Toward Technology Attitudinal Research among Iranian Older Adults: Are They Technophile or Technophobe?

ABSTRACT

Objective: Older adults' attitudes toward technology are a key determinant of its acceptance or rejection, directly impacting the effectiveness of health interventions. The present study aimed to investigate and measure older adults' attitudes toward technology and to examine factors associated with these attitudes among individuals attending comprehensive health centers in Iran.

Methods: In this cross-sectional study, 420 participants were selected using multi-stage random sampling. The P.TechPH scale was employed to assess both technophilia and technophobia. Data were analyzed using SPSS version 16.

Results: The mean TechPH score (3.59 ± 0.40) indicated generally positive technophilic attitudes among the participants. Higher levels of technophilia were observed in individuals aged 60–65, those with higher socioeconomic status, employed participants, and those with higher educational attainment. Daily Internet users and individuals with greater proficiency in using phones or tablets also exhibited significantly higher technophilia levels ($P < 0.05$).

Conclusion: These findings highlight the need for targeted interventions to foster positive attitudes toward technology among older adults, taking into account individual beliefs and relevant sociodemographic factors.

Keywords: Aging; Technology; Attitude; Technophobia; Technophilia.

Introduction

In the era of global ageing, digital technology is increasingly recognized as a promising tool for addressing many challenges associated with ageing, including declining physical and cognitive functions, multimorbidity, and changes in social networks [1]. One domain that seeks to respond to these challenges is gerontechnology, an interdisciplinary field that applies technology to support older adults' needs and enhance their quality of life. Within this field, humanoid robots—equipped with artificial intelligence and human-like features—have been identified as future technologies with the potential to support older adults and alleviate pressures in elder care [2].

More broadly, the use of information and communication technologies (ICT), such as computers, the Internet, and mobile phones, has become increasingly common among older adults in many countries [3]. As a result, engagement with online platforms now constitutes an integral part of daily life for many older adults [4]. In particular, mobile technologies offer considerable potential for healthcare applications. Mobile phones have been identified as a means of bridging the traditional digital divide by providing access to underserved populations worldwide, especially in developing countries [5].

Advances in communication technologies—especially Internet-based and mobile technologies—have demonstrated substantial potential for global health education, health monitoring, and the promotion of healthy behaviors [6]. For example, eHealth and mHealth interventions represent technological innovations that can effectively promote physical activity [7]. In addition, assistive technologies for older adult care, including video monitoring, remote health monitoring, sensors, and electronic devices, have been widely recognized for their ability to enhance care provision and support independent living [8]. Overall, technologies designed for older adult care aim to monitor, support, or improve daily activities, personal health and safety, mobility, communication, and physical activity [9].

Despite these opportunities, technology adoption among older adults remains uneven. While a substantial proportion of older adults express interest in learning about and using new digital technologies and perceive them as relevant to their daily lives [10], adoption rates remain lower than those observed in the general population, and digital skills are typically lower than among younger age groups [11]. Consequently, older adults are often subject to negative stereotypes, being perceived as less capable of using new technologies due to their age [12]. Such age-related stereotypes are reflected not only in policy and research but also in technology design and in individuals' decisions to adopt digital tools [10].

Commonly reported barriers to technology use among older adults include negative attitudes, lack of awareness, inappropriate design, high costs, low self-efficacy, limited perceived need, privacy concerns, and trust issues [13, 14]. As a result, older adults who do not engage with computers or Internet-based technologies are unable to benefit from their potential advantages [15]. Moreover, late adoption of digital technologies can further impair digital competence, particularly among individuals with misconceptions about technology or limited IT literacy [16]. Against this background of rapid technological development, emerging technologies not only offer new opportunities and conveniences but may also alter behavioral norms and evoke emotional responses such as anxiety, fear, and sadness. These emotional responses have contributed to the emergence of two opposing concepts: technophobia and technophilia [17].

