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RESEARCH ARTICLE

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DO HEALTH-RELATED FACTORS AFFECT SMARTPHONE USE IN ELDERLY INDIVIDUALS?[1]

Yaşlı Bireylerde Sağlıkla İlişkili Faktörler Akıllı Telefon Kullanımını Etkiler Mi?

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ABSTRACT

The purpose of this study was to investigate the impact of physical and cognitive characteristics of elderly individuals living in nursing homes on their smartphone usage. The study included 67 volunteer individuals residing in a nursing home in Muğla. Sociodemographic characteristics and smartphone usage details of the individuals were questioned using a form prepared by the researchers. Participants' physical functions were assessed using the 6-Minute Walk Test, the 5 Times Sit-to-Stand Test, and the Berg Balance Scale. The Montreal Cognitive Assessment Scale (MoCA) was used to examine cognitive function. The mean age of the individuals included in the study was 74.18±3.26 years. A statistically significant moderate positive relationship was observed between the smartphone usage duration and MoCA score of the individuals ($r=0.530$, $p<0.05$). No statistically significant relationship was found between smartphone usage duration and physical functions ($p>0.05$). As per the results of our study, an increase in smartphone usage duration has been seen to be associated with the preservation of cognitive abilities in elderly individuals. We believe that smartphones, which can provide access to various health services when used effectively, as well as meeting the socialization needs of individuals living in nursing homes, play an essential role in promoting active aging.

Keywords: Elderly, nursing home, cognition, technology, social work.

ÖZET

Bu çalışmanın amacı huzur evinde yaşayan yaşlı bireylerin fiziksel ve bilişsel özelliklerinin akıllı telefon kullanımı üzerindeki etkisini incelemekti. Çalışmaya Muğla'da huzurevinde konaklayan 67 gönüllü birey dahil edildi. Araştırmacılar tarafından hazırlanan form yardımıyla bireylerin sosyodemografik özellikleri ve akıllı telefon kullanım detayları sorgulandı. Katılımcıların fiziksel fonksiyonları 6 Dakika Yürüme Testi, 5 Kere Otur Kalk Testi ve Berg Denge Ölçeği kullanılarak değerlendirildi. Bilişsel fonksiyonun incelenmesinde Montreal Bilişsel Değerlendirme Ölçeği (MBDÖ) kullanıldı. Çalışmaya dahil edilen bireylerin yaş ortalaması 74.18±3.26 yıldı. Bireylerin akıllı telefon kullanım süresi ile MBDÖ skoru arasında istatistiksel olarak anlamlı orta düzeyde pozitif ilişki görüldü ($r=0.530$, $p<0.05$). Akıllı telefon kullanım süresi ile fiziksel fonksiyonları arasında istatistiksel açıdan anlamlı ilişki görülmedi ($p>0.05$). Çalışmamızın sonuçlarına göre, akıllı telefon kullanım süresindeki artışın yaşlı bireylerin bilişsel yeteneklerinin korunması ile ilişkili olduğu görülmüştür. Huzur evinde yaşayan bireylerin sosyalleşme ihtiyacını gidermekle birlikte etkili kullanıldığında pek çok sağlık hizmetine ulaşımını da sağlayan akıllı telefonların bireylerin aktif yaşlanmasında etkili olduğunu düşünmekteyiz.

Anahtar Kelimeler: Yaşlılar, huzurevi, kognisyon, teknoloji, sosyal hizmet.

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INTRODUCTION

Aging is a natural process characterized by the complex interplay of biological, psychological, and sociocultural processes that result in the changes an individual experience over their life course (López-Otín et al., 2013). The aging process is the result of biological mechanisms that lead to a decline in the functions of cells, tissues, and organs, as well as a reduction in overall life span (Niccoli and Partridge, 2012). It is also associated with psychological processes that cause changes in individuals' emotional and cognitive abilities (Schaie and Willis, 2010). At the sociocultural level, aging refers to the transition to later stages of life, accompanied by varying life experiences, roles, and expectations across societies and cultures (Settersten and Hagestad, 2015).

