78].

Interactive design improvements could further enhance user satisfaction. For instance, increasing the spacing between interactive elements and employing consistent visual cues can reduce the likelihood of errors, particularly for users with fine motor difficulties. Moreover, integrating tailored tutorials and responsive customer support into app interfaces could address common usability issues and foster a more inclusive digital environment for older adults.

Future research should explore the relationship between user satisfaction and app retention rates in older populations. Examining how factors such as usability, pricing, and advertising influence engagement could guide the development of more effective apps tailored to the needs of this growing demographic. Additionally, co-design approaches involving older adults in the development process may yield innovative

solutions that balance functionality, affordability, and accessibility.

4.4. Barriers to the use: proposals and future directions

This study identifies several gaps in current research on walking apps for older adults, particularly the lack of inclusive and representative approaches. A large number of studies have focused on clinical or high-risk populations, limiting our understanding of how these apps are used and perceived among more general older adult users. Important aspects such as differences in mobility, familiarity with technology, socioeconomic conditions, and cultural background remain insufficiently explored, despite their relevance in shaping both adoption and continued use of digital tools [46].

The generalizability of existing findings is also affected by small sample sizes and the use of controlled settings in most studies. There is a clear need for longitudinal research that can assess the long-term effects of walking apps—not only on physical activity, but also on outcomes such as social participation and perceived well-being. These studies should consider how user characteristics interact with specific app features, allowing for more precise conclusions about which types of interventions work best for which users [48].

In practical terms, future research should: (1) include more diverse and community-dwelling older adults in study samples; (2) apply longitudinal designs to assess sustained use and outcomes; and (3) evaluate broader effects such as motivation, engagement, and adherence, beyond step counts alone.

Regarding design, upcoming app developments should seek to better combine physical activity promotion with opportunities for social connection—especially considering that many older users report valuing both. While widely used features like step tracking, reminders, and progress feedback are a good starting point, adding community-based elements (e.g., walking groups or shared challenges) could improve user satisfaction and increase continued use [73].

According to our results, cost and interface complexity seem also to constitute key barriers. While some positive correlated between age and income are typical in high income economies, in many regions many older adults live on fixed incomes, which can limit access to apps with high upfront costs or paywalled features [73,74]. Designing transparent pricing schemes and ensuring that basic versions are fully usable can help reduce these barriers. In addition, simplified layouts, larger fonts, and intuitive navigation remain critical for this population group [75].

Finally, one of the most promising paths for improvement is to involve older adults more directly in the development process. Co-design approaches—where users contribute ideas and feedback during the app creation phase—may help ensure that these tools are not only functional, but also better aligned with older adults’ preferences, habits, and actual needs. This approach may also strengthen the long-term relevance of apps as supportive tools for both physical and social aspects of aging.

4.5. Limitations of the study

A systematic review is a valuable method for synthesizing the main scientific findings on a research problem. However, this type of study has some limitations that should be mentioned, such as publication bias, which indicates that research with significant results are more likely to be published [79], and selection bias, whereby it is possible that some potentially selectable studies have not been identified in the search process [80].

In addition, there is a language bias since research that has not been published in English or Spanish has not been considered. However, the strict use of the PRISMA guidelines has reduced these limitations to a minimum, guaranteeing a transparent and systematic process with specific inclusion/exclusion criteria. Another factor to consider is that, regardless of the approached followed by the reviewed studies, a greater walkability and active travel share may also depend on better promotion

of active mobility through urban design and accessibility for all types of people, specifically taking into account the restrictions and needs typical of an older population [15,81,82].

Moreover, some limitations of this study are related to the sentiment analysis, due to the absence of demographic data we were unable to specifically filter reviews based on the age of the reviewers. As a result, the sentiment analysis encompassed reviews from all age groups, which may have influenced the overall results. While this approach still provides valuable insights into the general user experience given the growing exposure to technology across all age groups [83,84], future research could benefit from exploring methods to better isolate reviews from older adults to obtain more targeted feedback.

Finally, the geographical ubication of the search in App Stores may led to a limitation, searches were conducted using a device with an IP address located in Spain, which may have resulted in region-specific app availability, potentially limiting the global applicability of the findings. Consequently, the apps identified may not represent the full range of available applications worldwide, future studies could expand the search criteria to include multiple regions or use VPN-based searches to ensure a more globally representative sample.

5. Conclusions

This study analyzed both the potential and current limitations of mobile applications intended to promote walking among older adults, focusing on their main features, reported effectiveness, and user experiences. While these tools may help increase physical activity and, to some extent, reduce social isolation, relevant shortcomings remain in terms of their design and practical applicability. Features such as step tracking, reminders, and gamification are common, but only a few apps combine them in a way that specifically responds to the needs of older users. Moreover, many of the reported benefits—such as improved gait or reduced sedentary behavior—are drawn from small-scale studies, which limits the extent to which these findings can be generalized.

Overall, user satisfaction appears to be high, particularly regarding ease of use and functionality. However, several barriers continue to restrict their broader adoption. These include interface complexity, limited customization, and pricing models that may not be accessible to all users. Older adults tend to benefit more from simplified interfaces, clear navigation, and appropriately scaled text, which facilitate continued use.

Looking ahead, further development should prioritize designs that address both physical activity and opportunities for social engagement, while ensuring that the interface and functions are adapted to older users' needs. Addressing cost-related constraints and usability barriers will also be necessary to improve accessibility and ensure a broader and more sustained impact of these technologies.

Conflicts of interest

The authors of this paper declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

This work was supported by the Research Grant INVEST/2022/59 from Generalitat Valenciana. Funding entities did not contribute to the study design or data collection, analysis and interpretation or writing of the manuscript.

CRediT authorship contribution statement

Pau Llopis: Writing – review & editing, Visualization, Software, Project administration, Investigation, Writing – original draft, Validation, Resources, Methodology, Funding acquisition, Data curation,

Formal analysis, Conceptualization. **Oscar Oviedo-Trespalcacios:** Writing – original draft, Validation, Methodology, Writing – review & editing, Visualization, Resources, Investigation. **Francisco Alonso:** Validation, Software, Visualization, Supervision, Resources, Investigation, Conceptualization, Project administration, Funding acquisition. **Mireia Faus:** Validation, Investigation, Data curation, Writing – review & editing, Methodology, Formal analysis. **Sergio A. Useche:** Writing – review & editing, Visualization, Supervision, Methodology, Formal analysis, Conceptualization, Writing – original draft, Validation, Project administration, Investigation, Data curation.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Francisco Alonso and Pau Llopis reports financial support was provided by Generalitat of Valencia. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.sfr.2025.100982](https://doi.org/10.1016/j.sfr.2025.100982).

Data availability

No data was used for the research described in the article.

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