Awareness and Practice about Balance Training Apps or Fall Prevention Apps among Elderly Population- A Questionnaire based Study

[1] Poorvi Mathur; [2] Sarika Bhati; [3] Renuka Jakhar
[1,2] MPT student, School of Physiotherapy, SGT University,Haryana, India
[3] Assistant Professor, School of Physiotherapy, SGT University, Haryana, India

Corresponding Author: Renuka Jakhar

Abstract: Health systems integrated with conventional care models have great possibilities to influence the rehabilitation provided and wide spread use of these apps depends on awareness, accessibility and usability. The aim of this study is to assess awareness and practice of mobile apps helping in balance assessment, rehabilitation and fall prevention among elderly population. An online questionnaire will be developed including questions for demographic data, regarding their medical history with special attention given to their balance issues and questions addressing awareness and usage of balance assessment mobile apps. It will be distributed to 400 elderly relatives of students at Faculty of Physiotherapy. Out of all the responses recorded, the frequency of each response for respective questions filled in will be recorded. The balance training apps are convenient, cost effective, can be customized to one's needs and preference. These apps are easily accessible and can be used as a tool for rehabilitation and reducing risk of fall. The introduction and practice of these apps will further make elderly population independent in ADLs and reduce prevalence of injury.

Keywords: Awareness, Balance assessment, Balance training apps, Elderly population, Fall prevention, Mobile health applications, Prevention of injury, Rehabilitation, Surveys, Questionnaires

Introduction

A major health issue related to falls among the elderly is a result of the world's aging population. 96.2 crore individuals worldwide are 60 years of age or older, making up 13% of the global population. It is projected that the number of people in the world who are 60 and older is expected to rise from 90 crore in 2015 to 200 crore by 2050. From 5.6% in 1961 to 8% in 2017, the proportion of Indians 60 and older increased. Projections indicate

that by 2026, about 12.4% of the total population will have been reached, demonstrating a steady increase. In rural India, approximately 64 out of every 1,000 senior citizens have one or more disabilities, compared to 55 out of every 1,000 in metropolitan areas. Falls are responsible for two out of every three deaths in this group. Fall-related deaths claim the lives of about 646,000 people worldwide, with more than 80% of these deaths occurring in nations with limited resources (Amaljith AB et al., (2024). According to the WHO (2021), falls are the second leading cause of accidental injury deaths worldwide. In India, the prevalence of falls among community-dwelling elderly is estimated to range from 14% to 53%. This has significant implications for their health and well-being. WHO also indicates that individuals 65 and older account for the majority of fall-related deaths. Approximately 25 to 30 percent of adults who live in the United States fall every year, and the combined cost of falls—both deadly and nonfatal—is close to $50 billion (Mercy et al.,2024).

Falls, especially in the elderly population, can have psychological effects and contribute to disability since many wounded people are unable to return to their prior level of functioning. (**Appeadu et al., 2021).** People who have fallen may become afraid of falling again, which might make them less mobile. The reduced mobility brought on by a fear of falling can result in a number of problems, such as pressure ulcers, pneumonia, rhabdomyolysis, weakness, and an increased risk of further falls. (Amaljith AB et.al.,2024). Moreover, major balance problems often arise with age such as medication, osteoarthritis, depression, dizziness, and disturbances in balance and gait (due to cerebellar damage or in connection with age-related degenerative changes in the middle and inner ear)(Salari et.al.,2022) are exacerbated by conditions like vestibular disorders (Benign paroxysmal positional vertigo, stroke, multiple sclerosis) and Parkinson's disease. Impaired balance can severely limit mobility and increase the risk of falls (Agarwal et al., 2012). Research indicates that a multi-component, supervised physical exercise program can be beneficial on older women's physical fitness by enhancing their muscular strength, balance, and flexibility—all of which are components of physical fitness (Nogueira et al., 2017; De Resende-Neto et al., 2019). According to Schutzer and Graves (2004), unsupervised exercise regimens may overcome beyond financial and transportation cost.

Research demonstrates that interventions focusing on strength and balance-focused therapies have been shown to significantly lower the risk and frequency of falls as well as the associated injuries (sadaqaeetal.,2023). Therefore, we predict that older women who undergo a physical fitness program using a specifically created app that lets them choose how long and how often to work out will exercise enough to see noticeable improvements in their flexibility, balance, and muscle strength. A highly responsive central nerve system that combines sensory data from the vestibular, somatosensory, and visual systems to

initiate motor responses that preserve body alignment is crucial for maintaining balance. The inner ear contains the vestibular system, responsible for detecting motion and spatial direction. Somatosensory input gives information about body position and movement from muscles and joints, whereas the visual system effectively aids in maintaining orientation by providing information about the surrounding environment.

