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Original Article

Comparison of the Effects of Mobile Learning and Traditional Self-care Education on Loneliness and Social Isolation in Community-dwelling Older Adults :Study Protocol of a Three-Arm Randomized Controlled Trial

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Introduction: Loneliness and social isolation are common problems in older adults, which has negative effects on health. Increasing self-care ability seems to help. Therefore, the present study will be conducted with the aim of comparing the effects of mobile learning and traditional self-care education on loneliness and social isolation in community-dwelling older adults.

Methods: This three-arm randomized controlled trial will be conducted in Tehran-Iran 2024. The qualified older adults from health centers in Tehran city will be consecutively selected and randomly allocated into three groups: mobile learning (n = 40), traditional education (n = 40), and control (n = 40). The loneliness inventory for older adults, Lubben social network scale, and demographic characteristics will be used to collect information, and completed before, immediately, and 12 weeks after the intervention. The data will be analyzed using descriptive and inferential statistics by SPSS software version 16 at a significance level of $p < 0.05$.

Conclusion: This clinical trial will determine the most successful and cost-effective approach in reducing loneliness and social isolation in older adults. The results are expected to improve the self-care skills of the older adults, thereby reducing the negative consequences of loneliness and social isolation, including various health issues and mortality rates, in the long run.

Keywords: Aged, Loneliness, Social Isolation, Self-Care, E Learning

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Introduction

The progress of medical technology, the growth of healthcare services, and longer lifespans have hastened the aging of populations worldwide (1). As seniors grow older, they become more susceptible to various mental and social health issues, which can affect their quality of life (2). Loneliness and social isolation are examples of these problems (3). Social isolation refers to the absence of social connections with others and the lack of stable, positive, and meaningful relationships (4). It is often the result of the breakdown or disruption of social relationships, suggesting unsuccessful aging (5). Predictable life events that come with aging, such as retiring, becoming a widow, transitioning from parenthood to solitude, and going from good health to disability or dependence, increase older adults' vulnerability to

social isolation (6). Reports indicate that 24% of Americans aged 60 and above experience social isolation (7). Loneliness, a subjective feeling of being alone or abandoned, reflects inadequate, unstable relationships where individuals feel unloved and unaccepted (8). Among older adults, loneliness can lead to feelings of disappointment, isolation, reduced social abilities, psychological distress, and ineffective interactions (9). Over 43% of U.S. seniors aged 65 and older report feeling lonely (10). Factors like health conditions, widowhood, living alone, emotional challenges, low income, and limited social support can heighten loneliness and social isolation risks in the older adults, impacting their health negatively (11-14). Social isolation and loneliness increase all-cause mortality risks by 29% and 32%, respectively (15-17). Inadequate social connections elevate the chances of coronary artery disease by 29%, stroke by 32%, and contribute to changes that raise the risk of Alzheimer's and dementia in older individuals (18, 19). Research shows that loneliness and social isolation in the older adults can lead to increased anxiety, depression, psychosis, personality disorders, suicidal thoughts, self-neglect, self-harm, poor treatment compliance, malnutrition, and inactivity (20-22). Shamlou et al., (2021) found that both loneliness and social isolation are strongly negatively correlated with self-care levels in the older adults (5).

Self-care involves promoting and maintaining health, preventing and managing illness and disability, and is a dynamic, conscious, learnable, and adaptable process. It includes physical, psychological, emotional, social, and spiritual dimensions, and helps people balance loneliness and social interactions (23, 24). However, older adults often have inadequate self-care skills (25). Improved self-care can enhance quality of life, independence, interaction, spiritual growth, self-esteem, medication adherence, nutrition, problem-solving skills, self-efficacy, and reduce overall healthcare burden (26-28). Velligan et al., discovered that self-care education can improve the mental health of at-risk individuals (29). Age-related changes in older individuals necessitate tailored learning methods, with traditional approaches like lectures commonly used in healthcare training for seniors (29 - 31). Research indicates that traditional self-care education methods lead to positive behavioral changes in the older adults, enhancing their self-care abilities, nutritional status, physical activity, and mental well-being (32). Alongside traditional methods, modern tools like digital media, including mobile learning (M-learning), are increasingly employed to promote healthy lifestyles among older adults (31, 33, 34). Smartphone applications offer convenient access to educational resources on disease management, healthy living tips, nutrition guidance, and support for emotional and social well-being (35-37). These apps deliver multimedia education, medication reminders, personalized learning environments, flexible learning opportunities, independent learning options, and repeated access to multimedia content, contributing to improved health outcomes and life satisfaction in older individuals (38-40). Loneliness and social isolation in the elderly can negatively impact their quality of life and lead to various health issues such as depression, anxiety, suicidal thoughts, and higher mortality rates, although studies have reported inconsistent results (3). Considering the negative correlation between self-care and loneliness/social isolation in older adults, self-care education is expected to reduce loneliness and social isolation levels by changing their awareness, attitudes, and behaviors. Research has also shown that M-learning and traditional education have different effects on various factors. Comparing the effectiveness of these educational methods can help professionals select the most successful and cost-effective self-care education method for the older adults. This study protocol outlines a three-arm randomized controlled trial (RCT) that will compare the effects of M-learning and traditional self-care education on loneliness and social isolation in community-dwelling older adults. The researcher anticipates that 8 sessions of mobile learning and traditional self-care education can significantly change loneliness and social isolation levels in older adults both immediately and 12 weeks after the intervention.