The World Health Organization (WHO) categorizes middle-aged individuals as those between the ages of 45-59, and older adults as those between the ages of 60-74. Further, they classify older adults into three subcategories: young-old (65-74 years), middle-old (75-84 years), and oldest-old (85 years and over) (Arulat, 2009). According to the Turkish Statistical Institute (TSI), if the current population growth rates continue, Turkey will be among the countries experiencing an aging population. The percentage of the population aged 65 and over is expected to rise to 12.9% in 2030, 22.6% in 2060, and 25.6% in 2080 (TSI, 2022).

Aging results in a decrease in an individual's ability to adapt to their environment, leading to structural and functional changes in many organs and systems. Examining the changes that occur in the musculoskeletal system with aging reveals a decrease in muscle strength and mass, changes in the histomorphological characteristics of ligament and tendon structures, and a reduction in bone tissue mineral support with a tendency toward increased breakdown of metabolism (Roberts et al., 2016; Yiğitbaş et al., 2016; Tails et al., 2003). These changes in the musculoskeletal system negatively affect an individual's balance performance and the sustainability of their balance (Vanbeveren and Avers, 2012). Another change observed with aging is the impact on cognition, which is the ability to acquire information through all sensory organs, and to understand and interpret this information. Cognitive functions include attention, short- and long-term memory, perception, orientation, language skills, decision-making ability, abstract thinking, arithmetic calculation ability, and executive functions (Glisky, 2007). Executive functions allow an individual to independently plan and process goal-directed behaviour appropriately, determining the next step in sequential tasks. Symptoms of executive dysfunction include attention deficits, decreased problem-solving ability, and difficulties in daily living activities. With age, there is a decline in general cognitive capacity, particularly in the speed of executive functions (Güler, 2011). Aging can be defined as the stress and regression on the functional and cognitive capacity of physical health, deterioration in psychosocial processes, decreased access to social networks, regression in social participation, loss in quality of life and social roles, compromises in independent life, economic losses and inability to utilize new opportunities in daily life (Kalınkara and Kalaycı, 2020).

Old age should be evaluated not only physically but also psychosocially. Physically, old age encompasses the physiological changes brought about by the aging process, while psychosocially, it examines the changes in adaptive abilities related to memory, perception, mood changes, communication, and personality traits with aging. Social isolation and feelings of loneliness associated with aging cause individuals to become introverted. In this regard, the participation of older adults, especially those living in nursing homes, in social activities is negatively affected due to the decline in both physical and cognitive functions. A review of the literature highlights the importance of technological innovations such as mobile internet for older individuals seeking to maintain active engagement in life and escape social isolation. Through mobile internet, individuals' needs are met in various areas, including banking transactions, various reservations, purchasing goods or services, video calls, and medical support. Mobile internet, which can act as an immediate alarm in case of elderly individuals experiencing difficulties, also facilitates social connections (Demiris, 2008). Individuals living alone can call their relatives, engage in video conversations, and make friends to escape loneliness using mobile internet. Thanks to applications installed on smartphones through mobile internet, some health-related issues can also be detected (Plaza, 2011). Online health applications, such as calorie counting, heart rate monitoring, emergency services, and ambulance services, first aid, pedometers, and stress level measurements, contribute to the successful aging of elderly individuals.

In advancing age, elderly individuals experience physical difficulties and an increased need for health-related support. Due to age-related mental and physical decline and the rapidly growing elderly population, the need for technology is steadily increasing (Palmore, 1985). Physical, cognitive, and psychological changes associated with aging, such as decline in social relationships, difficulty in performing daily activities, and health issues, can be addressed with the assistance of technological devices (Rowe, 1987). Therefore, the acceptance and effective use of technology by elderly individuals become crucial for successful aging (Olson, 2011). The use of digital technologies and social media applications intensifies the relations of older individuals with their social environment and actively includes them in social life (Artan and Urhan, 2019).

Despite the changes and losses observed in all organs and systems of elderly individuals, it is essential to improve holistic adaptation ability to maintain active aging. Technology acceptance and usage facilitate coping with various deficiencies and enhancing adaptation. Therefore, the aim of this study is to investigate the relationship between smartphone usage and physical and cognitive functions in elderly individuals living in nursing homes.

The hypotheses of the study are listed below:

H_1: Health-related factors in elderly individuals are influenced by the use of smartphones.

$H_{1\text{-}1}$: There is a relationship between the physical functions of the elderly and the duration of smartphone use.