Physical performance tests such as the Timed Up and Go (TUG), thirty-second sit-to-stand (30-s STS), and the four-stage balance test (FSBT) have moderate to excellent sensitivity and specificity for identifying future fallers. The Centers for Disease Control and Prevention (CDC) developed the Stopping Elderly Accidents, Deaths and Injuries (STEADI) initiative to increase falls 'screening and management (Mercy et.al.,2014). A key element in lowering falls and increasing mobility in this population may be strength and balance training.Mobile apps and telehealth are great resources for enhancing these systems. For better inner ear function, these apps integrate vestibular therapies such as head movement tasks and gaze stabilization. Apps frequently include visual tracking tasks, obstacle navigation simulations, and real-time visual feedback with the use of the phone's camera or screen-based instructions for the visual system. The American Physical Therapy Association and American Occupational Therapy Association have both advocated for the integration of telehealth services into clinical practice.

Older adults are increasingly using smartphones and mobile apps. Providing health-related apps for gait assessment would help older adults improve their health outcomes and reduce the burden of care. There is emerging evidence supporting the use of mobile phone–based healthy lifestyle programs, such as those that help increase physical activity, Researchers Hawley-Hague et al (2020) developed and tested smartphone apps "Motivate Me" for healthcare professionals and "My Activity Programme" for patients, were designed to facilitate goal setting, exercise scheduling, and feedback. The apps were tested with seven patients and three healthcare professionals for three weeks, showing promising results in terms of usability and acceptability. Key features included personalized goal setting, exercise reminders, and motivational messages. The study highlights the potential of smartphone apps in supporting fall prevention exercises among older adults, with user-led design being crucial for their success.

Zhong and Rau (2020) showed that the app provided accurate and reliable gait assessments, suggesting its potential for remote monitoring and early detection of gait-related disorders in older adults. This suggests smartphones could serve as a reliable and convenient assessment tool for dynamic balance in physical therapy and rehabilitation settings. Despite these promising outcomes, little has been discovered regards how older adults in India use this sort of technology. This illustrates the significance of context-specific studies that look into accessibility, awareness, and obstacles to the adoption of

fall prevention technology. In order to figure out the prevalence of falls, impairments related to balance, and the opinion of exercise-based preventative measures among the elderly population in India, the present study must be carried out. This survey's objectives include investigating the feasibility and popularity of smartphone-based tools for monitoring gait and balance and to produce findings that may direct the design and implementation of fall prevention measures that are acceptable to Indian older adults living in the community, readily available, and supported through empirical evidence.

Methodology

Sample population and questionnaire design

This cross-sectional study administered a questionnaire to assess the awareness and usage of mobile apps used for balance training and fall prevention among elderly population. From all the participants included were of age group 60 to 90 and above. Convenience sampling was used in this study. The inclusion criteria included;

- adults above 60 years
- they had access to a smartphone
- willing to participate in the study

A Self- Completion Questionnaire was developed at Faculty of Physiotherapy. It primarily focused on awareness and usage of Balance Training or Fall Prevention Apps among Elderly Population, The questionnaire consisted of 26 questions covering sociodemographic details, history of falls, smartphone usage, and awareness and usage of balance training and fall prevention app. Section 1 (8 questions) related to sociodemographic details,Section 2 (7 questions) related to history of fall and smartphone usage, Section 3(11 questions) related to awareness and usage of mobile apps for patients, out of these 21questions were multiple choice questions [MCQs] and five open-ended questions Experienced content expert (Neurologist) evaluated each item on the questionnaire for content validity, questionnaire was subsequently piloted among 30 elders, Simple split-half method was used to assess reliability of the questionnaire by applying Spearman-brown prophecy coefficient formula. The reliability value of the questionnaire was 0.80 and hence the questionnaire was found to be good.

Data collection

The questionnaire was distributed to the elderly relatives of physiotherapy students, All participants were provided with a subject information sheet and were briefed. After obtaining writ ten consent, the students were given an internet link to access the self-administered questionnaire. the responses of completed questionnaires were received and the information was only available to members of the research team, It was estimated to take 15–20 min to complete.