Technophilia and Technophobia

Although technophilia lacks a universally accepted definition [18], it is generally understood as an attraction to and enthusiasm for using technology, particularly new technologies such as personal computers, the Internet, mobile phones, and other digital devices [19, 20]. First introduced in the 1960s [20], technophilia reflects an individual's overall relationship with technology and influences acceptance, persistence, and perceived outcomes of technology use [21]. Technophilic individuals typically engage positively with most technologies, adopt new tools enthusiastically, and view technological development as a means to improve living conditions and address societal challenges [20]. They tend to enjoy using technology, maintain positive attitudes towards adoption, and focus on its personal benefits [22], without fearing broader societal consequences [20].

In contrast, technophobia refers to an irrational fear or anxiety associated with the use of technology [20, 22, 23]. This concept encompasses two dimensions: fear of the societal and environmental impacts of technological advancement and fear of using technological devices, such as computers and advanced tools [20]. Technophobia is characterized by unpleasant emotions, including anxiety, fear, and aversion to modern technologies such as computers, robots, artificial intelligence, and other digital devices [16, 17]. As a psychological orientation towards technology, technophobia can inhibit

technology use and limit individuals' ability to benefit from technological innovations [20, 22]. Technophobic individuals often resist adopting new technologies due to fear, thereby restricting their engagement with digital opportunities [22, 24].

Empirical research on the measurement of technophilia and technophobia remains limited. One notable contribution by Anderberg et al. (2019) involved the development of a concise instrument to assess attitudes towards technology among Swedish older adults. This tool captures two dimensions—technophilia and technophobia—using a scoring range from 1 to 5 [21]. Conceptually, individuals' attitudes towards technology can be positioned along a continuum, ranging from fully positive to fully negative (See Fig. 1).

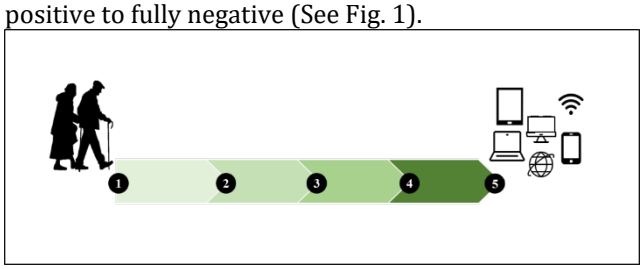

Fig. 1 TechPH Continuum Scheme

Older adults are frequently stereotyped as technophobic, less capable, and less willing to adopt new digital technologies [10]. However, the assumption that technophobia is limited to older populations has long been challenged [20]. In the context of technology use, internalized negative age-related stereotypes—such as the belief that older adults lack sufficient technological skills [12] —may contribute to technophobia, anxiety, and generally negative attitudes towards technology [25, 26]. Older adults without prior computer experience are particularly likely to report concerns and fears related to technology use [27]. Furthermore, age-related declines in sensory and cognitive functioning may increase perceptions of technological complexity and effort, thereby heightening anxiety [12].

Technophobia may have adverse consequences for older adults' well-being by limiting participation in social and digital activities [3, 25]. Nevertheless, intervention studies targeting older adults have demonstrated that technophobia can be reduced through self-education, mentoring, collaborative learning, and intergenerational support, with self-efficacy increasing as individuals gain hands-on experience with technology [12].

To effectively implement and evaluate technologies for older adults, it is essential to assess their attitudes towards technology, as these attitudes strongly influence acceptance or rejection and, consequently, the effectiveness of technology-based health interventions. This understanding is particularly important given the limited empirical evidence in the global literature. For instance, Mitzner et al. (2017) reported that gender, prior technology experience, technology efficacy, and self-efficacy significantly influenced technology acceptance and predicted long-term use among older adults [15]. Schlomann et al. (2022) further emphasized the value of multidimensional measures of views on ageing (VoA) in understanding the relationship between ageing experiences and technology acceptance [11]. Similarly, Berner et al. (2015) found that rural residence, education level, and age influenced Internet use among Swedish adults aged 65 and older, highlighting the risk of digital exclusion in an increasingly digital society [28]. Nimrod (2018) also identified technophobia as a potential risk factor for reduced online engagement and lower life satisfaction among older adults [29].