$H_{1\text{-}2}$: There is a relationship between the cognitive functions of the elderly and the duration of smartphone use.

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METHOD

The study population consisted of 82 elderly individuals residing in a nursing home in the central district of Muğla province. The sample size of the study was calculated using GPower Version 3.1.9.4 software. Considering 80% power and a 0.05 margin of error, the study was completed with 67 volunteers who met the inclusion criteria.

Inclusion criteria:

- Being 65 years old or older and voluntarily participating in the study
- Having sufficient cooperation and cognitive level to understand the tests (Mini Mental Test score of at least 24)
- Being able to walk independently
- Being a smartphone user

Exclusion criteria:

- Having serious chronic diseases that may be contraindicated for physical activity (such as symptomatic coronary artery disease, uncontrolled hypertension, or metabolic disorders)
- Having a diagnosed neurological, vestibular, psychiatric, or cognitive disorder
- Having severe vision loss
- Having undergone surgical operations within the last 6 months
- Having a compression fracture risk due to osteoporosis

Study Design

This cross-sectional and descriptive study was conducted in a nursing home in Muğla-Turkey, between January and August 2022.

Data Collection Tools

Descriptive Information Form: This form was used to recorded individuals' features such as age, gender, marital status, education level, height, body weight, body mass index (BMI), chronic illnesses, medications, duration of stay at the nursing home, and details about their smartphone usage. Additionally, opinions regarding how the elderly perceive themselves physically, socially, cognitively, and emotionally were recorded.

Participants' physical functions evaluated using the 6 Minute Walk Test, the 5 Times Sit-to-Stand Test, and the Berg Balance Scale; their cognitive functions were assessed using the Montreal Cognitive Assessment Scale.

6 Minute Walk Test (6MWT): The 6MWT is a test used to assess functional exercise capacity. Participants are asked to walk as far as possible within 6 minutes on a flat, unobstructed, and straight area with defined 30 m boundaries. They are informed that they can rest if they feel fatigue, shortness of breath, dizziness, nausea, or pain and continue when they feel ready. Participants are encouraged at 2-minute intervals with a consistent tone. The total distance walked in meters is recorded after 6 minutes. Heart rate, systolic and diastolic blood pressures, oxygen saturation, perceived fatigue, and shortness of breath levels are recorded before and after the test (Görek and Dilektaşlı, 2019).

Five Times Sit-to-Stand Test (5TSST): The 5TSST was developed by Whitney et al. in 2005. Participants are asked to stand up and sit down quickly from a standard chair with their arms crossed over their shoulders and their backs against the chair. The stopwatch starts with the "start" command and stops when the participant contacts the chair on the last repetition. The activity is repeated 5 times consecutively, and the time is recorded in seconds (Whitney, 2005).

Berg Balance Scale (BBS): The BBS was developed by Berg KO et al. in 1989 and has been translated, adapted, and validated in Turkish by Şahin et al. in 2013 (Berg 1989; Şahin 2013). The scale consists of 14 functional parameters, each scored between 0 and 4. The maximum total score a participant can achieve is 56. The level of proficiency in the performed activity is determined as 0 for "cannot do" and 4 for "can do independently and safely." Functional activities in the 14 items include supported and unsupported sit-to-stand, transfers, standing with eyes open and closed, standing with a narrow and wide support surface, picking up an object from the floor, looking over the right and left shoulders, turning 360 degrees, standing on one foot, stepping onto a step, tandem stance, and reaching forward with arms and elbows straight while standing. A high score indicates good balance function. A score of 0-20 on the scale with a cut-off value of 21 indicates a high risk of falling, 21-40 indicates a moderate risk, and 41-56 indicates a low risk.

Montreal Cognitive Assessment Scale (MoCA): MoCA is an assessment scale that includes 8 different cognitive functions designed to detect mild cognitive impairment. It was developed by Nasreddine et al. in 2005. In addition to abstract thinking tests such as trail making, clock drawing, and similarities, the test also includes executive functions like cube copying. The test also evaluates naming, memory and attention, sentence repetition, verbal fluency, and delayed recall subgroups. The highest possible score on the test is 30. A total score of 21 or higher indicates the participant is within normal limits. The test takes approximately 10 minutes to administer (Nasreddine, 2005). The Turkish adaptation, validity, and reliability studies of the scale have been conducted (Kaya, 2014; Özdilek, 2014).