Outcome variables

Using structured questionnaire, the researchers recorded the participants' background information, including age, sex, height, weight, education, smartphone experience, fall history in the past 1 year, chronic disease and internet experience. Fall history was determined by asking the question "Have you ever fallen unintentionally in the past six months?" Smartphone experience was determined by asking the question "Are you using a smartphone?", "How comfortable you are with the smartphone?"

Secondly, questions were asked about usage of mobile apps available for balance assessment and training, "If they have used or heard about any such app?". "how often it is used?". All these questions and more were asked and the responses were recorded

The respondents' awareness and use of mHealth apps were measured in Sects. 2 and 3 in a binary fashion as "aware or not aware of mHealth apps" and "use or do not use mHealth apps." the mean attitude score of Sects. 2 and 3 was calculate for each respondent

Exposure variables

Basic demographic information for all participant was collected including age (years), gender (male or female), education level (high school, graduate, post graduate), occupation, area pf residence, marital status (married, divorced, widowed, unmarried) mobile device ownership (yes or no), and familiarity with device, history of fall and balance issues (yes or no), frequency of fall within a year, circumstances behind the fall (slipped on floor, dizziness, trip over object, etc.)

We also evaluated the frequency of use for the app (regularly, occasionally, once or twice) frequency of falls after using the app, subjects opinion about the usability of app

Statistical analysis

Statistical analyses were performed using MS EXCEL The data presented as frequencies (n) and percentages (%).

Result

Demographical data

A total of 400 internet links were distributed among elderly population out of which 260 complete responses were received, these responses were thenanalysed. The demographic characteristics of the respondents are shown in Table 1. The age of the respondent's majority lied between 60-70 age group, and the majority were female (53.1%) and (46.9%) were males. The respondents majorly lived with either family(80%) or spouse (10.4%), remaining people lived alone. 40% of the respondents did not get any formal education while a very less number had completed post-graduation (8.1%) and higher(2.7%). Most of the respondents resided in urban(41.5%) and rural areas (32.7%),Occupation of the

respondents had huge diversity like farmer, government employee, home maker, self-employed etc.

40% of the respondents had independent access to smartphone and nearly 23% shared theirs with family, 36.2% did not have access to smartphones. In terms of familiarity a huge chunk needed occasional help using the smartphone(33.1%) and (30.4%) were not at all comfortable with the device (18.8%) were somewhat comfortable and (17.7%) at ease with using smartphones.

Respondents suffering from any chronic disease were 36.5% and those not suffering from chronic disease were 63.5%, majority of chronic diseases were Hypertension, Diabetes mellitus, Chronic heart diseases and Degenerative disorders. 57.3% were on chronic medications

Awareness of, attitudes toward, and use of Balance training applications among the respondents

Most respondents have experienced a fall over the past years (61.5%) and have varied reasons for it, like fall on wet floor, lost balance while walking, fall from a height (e.g., stair), dizziness or fainting, tripped over an object. Most of them did not consulted a physician or Physiotherapist regarding the complaint. Most respondents (81.2%) were not aware of the existence and function of Balance training and assessment apps, the same trend was observed when asked about usage of such apps by respondent (91%) have not used any such apps

Though a positive trend was seen when asked whether they would like to know about such applications 60% of respondents showed interest and 30.8% had faith that such apps can be beneficial though 58% were uncertain of the suitability of balance training apps to use.

Table 1 Demographical data of Participants

Variables/ Responses	Frequency(n)	Percentage(%)
Age (in years) 60-70 70-80 80-90 90 and above	 110 106 30 14	 42.3 40.8 11.8 5.6
Gender Male Female	 122 138	 46.9 53.1

Living arrangement With family With spouse Living alone Middle	 208 27 24 1	 80 10.4 8.8 0.4
Qualification No formal education 10th pass 12th pass Graduate Postgraduate Higher than post graduate	 105 35 45 47 21 7	 40.4 13.5 17.3 18.1 8.1 2.7
Area of residence Urban Rural Semi urban Earlier rural now urban	 108 85 64 1	 41.5 32.7 24.6 0.8
On Chronic Medication Yes No	 149 111	 57.3 42.7

Table 2. Awareness, attitudes and use of balance training applications among the respondents

Variables/Responses	Frequency(n)	Percentage(%)
Access to smartphone Personal smartphone Shared with family No smartphone	 104 62 94	 40 23.8 36.2
Familiarity with smartphones Very comfortable Somewhat comfortable Need help occasionally	 46 49 86	 17.7 18.8 33.1