Despite growing adoption of digital technologies among older adults, a substantial knowledge gap remains regarding attitudes towards technology in the Iranian context. Understanding these attitudes is crucial, as negative perceptions—such as technophobia—may hinder engagement with digital activities, limit potential benefits, and adversely affect overall well-being. Given Iran's rapidly ageing population and the increasing integration of digital technologies into social interaction, health management, and everyday life, examining older adults' attitudes towards technology is both timely and necessary. Therefore, this study aimed to investigate and measure older adults' attitudes towards technology and to examine factors associated with these attitudes among individuals attending comprehensive health centers in Iran. By providing a clearer profile of this population, the findings may inform population-based planning and support the development of targeted, culturally sensitive interventions.

Methods

Study Design & Population

This cross-sectional study was conducted among older adults affiliated with three headquarters of the Shahid Beheshti University of Medical Sciences, which were used as strata in the sampling process. Each headquarters, serving as a central administrative unit, oversees multiple comprehensive health service centers within its geographic area. To determine an appropriate sample size, the standard deviation (σ) value was set at 0.4 based on pilot study result. Using a 5% margin of error, a 95% confidence level, and accounting for a 10% anticipated dropout rate, the Cochran formula was applied, yielding an estimated sample size of approximately 420 participants.

$$n = \frac{z^2_{1-\alpha/2}\ \sigma^2}{\sigma^2} \cong 420$$

Participants were recruited using a multistage random sampling procedure. In the first stage, three headquarters North, East, and Shemiranat overseen by the Shahid Beheshti University of Medical Sciences were selected as strata from the seven existing headquarters in Tehran. These strata included 23, 21, and 8 comprehensive health service centers, respectively. In the second stage, the centers affiliated with each selected headquarters were treated as clusters. A full list of centers for each headquarters was made, and each one was given a unique ID number. Clusters were then randomly drawn using a lottery method, resulting in 14 selected centers: seven from the North headquarters, five from the East, and two from the Shemiranat. In the third stage, the populations served by these centers were identified through the Integrated Health System (SIB). From each center, approximately 30 eligible older adults were selected using systematic random sampling based on their existing medical record numbers and were subsequently enrolled in the study (See Figure 2).

Participants were invited to take part in the study based on the following criteria: willingness to participate, being an Iranian national, age 60 years or older, literacy and the ability to complete the questionnaire, having a household file at a comprehensive health service center, and absence of cognitive impairment at the time of the study. Questionnaires that were incomplete were considered as withdrawals. A total of 25 older adults submitted incomplete questionnaires due to reasons such as rushing, refusal to cooperate, fatigue, or the insistence of a companion to leave the center. These participants were subsequently replaced by an equal number of individuals meeting the inclusion criteria.

