

IMPLEMENTATION OF DIGITAL TECHNOLOGY TO IMPROVE BALANCE AT ELDERLY POSYANDU

Fidyatul Nazhira^{1*}, Risa Kusuma Anggraeni², Kiki Rezki Faradillah³, Rabia⁴,
Heri Wibisono⁵, Gibran Ghani⁶, Dinda Puspadini⁷, Marcel Geordan
Nainggolan⁸, Ananda Putri Rifanty⁹

¹⁻⁹Universitas Pembangunan Nasional Veteran Jakarta

Correspondence email: risakusuma@upnvj.ac.id

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ABSTRACT

This community service initiative was designed to enhance balance among the elderly by leveraging digital technology at Posyandu Lansia RW 06, Rangkapan Jaya Baru, Depok City. The underlying issue was that Indonesia's increasing life expectancy was not accompanied by healthier lifestyle habits, leading to a higher risk of falls. Poor balance among the elderly elevated the likelihood of falls, which could adversely affect their independence and quality of life. The research methodology involved conducting Focus Group Discussions (FGDs) to identify primary concerns, educating participants on the importance of balance, and providing balance exercise training through digital instructional videos. Evaluations were performed using pre-test and post-test assessments. The results indicated a significant improvement in the participants' knowledge. In conclusion, despite challenges like limited access to technology, the program successfully achieved its objectives and showed potential for further development and implementation in other locations. This initiative provided tangible benefits to the elderly, boosting their confidence in daily activities, reducing the risk of falls, and thereby enhancing their overall quality of life.

Keywords: Elderly, Balance, Exercise, Technology

1. BACKGROUND

The modern era introduces two significant challenges and opportunities: the rise in life expectancy and the rapid advancement of digital technology, often referred to as the Fourth Industrial Revolution or Industry 4.0. As life expectancy increases, many countries are witnessing a growth in their populations aged 65 and older. In Indonesia, for example, the current life expectancy has reached 71.34 years (BPS, 2021; Mannheim, 2019). Depok is among the Indonesian cities with the largest elderly populations. Data from the Central Bureau of Statistics (BPS) in 2021 estimates that Depok had 182,820 elderly residents, comprising about 7.3% of the city's total population. This makes Depok one of the cities with a high number of senior citizens in Indonesia (Depok City Health Department, 2021). In 2023, Depok City's life expectancy was recorded at 75.53 years, showing an increase from previous years—75.24 years in 2022 and 74.97 years in 2021 (Depok City Central Bureau of Statistics, 2023).

However, this increase in life expectancy is not matched by improvements in healthy lifestyle habits. Consequently, there is a rise in the prevalence of multiple comorbidities, chronic diseases, balance disorders, and falls that impact the independence of the elderly (Gaspar, 2022). Balance disorders are common issues among older adults and often serve as the primary cause of falls, which can lead to serious injuries or even fatalities. Maintaining body balance is a complex process involving the interaction of the musculoskeletal system, central nervous system, and sensory systems. Research has shown that declines in these systems—such as decreased muscle mass and contractility, along with biomechanical changes in joints and the spine—contribute to an increased risk of falls and are underlying causes of balance disorders in the elderly (Xin, 2023).

Various exercise methods have proven effective in reducing the risk of falls among the elderly. Systematic reviews and meta-analyses indicate that exercise programs focusing on muscle strengthening, balance enhancement, and functional exercises can significantly decrease the incidence of falls. These programs involve structured activities designed to improve stability and physical strength in older adults, helping them maintain balance and reduce the likelihood of falling (Sherrington, 2020; Poulton, 2020). A study by Liu-Ambrose et al. (2012) demonstrated that structured balance training programs significantly lower the risk of falls in the elderly population. Their research showed improvements in muscle strength, coordination, and postural responses that contribute to reducing fall risk. Similarly, a meta-analysis by Sherrington et al. (2019) concluded that balance exercises, as part of fall prevention interventions, are effective in decreasing fall risk among older adults (Liu-Ambrose, 2012; Sherrington, 2019).

One method for conducting balance training is through digital technology. This innovative approach has the potential to effectively deliver fall prevention exercise programs to the elderly. Moreover, digital technology can enhance the reach, acceptance, and sustainability of balance improvement programs among older adults. Integrating technology-based exercise programs can positively impact adherence among the elderly by overcoming perceived barriers during exercise sessions. Therefore, this community service project aims to assist in implementing balance training for the elderly through digital technology.