Not comfortable at all	79	30.4
Suffering from any chronic disease		
Yes	95	36.5
No	165	63.5
Experienced any balance issue or falls over the past year		
Yes	100	38.5
No	160	61.5
Consulted a physician or physiotherapist regarding balance issues		
Yes	58	22.3
No	202	77.7
Heard about balance training mobile apps		
Yes,I use them regularly	10	3.8
Yes, but I have not used them	39	15
No, I have not heard about them	211	81.2
Ever use any balance training app or fall prevention apps		
Yes	21	8.1
No	239	91.9
How often have you used balance apps in the past, or are you currently using any?		
Yes,regularly	10	4.7
Occasionally	12	5.6
Tried once or twice	8	3.7
No never used	184	86
Like to learn more about balance training apps or fall prevention apps		
Yes	156	60
No	104	40
Do you think such apps can be a good way of achieving the balance?		
Yes	80	30.8
Not at all	29	11.2
Maybe	151	58

Table 2 cont.

Variables	Various responses given by participants
Which chronic disease are you diagnosed with?	Hypertension Diabetes Mellitus Cardiac Disease
How many times have you experienced fall in past year?	Once Twice 3-4 times More than5
What were the circumstances of your most recent fall?	Slipped on a wet floor Lost balance Tripped over an object Fainting or dizziness
what type of app have you heard of (Name any one)	Balance trainer Never heard of any Never used or heard of
How did you come to know about this app?	Haven't heard of I don't know about any Social Media

Discussion

A significant healthcare concern is the increasing incidence of falls among older persons, especially as the countries and world's elderly population continues to increase. Falls have severe adverse impacts on the individual's mental, physical, and financial well-being in addition to being a major cause of injury-related deaths. This study aims to know about the awareness, usage and barriers in balance training mobile apps and fall prevention apps among older adults. Although usage of smartphone is increasing at alarming rate in elderly population, but some significant gap exists between the availability of mHealth solutions and their actual adoption for fall prevention. According to our findings, older adults are cautious to use these apps due to insufficient digital literacy, low confidence and lack of personalized guidance. Additionally, majority of the seniors are unaware about these kinds of apps that plays and imperative role in safety and mobility, which emphasizes the need for improved education and more outreach.

Considering the fact that smartphone usage is growing for every age category, study evidence suggests that older adults continue to fail to utilize fall prevention apps in

sufficient proportions. Previous studies (Wang et al., 2022; Pan et al., 2021; Jembal et al., 2022; Thompson et al., 2020; Miller et al., 2019) have repeatedly emphasized issues like low motivation, lack of individualized guidance, low confidence, and digital illiteracy among older populations. The results obtained demonstrate that many older adults are still hesitant to use mHealth (mobilehealth) solutions considering they are unable to understand the positive aspects, have trouble finding apps, or have concerns about privacy and security. Based on recent research by Ashe et al. (2024), adherence to technologically based fall prevention programs is frequently low over time, particularly when encouragement and input are limited. This is particularly the case whenever the services are readily available via remote access.

As shown in similar research by Jembal et al. (2022), awareness itself doesn't impact regular use of mHealth apps. Their study with medical students showed that those in clinical settings, who had more hands-on experience, utilized apps regularly and with more confidence. This suggests that practice under supervision and training enhances comfort with technology. Similar to this, Wang et al. (2022) emphasized the importance of designing apps with user-friendly functions like voice instructions, bigger buttons, as well as simple navigation, especially among older persons who may have cognitive or visual impairments. These aspects of design reduce frustration and foster regular use.

Additionally, Pan et al. (2021) state that older populations don't use mHealth tools because of poor instructions, a lack of modification, and more concerns about their privacy and hidden costs. Their research suggests that features that are worthy for older users include bigger typefaces, simplified layouts, offline functionality, and clear data protection regulations. Participants in our study also want some features such as real-time feedback, adjustable reminders, visual clues, and auditory instructions. When combined with community training sessions or caregiver support, these features may be implemented more frequently and lead to better results of fall prevention.

The current study provides significant findings into the current state of digital health awareness for elderly people through investigating the knowledge of and utilization trends of fall-prevention apps. The findings demonstrate that although awareness is progressively growing, actual use is still constrained by obstacles such poor computer literacy, difficulty with usability, and a lack of concentrated guidance. These results are in sync with global patterns, which show that digital health solutions frequently have problems with accessibility and sustained engagement, especially when used by older persons in settings with limited resources. Crucially, the study emphasizes the necessity of multifunctional initiatives that expand beyond technology design, including healthcare provider involvement, community-level education, and culturally relevant methods for engagement to close the understanding-to-adoption gap. Fall prevention programs may

have an additional effect on elder populations' functional independence and quality of life if they are included within comprehensive contexts for promoting health.