Data Collection

The data of this study were collected face-to-face using the data collection tools.

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Data Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) Version 25. The Shapiro-Wilk test was used to determine the suitability for normal distribution. Spearman correlation analysis was used to explain the scores of participants in analysing the data with normal distribution. In the statistical analysis of other data that do not follow a normal distribution, the results were interpreted using the Mann-Whitney U test and the Kruskal-Wallis H test. Analysis results are expressed as a mean±standard deviation, and a frequency (percentage). A probability value of $p<0.05$ was considered statistically significant.

Ethical Consideration

Before starting the study, ethics committee approval was obtained from the Muğla Sıtkı Koçman University Medicine and Health Sciences Ethics Committee-2 (December 22, 2021, No: 43). In addition, a study permit was obtained to conduct the study from Muğla Family and Social Policies Provincial Directorate (November 19, 2021- No: E-83531317-500-1787407). This study was conducted in accordance with the principles of the Helsinki Declaration. Participants were informed about the aim of the study. Informed consent was also obtained from the participants after a detailed explanation of the study.

RESULTS

The demographic and social characteristics of the participants in the study are shown in Table 1.

Table 1. Demographic and Social Characteristics of the Participants (n=67)

Characteristics		n	%
Gender	Female	40	60
	Male	27	40
Marital status	Married	30	45
	Single	25	37
	Divorced	12	18
Education level	Literate	7	10.44
	Primary school	40	59.7
	High school	15	22.4
	College	5	7.46
Chronic illness	Yes	26	38.81
	No	41	61.19

Chronic illness type	Under-controlled hypertension	15	22.4
	Diabetes Mellitus	11	16.4
Regular medication use	Yes	17	25.37
	No	50	74.63
Characteristics		Mean	Standard Deviation
Age (years)		74.18	3.26
Height (m)		1.64	0.04
Weight (kg)		80.35	15.24
Body Mass Index (BMI- kg/m2):		28.78	4.35
Duration of stay at the nursing home (years)		7.02	5.04

The responses to the questions asked to examine the smartphone use of the individuals included in the study are given in Table 2.

Table 2. Participants' Smartphone Usage Details

Variables		**Mean±Standard Deviation**
Duration of using smartphone (years)		8.82±2.03
Duration of daily using smartphone (hours)		6.61±2.01
Variables		**n**
Purpose of smartphone usage	News reading	40
	Communication	67
	Social media	32
	Shopping	21
	Banking transactions	15
Applications used	Social media apps	32
	Communication apps	67
	Shopping apps	21
	Hobbies and interests' apps	12
	Puzzle and game apps	8

According to the Mann-Whitney U test analysis, no significant difference was found between smartphone usage duration and gender ($p>0.05$). Additionally, according to the Kruskal-Wallis H Test result, there was no statistically significant difference in smartphone usage duration and education levels of individuals ($p>0.05$).

The 6 Minute Walk Test (6MWT), 5 Times Sit-to-Stand Test (5STS), Berg Balance Scale (BBS), and Montreal Cognitive Assessment Scale (MoCA) scores of the individuals who voluntarily accepted to participate in the study are shown in Table 3 as follows.

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Table 3. Scores of evaluation parameters

Parameter	Mean±Standard Deviation
6 Minute Walk Test (m)	407.59±47.23
5 Times Sit-to-Stand Test (sec)	18.11±3.43
Berg Balance Scale	43.18±6.3
Montreal Cognitive Assessment Scale	23.38±2.08

When the relationship between smartphone usage details and other evaluation parameters was examined by spearman correlation analysis, the following results were obtained:

- A statistically significant moderate positive relationship was observed between smartphone usage time and MoCA score ($r=0.530$, $p<0.05$).
- No statistically significant relationship was observed between smartphone usage time and BBS, 6MWT, and 5STS results ($r1=0.179$, $r2=0.203$, $r3=-0.331$, $p>0.05$), respectively.

When other measurement results evaluating physical performance were examined;

- A statistically significant moderate negative relationship was observed between 6MWT and 5STS results ($r=-0.601$, $p<0.05$).
- A statistically significant moderate positive relationship was observed between 6MWT and BBS scores ($r=0.534$, $p<0.05$).
- A statistically significant negative moderate relationship was detected between BBS and 5STS results ($r=-0.509$, $p<0.05$).