Methods

Study aim, design, setting, and ethics

A pretest-posttest design will be used to conduct this three-arm RCT. The study will compare the effects of M-learning and traditional self-care education on loneliness and social isolation in community-dwelling older adults. The research will be carried out in a comprehensive health center affiliated with the Tehran University of Medical Sciences, Iran. Chosen comprehensive health service center is one of the oldest health centers under the supervision of Tehran University of Medical Sciences, which covers several thousand people and a high proportion of them are older adults. Also, due to the ease of access of the research team, this center has been selected for sampling. The study was designed based on the CONSORT-EHEALTH statement guidelines (41). (Figure 1)

The SPIRIT 2013 template (51) describes the study schedule enrolment, interventions, and assessments. (Table 1)

Participants

Recruitment and screening

The study population consists of all older adults visiting comprehensive health centers in Tehran, Iran, in 2024. To this end, 120 older adults will be selected to participate in an eight-week intervention. All literate older adults in the 60–70 years-old age group who are able to perform their daily activities, have no history of mental disorders (based on self-reports and background files), have access to an Android smartphone, have never participated in a similar educational program, and do not suffer from hearing,

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visual, sensory, or speech disabilities will be enrolled. Exclusion criteria will include missing at least two sessions or suffering from a serious illness or disability.

Sample size

With an effect size of 25% and power of 80%, the sample size was calculated in G*Power as 36 individuals per group. The final sample size was then determined as 40 individuals per group (total size: 120), allowing for a loss to follow-up of 10%.

Randomization and blinding

The sample will be selected using consecutive sampling after obtaining written informed consent from eligible people. A total of 120 individuals will be selected as the sample based on the inclusion criteria. Then the selected people will be assigned to three groups M-learning, traditional education, and control groups, 40 individuals per group). Using a randomized block design (6-individual blocks, www.randomizer.org), random sequences of letters A, B, and C will be created, which will assign the samples to one of the three desired groups. All participants will receive sealed, opaque, sequentially numbered envelopes to conceal the allocation sequence. The researcher will enter the mobile app access code for each participant in the M-learning group. The access codes will not be shared with these individuals to prevent participants in the traditional education and control groups from gaining access to the educational content. This will help that the participants in the traditional education group will not be influenced by the content or any potential biases introduced by the M-learning group .Additionally, face-to-face meetings will hold for the two intervention groups on different days of the week, which further minimizes the risk of contamination by separating the groups in terms of time and setting.

M-learning group

The educational content for those in the M-learning group will be provided by developing an Android application based on mobile health technology. The offline app will be designed and developed by the researcher in Java using Android Studio. The app will be tailored to the needs of the older adults so that problems such as muscle weakness, limitations in performing precise tasks, vision loss, color vision problems, and extreme screen light sensitivity do not prevent optimal use of the educational content. In addition, this user-friendly app will allow participants to select the fonts they want and adjust the color contrast of the background. To increase the attention of the older adults and enhance the effectiveness of sessions, the education will be provided in the form of multimedia content. Participants will attend two 20-minute sessions each week. In the first session, the researcher will meet with participants in person to explain the research objectives and educational program, show them how to install and use the software, and let them know how to reach the researcher if they had any questions. Sessions number 2 to 7 will be presented to those in the M-learning group via the researcher-made app, and participants will not have access to the next session until they read the content of the previous session. The trainings related to the second to seventh sessions have been designed and compiled in various ways in the mobile application. All text training will be provided to the older adults in two optional ways (podcast or text). Also, in each session, infographic images with adjustable magnification and short educational videos suitable for the topics of each session will be available to the the older adults. After each session is activated, all the above items will appear on the screen and the older adults can use the contents by clicking on the specified sections. The app will send reminder messages to participants to remind them to study the educational content. In addition, participants will be able to ask their questions from the researcher by phone or SMS. In the last session, the researcher will answer questions raised by participants after providing a summary of the sessions.