References

1. Borah, M., & Deka, C. (2022). Cross-Sectional Study on Awareness and Usage of Government COVID-19 Mobile Health Applications among Adult Smartphone Users of Assam. Apollo Medicine, 19(3), 163-167.
2. Bhuyan, S. S., Lu, N., Chandak, A., Kim, H., Wyant, D., Bhatt, J., ... & Chang, C. F. (2016). Use of mobile health applications for health-seeking behavior among US adults. Journal of medical systems, 40(6), 153.
3. Kong, D., Fu, J., Hong, Y., Liu, S., & Luo, Y. (2022). The application and prospect of mobile health (mHealth) in health service for older people living alone in community: a narrative review. Iranian journal of public health, 51(4), 724.
4. Tajudeen, F. P., Bahar, N., Tan, M. P., Peer Mustafa, M. B., Saedon, N. I., &Jesudass, J. (2022). Understanding user requirements for a senior-friendly mobile health application. Geriatrics, 7(5), 110.
5. Zhong, R., & Rau, P. P.(2020). A mobile phone-based gait assessment app for the elderly: development and evaluation. JMIR MhealthUhealth. 2020 Feb 29; 8 (2): e14453. 10.2196/14453.
6. Han, S., Lee, D., & Lee, S. (2016). A study on the reliability of measuring dynamic balance ability using a smartphone. Journal of physical therapy science, 28(9), 2515-2518.
7. Hawley-Hague, H., Tacconi, C., Mellone, S., Martinez, E., Ford, C., Chiari, L., ... & Todd, C. (2020). Smartphone apps to support falls rehabilitation exercise: app development and usability and acceptability study. JMIR MhealthUhealth. 2020 Sep 28; 8 (9): e15460. 10.2196/15460.
8. Ka, S. (2004). Barriers and motivations to exercise in older adults. Preventive Medicine, 39(5), 1056-1061.
9. Resende-Neto, A. G. D., Aragão-Santos, J. C., Oliveira-Andrade, B. C., Silva Vasconcelos, A. B., De Sá, C. A., Aidar, F. J., ... & Da Silva-Grigoletto, M. E. (2019). The efficacy of functional and traditional exercise on the body composition and determinants of physical fitness of older women: a randomized crossover trial. Journal of Aging Research, 2019(1), 5315376.
10. Amaljith A, Marzo RR, Lekamwasam S, Kisa A, Behera A, S P, Saravanan PB, Shah PB, Mahapatra SS, Gopi K, P V, Swathika R, Baddar NU, John DM, Rajagopal V.(2024), Prevalence of fall and its associated factors among elderly population in India: Evidence from the Longitudinal Aging Study of India (LASI). The Evi. 2024:2(2):1-.

11. Jembai, J. V. J., Wong, Y. L. C., Bakhtiar, N. A. M. A., Lazim, S. N. M., Ling, H. S., Kuan, P. X., & Chua, P. F. (2022). Mobile health applications: awareness, attitudes, and practices among medical students in Malaysia. BMC Medical Education, 22(1), 544.
12. Pan, J., Dong, H., & Bryan-Kinns, N. (2021). Perception and initial adoption of mobile health services of older adults in London: mixed methods investigation. JMIR aging, 4(4), e30420.
13. Appeadu, M. K., & Bordoni, B. (2023). Falls and fall prevention in older adults. In StatPearls [Internet]. StatPearls Publishing.
14. Sadaqa, M., Németh, Z., Makai, A., Prémusz, V., & Hock, M. (2023). Effectiveness of exercise interventions on fall prevention in ambulatory community-dwelling older adults: a systematic review with narrative synthesis. Frontiers in public health, 11.
15. Prithviraj D, (2023) The awareness and usage of orthodontic apps and social media by orthodontists in the UK: A questionnaire-based study. J Orthod.
16. Olsen S, (2023) Smartphone-based gait and balance accelerometry is sensitive to age and correlates with clinical and kinematic data. Gait Posture, 100:57-64.
17. Jembai, J.V.J., Wong, Y.L.C., Bakhtiar, N.A.M.A. et al.(2022) Mobile health applications: awareness, attitudes, and practices among medical students in Malaysia. BMC Med Educ,544.