DISCUSSION AND CONCLUSION

Technology is an important tool in maintaining daily activities, eliminating physical and environmental barriers caused by aging, maintaining social relationships, helping the elderly live healthy, independent and safe, and improving their quality of life (Kalınkara and Sarı, 2018). The rapid advancement of technology can make it difficult for older individuals to keep up with and adopt. Elderly individuals often struggle to use many new technological products due to problems in their general physical condition and the decline in their cognitive abilities. In this study, we investigated the relationship between smartphone usage and physical and cognitive functions of elderly individuals living in nursing home.

The aging population has been growing, and with it, the need for appropriate technology to assist older adults in their daily lives. Smartphone use among older adults has been increasingly recognized as a means to provide social engagement, cognitive stimulation, and assistance with daily tasks (Charness and Boot, 2009). Nursing homes are perceived as an institution that takes shelter in the last stage of life, but where elderly individuals feel lonely and abandoned (Danış, 2009; Oktik et al, 2004). Elimina-

tion of this perception, raising the quality of life, developing the social relations network of the elderly will be possible with the use of protective and preventive gerontological services and communication technologies. In our study, the elderly indicated that their smartphone use was primarily for socialization. This was because their perception of their social situation was that they were isolated. They expressed that they used smartphones as a solution to their feelings of social isolation. Loneliness and social isolation are significant issues for older adults living in nursing homes (Cacioppo et al., 2014). Encouraging and supporting the use of smartphones by older adults in these settings could provide a means for maintaining social connections, accessing information, and enhancing their overall well-being. Increased usage and adoption rates are primarily attributed to the duration of use. Grewal and Sahni (2019) included 90 elderly individuals in their study and reported that their daily smartphone usage time ranged from 3 to 8 hours (Grewal and Sahni, 2019). In our study the average daily smartphone usage time was found to be 6.61±2.01 hours. This result was similar to the literature.

Smartphone use may provide an opportunity for these individuals to maintain social connections with friends, family, and caregivers through communication apps, such as messaging and video calls. The use of smartphones can facilitate the continuation of relationships and contribute to a sense of belonging among older adults (Chen & Schulz, 2016). Additionaly, based on the findings of our study, it was observed that older adults used their smartphones to solve puzzles and play games related to their hobbies, such as gardening, home decoration, and meal preparation. Indeed, our findings are consistent with the existing literature on older adults' use of smartphones and technology. Numerous studies have demonstrated that older adults can benefit from engaging with technology and using smartphones for pursuing hobbies (Charness and Boot, 2009; Mitzner et al., 2010; Heinz et al., 2013). Providing older adults with access to smartphone applications tailored to their interests and needs may have a positive impact on their overall well-being and quality of life. By engaging in activities they enjoy and find meaningful, older adults may experience a reduction in feelings of loneliness and isolation, particularly in nursing home settings (Preusse et al., 2017). It is important for nursing home staff and caregivers to recognize the value of smartphone use in promoting the well-being of older adults and to support their engagement with technology through training and assistance.

Cognitive decline is a common concern among older adults. Smartphones offer various applications that may help promote cognitive health and maintain cognitive abilities (Faisal et al., 2014). For example, puzzle games, memory exercises, and brain-training apps may provide mental stimulation and help slow cognitive decline among older adults living in nursing homes (Barnard et al., 2013). It reveals that these activities not only provide entertainment, but also contribute to maintaining cognitive function and promoting a sense of achievement among older adults (Charness and Boot, 2009). In a recent study investigating the cut-off values for the MoCA in elderly individuals without cognitive problems, scores were reported to range between 22 and 27 (Engedal et al., 2022). According to the results of our study, the cognitive functions of the participants were found to be similar to the liter-

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ature. Therefore, the relationship between cognitive function and smartphone usage duration is not surprising.

Smartphones can also aid older adults with daily tasks and activities. Applications that provide reminders for medication, appointment scheduling, and management of chronic health conditions can support older adults in managing their health and maintaining their independence (Preusse et al., 2017). Additionally, smartphones can offer access to information about health, news, and entertainment, catering to the diverse needs and interests of older adults living in nursing homes (Faisal et al., 2014). Contrary to the literature, our study found that elderly individuals did not frequently use their smartphones for healthcare services.