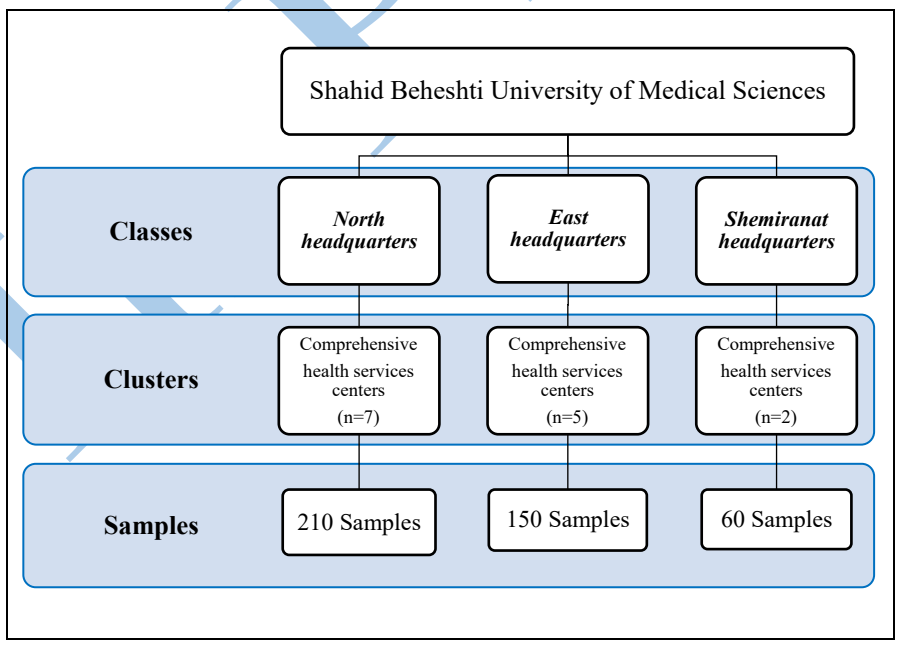

Fig. 2 Sampling Process Flowchart

Study Measures

Data were collected using a two-part questionnaire. The first part gathered demographic and background information, including age, gender, education level, marital status, employment status, economic status, number of children, frequency of Internet use, self-assessed technological proficiency, and family structure. The second part employed the TechPH scale, developed and validated by Anderberg et al. (2019) in Sweden to assess older adults' attitudes toward technology.

The scale comprises six items and measures two primary dimensions: technophilia (items 1–3) and technophobia (items 4–6). The scale demonstrated acceptable internal consistency, with Cronbach's alpha values of 0.72 and 0.68, respectively. Responses are recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with technophobia items scored in reverse [21]. The validity of the scale for the Iranian older adult population was confirmed in a 2024 study using translation, face, content, and construct validity methods. The reliability of the Iranian version, assessed via intraclass correlation coefficient (ICC) and internal consistency (Cronbach's alpha), was reported as 0.85 and 0.77, respectively [30].

Data Analysis

After the older participants completed the questionnaires, the data were coded and analyzed using SPSS software, version 16 [31]. The distribution of the data was evaluated by examining skewness and kurtosis to assess normality. Frequency distribution tables were generated, and group differences were analyzed using ANOVA and independent-samples t-tests.

Results

Participant Characteristics A total of 420 older adults participated in this study. As detailed in Table 1, the demographic profile was characterized by a predominance of participants aged 65–69 years (40%), those who were married (76%), and those currently unemployed (67.6%). Internet use was notably prevalent among the sample, with 283 participants (67.4%) reporting daily usage. Furthermore, while the majority utilized technology regularly, nearly half of the participants (42.1%) self-assessed their proficiency with tablets and smartphones as average (Figures 3 and 4).

Table 1 Demographic characteristics of the samples

Variables	Subgroup	N (%)
Age	60-64	146 (34.8)
	65-69	168 (40.0)
	70 & more	106 (25.2)
Gender	Male	222 (52.9)
	Female	198 (47.1)
Marital Status	Have spouse	319 (76.0)
	Have no spouse	101 (24.0)
Number of children	0	27 (6.4)
	1	49 (11.7)
	2	105 (25.0)
	3	157 (37.4)
	4	82 (19.5)
Education level	Under Diploma	78 (18.6)
	Diploma	139 (33.1)
	Academic	203 (48.3)
Employment status	Employed	136 (32.4)
	Non-Employed	284 (67.6)
Economic status	Weak	32 (7.6)
	Average	262 (62.4)
	Good	126 (30.0)
Who do you live with?	lone	48 (11.42)
	With spouse	173 (41.2)
	With children	37 (8.8)
	With spouse and children	140 (33.33)
	With Nurse and others	22 (5.25)