2. PROBLEM STATEMENT AND RESEARCH QUESTION

The elderly population at Posyandu RW 06 Rangkapan Jaya Baru, Depok, faces an increased risk of falls primarily due to a decline in balance abilities. This issue is multifactorial, arising from the natural aging process, which leads to loss of muscle mass (sarcopenia), biomechanical changes in the joints, and central nervous system impairments, all of which significantly affect postural stability. A Focus Group Discussion (FGD) involving elderly participants, healthcare workers, and Posyandu administrators revealed that balance difficulties are the most frequently reported concern. Moreover, the lack of access to appropriate training facilities and limited awareness of the importance of balance maintenance further exacerbate the problem.

Given these challenges, implementing a technology-based balance training program tailored to the specific needs of this community could provide an innovative solution. This program aims to enhance balance and reduce fall risk through digital tools that deliver targeted exercises and

educational content. Consequently, the research question guiding this study is: *How can the utilization of digital technology improve balance performance and increase awareness of fall risks among the elderly at Posyandu RW 06 Rangkapan Jaya Baru?*

3. LITERATURE REVIEW

Maintaining balance is a crucial ability for older adults, enabling them to perform daily tasks safely and independently. This skill depends on the coordinated functioning of various body systems, including the musculoskeletal system, the central nervous system, and sensory systems. As individuals age, functional declines in these systems can lead to balance disorders, increasing the likelihood of falls (Ambrose, Paul, & Hausdorff, 2013). Factors such as reduced muscle strength, decreased joint flexibility, and impairments in sensory functions make the elderly more susceptible to balance issues. Sarcopenia—the age-related loss of muscle mass and strength—significantly diminishes the ability to maintain body stability, especially during sudden postural changes (Chen et al., 2014). Moreover, age-related changes in sensory systems, like vision and vestibular function, further compromise stability under various conditions (Sturnieks, St George, & Lord, 2008).

Structured physical exercises designed specifically to improve balance have been proven effective in reducing fall risks among the elderly. Numerous studies have demonstrated that exercises focusing on strengthening core and lower limb muscles, as well as enhancing postural coordination, can significantly improve stability and physical strength in older adults (Sherrington et al., 2019). These exercises include functional movements such as standing on one leg, tandem walking, and activities aimed at improving postural reactions to balance disturbances. Consistent and structured training enables the elderly to better maintain their balance when confronted with risky situations, like navigating uneven surfaces or responding to sudden movements (Liu-Ambrose et al., 2015).

In today's technologically advanced era, digital technology has emerged as an innovative approach to assist the elderly in balance training. Digital media platforms, including instructional videos and mobile applications, allow older adults to practice independently or with minimal guidance from healthcare professionals. This technology offers high flexibility, enabling them to engage in exercises at their convenience (Valenzuela et al., 2018). With clear and easy-to-follow instructions provided through digital platforms, they can achieve similar benefits to practicing with a direct instructor but with greater time flexibility.

Additionally, digital technology allows healthcare providers to remotely monitor the progress of the elderly's training. Applications and devices that record and report training data enable healthcare workers to offer real-time feedback without being physically present (van Het Reve & de Bruin, 2014). This is particularly important for older adults who may have limited access to health centers or are unable to attend training sessions in person. The technology not only expands access to training but also enhances adherence to exercise programs by providing the flexibility needed to adapt to individual schedules and physical capabilities (Vogt et al., 2012).

Virtual reality (VR) and augmented reality (AR) technologies have also been explored as tools for balance training in older adults. These

technologies create immersive environments that can simulate real-life scenarios, enhancing engagement and the effectiveness of balance exercises (Mirelman et al., 2016). Research has shown that VR-based balance training can lead to significant improvements in balance and reduce the risk of falls among the elderly (Kim et al., 2015).

Furthermore, telehealth interventions have gained attention for delivering exercise programs to the elderly. Telehealth enables remote supervision and personalized feedback, which can improve exercise adherence and outcomes (Burgess et al., 2017). Integrating telehealth into balance training programs has the potential to overcome barriers such as geographical limitations and mobility issues.

The balance training program designed for this community service project utilizes digital technology as the primary medium. By providing instructional videos containing structured balance exercises, the program aims to enhance muscle strength and postural stability in the elderly. The selected exercises focus on functional movements that improve the body's response to everyday balance disturbances. In addition to physical exercises, the videos offer education on the importance of maintaining balance and practical ways for the elderly to apply these practices in their daily activities. This approach ensures that older adults not only understand the significance of balance but also gain tangible benefits from the exercises in their everyday lives.