Traditional education group

Participants in this group will meet in small groups of 8 to 10 people, and the researcher will provide them with physical, mental, emotional, social, and spiritual self-care education using lectures and educational aids such as markers, whiteboards, and Power Points. The older adults will attend a total of eight 45-minute sessions (2 sessions per week) at the selected comprehensive health center. At the end of each session, participants will express their opinions in a group discussion, and the researcher will answer their questions. The titles of the content that will be presented to the intervention groups are listed in Table 2.

Control group

Participants in this group will not receive any training; however, at the end of the intervention, the researcher will provide these individuals with the content of the self-care education sessions.

Outcome measures

The data will be collected using the Lubben Social Network Scale (LSNS), the Loneliness Inventory for Older Adults of Bandari et al., and a socio-demographic questionnaire. LSNS was developed by Lubben (2006) in Switzerland. This self-report tool has two subscales: relationships with family members (3 items) and relationships with friends and neighbors (3 items). The items are scored on a six-point Likert scale from “no one” (score 0) to “nine people and more” (score 5). The total score ranges from 0 to 30, and scores < 12 indicate social isolation. The reliability of the original version of the tool was confirmed by measuring its internal consistency (Cronbach’s alpha value = 0.83). A factor analysis was performed to assess the construct validity of the original version of the scale. The correlations among the rotated factor loadings for two samples were reported as 99% with high eigenvalues (42). Tavakoli

[DOI: 10.18502/ehj.v10i1.15965]

et al., (2020) translated LSNS into Persian and assessed the psychometric properties of this tool. The content validity of the Persian version of LSNS was confirmed with a content validity ratio (CVR) of 0.91 and a content validity index (CVI) of 0.97. In addition, the reliability of the tool was confirmed by assessing its internal consistency (Cronbach's alpha value = 0.89) (43).

The Loneliness Inventory for Older Adults was designed by Bandari et al., (2021) in Iran. The five subscales of this self-report tool include decreased social capacity (7 items), feelings of disappointment and uselessness (7 items), psychological suffering (8 items), experiencing loneliness at certain times (4 items), and inefficient interactions (3 items). The items are scored on a five-point Likert scale from "completely disagree" (score 1) to "completely agree" (score 5). The total raw score ranges from 29 to 145, but the final score ranges from 0 to 100. Higher scores indicate greater degrees of loneliness. The reliability of the inventory was confirmed using the internal consistency method with a Cronbach's alpha value of 0.94% and an intra-class correlation coefficient (ICC) of 0.97.

A socio-demographic questionnaire will be used to collect information about the age, sex, educational qualifications, marital status, medication history, chronic disease history, income status, number of children, job status, and life status of participants.

The questionnaires will be completed by participants, and a group of geriatric nursing professors will confirm the content validity of the educational content provided to members of the intervention groups. In addition, the structure of the app will be evaluated by a number of IT experts, and its reliability will be assessed by conducting a pilot study on a number of older adults.

Data analysis

The data will be analyzed in SPSS 16 using descriptive statistics (frequency, mean, and standard deviation) and inferential statistics (chi-square test and repeated measures analysis of variance (ANOVA) post-hoc test) in order to compare the mean scores of loneliness and social isolation for the three groups. P-values < 0.05 will be considered significant.

Trial registration number

IRCT registration number: IRCT20221024056283N1. The Institutional Review Board at TUMS approved the study protocol (IR.TUMS.FNM.REC.1401.077).

Ethical considerations

The Institutional Review Board at TUMS approved the study protocol (IR.TUMS.FNM.REC.1401.077). Participants will be assured of the confidentiality of their information and written informed consent will be obtained from all participants before starting the study.