The barriers to older adults using mobile applications have been the subject of various studies. In one of these studies, 113 older adults aged between 65 and 85 stated that they did not want to use technology due to security and reliability issues, as well as the technology disrupting their lives (e.g., unwanted calls, advertisements) and being expensive (Mitzner et al., 2010). A review which to investigate the potential and barriers related to aging and information technology use made by Charness and Boot. They found that older adults are less likely to adopt new technologies compared to younger adults (Charness and Boot, 2009). Barriers to technology adoption among older adults include cognitive and physical limitations, lack of experience or familiarity with technology, and negative attitudes towards technology. The authors concluded that more research is needed to understand the factors that influence technology adoption among older adults and develop interventions to overcome the barriers they face. They also emphasized the importance of designing technology that is accessible and easy to use for older adults, considering their cognitive and physical abilities. In similar, Alvseike and Brønnick (2012) reported that age-related cognitive impairments and low self-efficacy significantly reduced the participants' ability to use technology (Alvseike and Brønnick, 2012). In a study conducted in 2015, the physical functions of individuals living in a nursing home with an average age of 84.4±4.9 years were evaluated using the 6MWT, BBS and 5STS, and their scores were found to be 290.6±110.7m, 46.9±5.8, and 15.9±7.9 seconds, respectively (Caballer et al., 2015). In our study, it was observed that the scores of the 6MWT test and BBS were better. This may be due to the lower average age of our sample (74.18±3.26 years). However, the worse results of the 5STS may be possible due to participants not being fully focused on the test. Therefore, the lack of relationship between smartphone use time and physical function may have resulted from this heterogeneity. Contrary to expectations, our study's results did not support the view that smartphone use time negatively affects physical function levels.

Designing mobile phone apps and features that address the needs and preferences of elderly users is crucial to promoting their digital inclusion and improving their quality of life according to other study. The authors have indicated that developers should consider the specific needs and limitations of elderly users when designing mobile phone applications and interfaces, ensuring that these tech-

nologies are accessible and user-friendly for this age group (Faisal et al. 2014). Heinz et al. (2013) investigated daily needs and challenges, advantages and disadvantages related to technology use, how technology could help, and ways to make technology easier to use with 30 older adults (average age 83). Participants appeared to be willing to adopt new technologies when they acknowledged the benefits and usability of technology and overcame feelings of inadequacy. However, they expressed some concerns about society's overdependence on technology, the loss of social contact, and the complexity of technological devices (Heinz et al., 2013). In our study, we consider that the elderly acceptance of technology was aided by the user-friendly feature of the smartphones they used, which did not contain complicated applications.

The adoption of technology and the use of mobile applications by older adults are influenced by numerous variables, including the characteristics of the technology (e.g., perceived complexity, level of novelty) and the user's characteristics (e.g., experience and personal traits) (Mitzner et al., 2010). In our study, it was observed that smartphone usage, which is directly affected by cognitive abilities of individuals living in nursing homes, plays a significant role in helping older adults cope with feelings of loneliness. We consider that ensuring the acceptance and effective use of technology by older individuals will contribute to maintaining their health.

In conclusion, this study found a significant positive relationship between smartphone usage time and cognitive functions, while no significant relationship was found between physical performance measurements and smartphone usage time. These findings suggest that elderly individuals can support their cognitive functions by using technology. Furthermore, we consider that following physical performance indicators that are crucial for maintaining independence level, reducing the risk of falls, and promoting an active lifestyle is essential for the elderly.

Limitations of the study include the only center, narrow age range and limited access to the social environment of the participants. Future studies can more comprehensively investigate relationship between cognitive and physical functions of elderly individuals and technology usage with a wider age range and multicenter. In addition, studies can also evaluate the effects of technology usage on social adaptation and quality of life in elderly individuals.

In our study, our suggestions about elderly individuals staying in nursing homes;

- Strengthening social networks, providing easier use of technological products, and facilitating adaptation to these products, so that individuals staying in nursing homes can cope with the feeling of loneliness, which is the most important problem.
- Diversifying physical activities in accordance with age groups,
- In accordance with today's communication age, it is necessary to establish infrastructures suitable for other communication and information technologies, especially smart phones.

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