This program significantly contributes to improving the quality of life for the elderly, especially in urban environments with a relatively high aging population. By leveraging digital technology, the program can extend the reach of training and provide practical, easily accessible solutions for older adults who may find it challenging to attend fitness centers or health facilities in person. The initiative is also expected to be replicable in other locations with similar elderly populations, thereby broadening its impact.

Digital technology offers substantial potential in supporting home-based exercises, allowing the elderly to train their balance more conveniently. Through the use of instructional videos, older adults in areas with limited access to health facilities can still engage in independent practice. Beyond enhancing physical health, this program fosters greater independence among the elderly in maintaining their mobility. Consequently, the program contributes to reducing the risk of falls and serious injuries while boosting the confidence of older adults in performing daily activities.

Moreover, integrating digital technology into health interventions aligns with global trends toward e-health and telemedicine. This approach offers additional benefits such as cost-effectiveness, scalability, and the ability to personalize interventions based on individual needs (World Health Organization, 2019). By adopting digital solutions, healthcare providers can deliver interventions to a larger population without the limitations imposed by geographical barriers or resource constraints.

Studies have emphasized the importance of user-friendly design in digital interventions for the elderly. Ensuring that digital platforms are accessible and easy to navigate is crucial for successful implementation (Vaportzis, Clausen, & Gow, 2017). Features like large icons, straightforward instructions, and voice commands can enhance usability for older adults who may have limited technological proficiency.

Additionally, embedding social support mechanisms within digital platforms can enhance motivation and adherence. For instance, incorporating virtual communities or peer support features allows users to share experiences and encourage one another (Lelieveld et al., 2010). This social aspect can be particularly beneficial in maintaining long-term engagement with balance training programs.

4. METHODS

The community service program utilized several stages, including education, training, and mentoring. Designed to help improve balance in the elderly by using digital technology as the main medium, each stage was structured to ensure participants understood the importance of balance and could perform exercises correctly and safely.

a. Methods Used

The program employed several methods to achieve its main objectives:

1) Education

The initial stage involved educating the elderly about the importance of maintaining balance. This included explanations about the risk of falls among the elderly, the impact of declining balance on quality of life, and ways to maintain balance through physical exercises. The education was delivered through presentations and open discussions, allowing participants to ask questions.

2) Training

Following the educational sessions, balance exercises were conducted using digital technology. The elderly were invited to participate in training sessions guided by instructional videos. These videos featured balance exercises that were easy for the elderly to follow, with clear explanations and demonstrations. Each participant was accompanied by a physiotherapist to ensure movements were performed correctly to prevent injuries.

3) Mentoring

In addition to training, the program included mentoring by healthcare professionals during the exercise process. This aimed to provide direct guidance, monitor participants' progress, and adjust movements according to each elderly individual's physical abilities.

b. Number of Participants

The program was attended by 30 elderly individuals registered at the Elderly Posyandu RW 06 Rangkapan Jaya Baru, Depok. Participants were selected among those aged 60 and above who were still capable of performing light to moderate physical activities. This number was chosen based on the venue's capacity and the availability of adequate facilities for training and educational activities.

c. Implementation Steps

1) Preparation Stage:

a) An initial survey was conducted to identify the balance conditions of the elderly at Posyandu RW 06 Rangkapan Jaya Baru. This survey involved interviews with the elderly and Posyandu administrators to understand their needs and challenges.

b) The community service team prepared educational and training materials, including instructional videos to be used during balance exercises.

- c) Facilities at the Posyandu, such as projectors and screens, were set up to play the exercise videos. Training aids like therabands were also provided to support the exercise sessions.
- 2) Education Stage:
 - a) Education was provided to help the elderly understand the importance of maintaining balance and reducing the risk of falls. The material was delivered by a physiotherapist using visual media and presentation slides.
 - b) Discussions were held to gather questions and feedback from the elderly and to give them the opportunity to share experiences related to balance issues they had faced.
 - 3) Training Stage:
 - a) Training was conducted using instructional videos showcasing balance exercises appropriate for the elderly's abilities. Each training session lasted 20 minutes and was conducted under the direct supervision of a physiotherapist to ensure movements were performed safely and correctly.
 - b) The elderly followed the exercise movements as directed in the videos, with adjustments provided by the physiotherapist if necessary.
 - 4) Evaluation Stage:
 - a) Evaluation was carried out through pre-tests and post-tests to measure the increase in the elderly's knowledge about balance exercises and the impact of the training on their balance. The pre-test was conducted before the educational sessions, while the post-test was administered after all educational and training sessions were completed.
 - b) Data from the pre-tests and post-tests were analyzed using descriptive statistics to determine the level of improvement in participants' understanding and knowledge related to balance.
 - 5) Mentoring and Follow-up Stage:
 - a) Additional mentoring was provided to participants who needed extra assistance or experienced difficulties in following the exercises. The healthcare team offered advice and guidance to help the elderly practice independently at home.
 - b) Participants were also given written exercise guides to use as references when practicing on their own.