Table 1. Schedule for enrolment, interventions and assessments in this study

Timepoint		Baseline	0	Week 1-8	Week 12
Enrolement	Eligibility screen	*			
	Informed consort	*			
	Randomization		*		
Groups	M-learning			*	*
	Traditional education			*	*
	Control group				
Assessments	Age	*			
	Gender	*			
	Educational qualifications	*			
	Marital status	*			
	Medication history	*			
	Chronic disease history	*			
	Number of children	*			
	Income	*			
	Job status	*			
	Life status	*			
	Loneliness score	*			
	Social isolation score	*			
Primary outcome	Loneliness	*		*	*
	Social isolation	*		*	*

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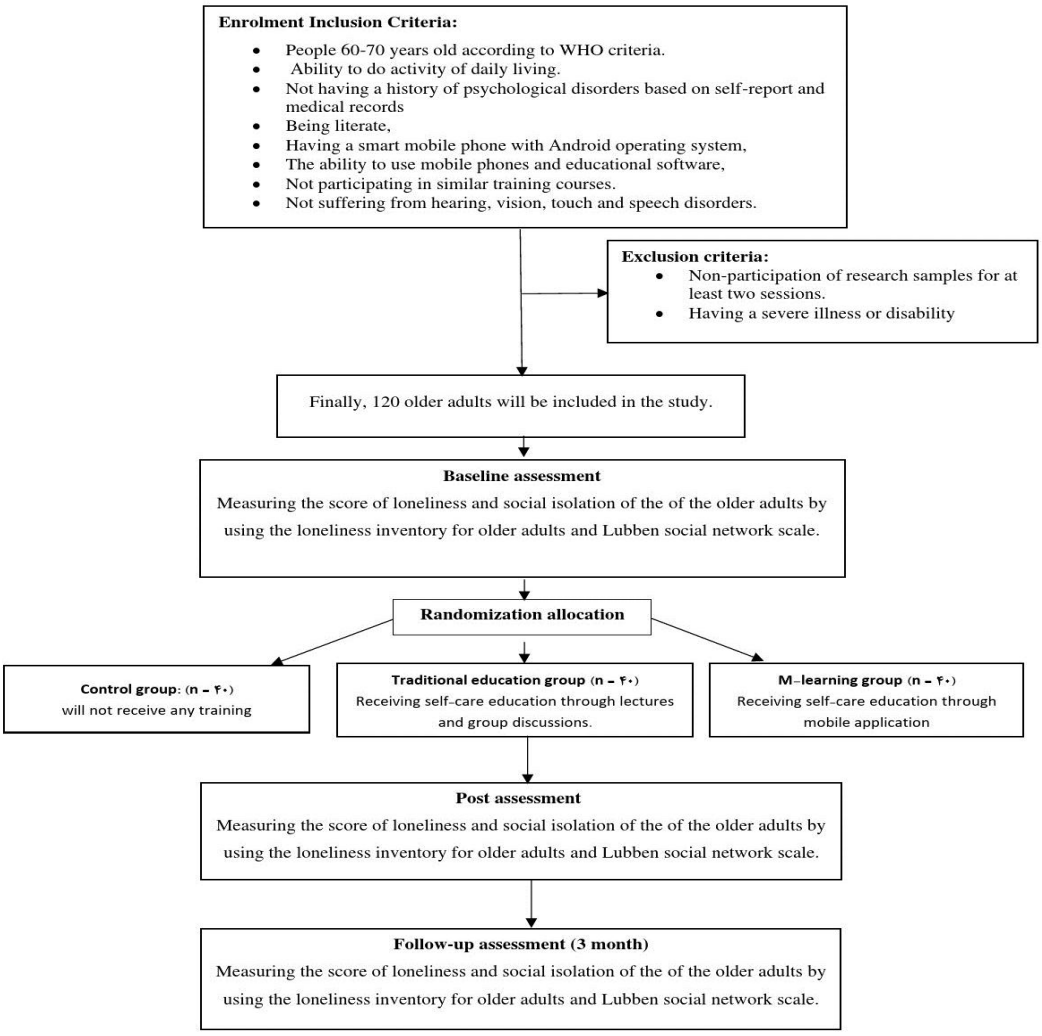

Figure1. The enrolment, randomization, and follow up of the study

Table 2. The titles of the content that will be presented to the intervention groups

Contents	Topics
The first section	An introduction to self-care in older adults
The second section	Nutrition
	Physical activity
The third section	Sleep health
	Medication management
The fourth section	Falling
	Urinary incontinence
The fifth section	Mental health
	Depression
The sixth section	Social self-care
The seven section	Spiritual self-care