With the methods implemented, this program is expected not only to enhance the physical balance of the elderly but also to improve their understanding of the importance of regular exercise in maintaining mobility and quality of life.

5. RESEARCH RESULTS AND DISCUSSION

a. Results

This community service program successfully utilized digital technology, specifically through instructional videos, to enhance the elderly's understanding of fall risks. Before the program began, a pre-test was conducted to measure the participants' knowledge level regarding fall risks. The pre-test results showed that the majority of the elderly (about 50%) had a low understanding of how balance disorders can increase the

risk of falls. After participating in educational sessions and training using digital videos containing information about balance exercises and fall prevention, the post-test results indicated a significant improvement in understanding. A total of 85% of participants showed increased knowledge on how to reduce fall risks through proper balance exercises. This demonstrates that digital technology can be an effective medium for delivering material to the elderly.



Figure 1. Education for the Elderly Using Digital Media

Description: Elderly participants attending an educational session using videos that explain the importance of balance exercises to prevent falls.

1) Role of Instructional Videos in Enhancing Understanding

The instructional videos used in this program effectively conveyed information in a more visual and interactive manner, greatly assisting the elderly in understanding concepts that might be difficult if explained only verbally. The videos featured simulations of balance movements performed correctly, providing the elderly with a clear depiction of the movements they should perform. This visual approach made it easier for them to understand and apply balance exercises in their daily lives.



Figure 2. Elderly Participants Engaging in Balance Training via Video

Description: Elderly individuals participating in balance exercises guided by instructional videos.

2) Challenges Faced

Although the results showed an improvement in understanding, some elderly participants experienced difficulties at the beginning of the program, especially those not accustomed to digital devices. However, with assistance from healthcare personnel during the training sessions,

the elderly gradually were able to follow and comprehend the material. Those who received more intensive guidance reported increased confidence in performing exercises independently.



Figure 3. Assistance for the Elderly During Training Sessions

Description: Elderly participants are seated and attentively following instructions during a training session, while facilitators provide guidance and support, with a training video displayed on the screen in the background.

b. Discussion

Using digital technology through instructional videos has proven highly effective in improving older adults' understanding of fall risks and prevention strategies. Prior to the program's initiation, many seniors had limited awareness of the link between balance disorders and the likelihood of falling. Pre-test assessments showed that approximately 50% of the elderly participants had a low comprehension of fall risks. After receiving training via instructional videos, post-test results indicated a significant improvement, with 85% of participants gaining a better grasp of how to prevent falls through balance exercises. This demonstrates that videos can be an effective medium for educating the elderly, especially because clear visualizations enable them to mimic exercise movements more accurately than through oral or written instructions.

Table 1. Evaluation of Knowledge Results

Category	Before Training (%)	After Training (%)
Knowledge	50	85



Figure 4. Elderly Participants Completing Post-Test

Description: Elderly individuals attentively completing post-test assessments using paper sheets

The application of digital technology, particularly through the use of instructional videos, has demonstrated significant potential in improving the understanding of fall risks among the elderly at Posyandu RW 06 Rangkapan Jaya Baru. These videos, through visual demonstrations and step-by-step guidance, offered a form of education that was not only accessible but also highly effective for older adults. By observing precise movements and safety practices, participants were able to accurately replicate exercises, a method that often surpasses traditional oral or written instructions. This aligns with existing literature indicating that visual learning techniques are particularly effective for older populations, who may find complex textual information less engaging or harder to retain.

One of the program's most notable achievements was the substantial improvement in participants' knowledge of fall prevention through balance exercises. Before the intervention, only 50% of participants had a basic understanding of fall prevention strategies, as indicated by pre-test evaluations. Following the training, this figure rose dramatically, with 85% of participants demonstrating a clear understanding of how balance exercises could mitigate fall risks. This significant improvement highlights the efficacy of instructional videos in enhancing health literacy and underscores their role as a valuable medium for health education in elderly populations.

However, the program was not without its challenges. A key obstacle was the initial unfamiliarity of participants with digital technology. Many elderly individuals had limited or no experience with devices such as projectors, tablets, or basic digital interfaces. This technological gap necessitated additional support to help participants effectively engage with the instructional videos. The role of facilitators and healthcare workers was crucial in this context. They provided hands-on guidance, patiently assisting the elderly in adapting to the new learning tools. Over time, this consistent support not only enabled participants to navigate the digital content confidently but also helped to build their overall digital literacy—a skill that could benefit them beyond the program. In addition to its educational benefits, the use of instructional videos offered several practical advantages. Unlike traditional teaching methods, which often require the physical presence of an instructor and adherence to a fixed schedule, videos allow for flexible learning. Participants could engage with the content at their own pace, pausing, replaying, or reviewing segments as needed. This flexibility is particularly beneficial for elderly individuals, whose energy levels or personal commitments might limit their ability to attend scheduled sessions. By facilitating self-directed learning, the program empowered participants to take greater control of their education, promoting not only better retention but also a sense of autonomy.

Nonetheless, concerns regarding the sustainability of the program emerged. One significant limitation was the lack of personal access to digital devices outside the program setting. Many participants were unable to continue practicing the exercises independently at home, which posed a risk to the program's long-term impact. Addressing this issue will

require strategic solutions, such as establishing community-based lending programs, securing partnerships with local organizations to provide devices, or creating shared access points within community centers. These measures could ensure that participants maintain ongoing access to the instructional content, reinforcing their learning and promoting continuous engagement. The outcomes at Posyandu RW 06 illustrate that, when implemented thoughtfully, digital technology can be a powerful tool in enhancing health education for older adults. The success of this initiative provides a scalable model for other communities with similar demographics and challenges. Tailoring educational content to the unique needs of the elderly, coupled with proactive support to overcome technological barriers, can result in meaningful improvements in their health and well-being. Future programs should consider integrating follow-up assessments to monitor long-term outcomes and explore the potential of expanding the curriculum to include other aspects of elderly care, such as nutrition or home safety.

This study was conducted with several key assumptions. First, it was assumed that the elderly participants would have a baseline level of physical and cognitive ability to engage with the instructional content. This included the ability to follow visual demonstrations and perform basic balance exercises without significant medical or physical constraints. Additionally, the study assumed that the participants' primary barrier to fall prevention knowledge was a lack of access to effective educational resources, rather than a lack of interest or willingness to learn. Lastly, it was presumed that the presence of facilitators during the intervention would be sufficient to mitigate any challenges related to the use of digital technology. These assumptions were critical in designing the program and may influence the generalizability of the findings to other populations with different characteristics or access to resources.

The strategic use of instructional videos represents a promising approach to health education for the elderly. The combination of visual learning, flexible access, and personalized support was instrumental in the program's success. While technological barriers remain, they can be effectively mitigated through structured assistance and resource allocation. This approach not only enhances the understanding of fall risks but also promotes safer, more independent living for elderly populations in various settings.

6. CONCLUSION

At Posyandu RW 06 Rangkapan Jaya Baru, the use of balance exercise instructional videos significantly enhanced the elderly's understanding of fall risks. These videos provided accessible education through visual demonstrations and step-by-step guidance, allowing seniors to observe and accurately replicate movements—often more effectively than traditional oral or written instructions. Despite initial challenges with unfamiliar technology, the hands-on assistance provided during the event ensured successful engagement. Facilitators played a critical role in helping participants navigate the digital content confidently, which was essential for maximizing the educational benefits.

The success of this initiative demonstrates that even solely providing balance exercise videos makes digital technology an appropriate and efficient solution for delivering health education to older adults. The flexibility of video instruction allows participants to learn at their own pace, accommodating their unique learning needs. The positive outcomes at Posyandu RW 06 suggest that this approach can be effectively applied in other communities with similar demographics. To build on this success, it is recommended that similar digital balance training programs be expanded to other communities, particularly in areas with limited access to healthcare professionals or exercise facilities. Continuous support should be provided through facilitators or healthcare workers to assist the elderly in using digital tools, particularly during the initial phase of implementation. Additionally, complementary educational content, such as nutrition guidance and fall risk assessment tools, can be developed to provide a more holistic approach to fall prevention. Lastly, establishing a follow-up mechanism to monitor and evaluate the long-term effectiveness of digital balance training on reducing fall risks and improving functional outcomes is crucial. These steps will enhance the scalability and sustainability of the program, ensuring its positive impact on elderly populations in various settings.

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