Discussion

This study aims to compare the impact of M-learning and traditional self-care education on loneliness and social isolation in community-dwelling older adults. While numerous studies have explored loneliness and social isolation in older adults, the researcher found no study on the effects of a comprehensive self-care program using M-learning and traditional self-care education approaches. Although some studies have presented effective interventions, researchers have also investigated the effects of modern technologies, cognitive therapeutic methods, health and social service provision, companion animals, befriending interventions, leisure activities, and individual skill development on loneliness and

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social isolation in older adults (4, 23, 44). Self-care is crucial for health, particularly in older adults, and self-care education through lectures and group discussions can improve health, well-being, and mental resilience in older adults (45). Given the increasing use of cell phones by older adults and the advantages of smartphone apps in senior education, the cost-effectiveness, flexibility, ease of use, quality, and availability of different learning methods should be considered (46). Studies have shown that mobile-assisted self-care education can enhance general health, nutritional status, and sleep quality in older adults (27). Videoconference-based training and digital educational techniques can be as effective or more effective than traditional methods in improving physical activity and nutrition aspects of a healthy lifestyle in older adults (49, 50). After evaluating existing self-care education apps for older adults, it is clear that none of them address all physical, psychological, social, and spiritual aspects of self-care simultaneously. Additionally, there is a lack of evidence on the impact of comprehensive self-care education on loneliness and social isolation in community-dwelling older adults. Many app developers have not managed to create customizable and user-friendly apps that cater to the needs of older adults. To our knowledge, this is the first clinical trial to compare the effects of two comprehensive self-care education programs, mobile learning and traditional self-care education, on loneliness and social isolation in older adults.

Mobile phone applications offer numerous advantages, including easy access to knowledge and educational content, the ability to provide multimedia resources that can be accessed anytime and anywhere, and the cost-effectiveness of this technology. However, an examination of self-care training applications designed for the older adults reveals shortcomings such as the lack of comprehensive training covering physical, psycho-emotional, social, and spiritual aspects of self-care simultaneously. Many applications also fail to prioritize customization and user-friendly design tailored to the specific needs of the older adults, prompting the current research to address these gaps. Conversely, traditional lecture-style teaching allows for group discussions, question-and-answer sessions, improved interpersonal relationships, comprehensive learning assessment, immediate feedback, and diverse learning opportunities for the older adults. Research findings on the effectiveness of teaching methods, comparing accompanying learning and lecture approaches, have shown varying results (52). Therefore, comparing these teaching methods can facilitate the selection of a more effective and cost-efficient approach to teaching self-care to the older adults.

Comparing modern and traditional methods of self-care education is crucial for informing future interventions and policies in health and treatment. Despite the unique advantages of both training methods, research findings on the effectiveness of these methods have varied. Examining the strengths and weaknesses of both approaches can facilitate the selection of more effective and cost-efficient ways to teach self-care, ultimately improving health outcomes and reducing disparities. Policy makers in the healthcare field can promote the more effective educational approach to respond to the different learning styles and preferences of the older adults.

Conclusion

This clinical trial will compare the immediate and long-term effects of two comprehensive self-care education, namely mobile learning and traditional self-care education, on loneliness and social isolation in community-dwelling older adults. This will help the researcher determine the most successful and cost-effective approach. The results are expected to help the older adults improve their self-care skills. This will reduce the negative consequences of loneliness and social isolation (e.g., cardiovascular disease, stroke, dementia, and mental disorders) as well as mortality rates associated with loneliness and social isolation among community-dwelling older adults in the long run.

Study limitations

Currently, the study does not seem to have any limitations, but the researcher will report important limitations that may be revealed at the end of the intervention.

Conflict of interest

The authors declare that they have no conflict of interest.

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Highlights

What is current knowledge?

- Loneliness and social isolation are directly related to health problems and mortality in older adults.
- The results of interventions to reduce loneliness and social isolation in older adults are contradictory.

What is new here?

- This clinical trial will compare the immediate and long-term effects of two comprehensive self-care education, namely mobile learning and traditional self-care education, on loneliness and social isolation in community-dwelling older adults.
- The study aims to determine the most successful and cost-effective approach to help the elderly improve their self-care skills and reduce the negative consequences of loneliness and social isolation, such as cardiovascular disease, stroke,

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dementia, and mental disorders, as well as mortality rates associated with loneliness and social isolation among community-dwelling older adults in the long run.

Abbreviations

M-learning: mobile health learning
M Health: mobile health

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