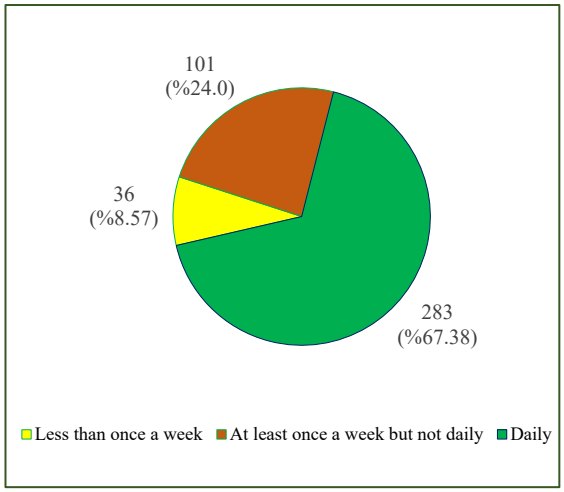

Fig. 3 Internet usage frequency pie chart

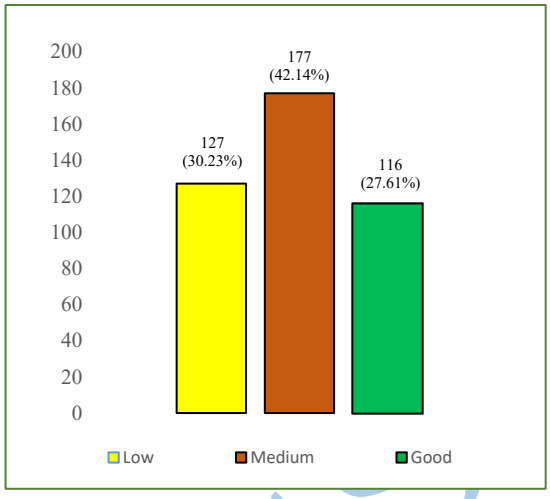

Fig. 4 Technological skill frequency bar diagram

Attitudes Toward Technology (TechPH Index) The overall mean TechPH score was 3.59 ± 0.4, which, on a scale of 1 to 5, indicates a moderately favorable attitude toward technology among the participants. However, analysis of individual items within the index revealed specific challenges. For instance, a significant majority (73.6%) fully agreed that the rapid pace of technological progress is difficult to keep up with, representing the highest frequency of agreement. Conversely, the statement regarding the need for additional support to try new gadgets received the highest frequency of "fully disagree" responses (25%) (Table 2).

Table 2 Mean and standard deviation of the TechPH and responses' frequencies

	Median	**Mean (SD)**	**Min**	**Max**	**Score Range**
TechPH Index	3.66	3.59 (0.4)	2.5	4.8	1-5
Technophilia and Technophobia Items	**Fully agree N (%)**	**Agree N (%)**	**No idea N (%)**	**Disagree N (%)**	**Fully disagree N (%)**
1. I think it's fun with new technological gadgets.	129 (30.7)	216 (51.4)	10 (2.4)	56 (13.3)	9 (2.1)
2. Using technology makes life easier for me.	209 (49.8)	170 (40.5)	7 (1.7)	29 (6.9)	5 (1.2)
3. I like to acquire the latest models or update.	84 (20.0)	115 (27.4)	16 (3.8)	148 (35.2)	57 (13.6)
4. I am sometimes afraid of not being able to use the new technical things.	12 (2.9)	148 (35.2)	75 (17.9)	153 (36.4)	32 (7.6)
5. Today, the technological progress is so fast that it's hard for me to keep up.	309 (73.6)	101 (24.0)	6 (1.4)	4 (1.0)	0 (0)
6. I would have dared to try new technical gadgets to a greater extent if I had had more support and help than I have today.	45 (10.7)	93 (22.1)	47 (11.2)	130 (31.0)	105 (25.0)

Factors Associated with TechPH Index The inferential analysis, detailed in Table 3, identified several significant predictors of technophilia. Age and education level played crucial roles, as younger participants (60–64 years) and those with higher educational attainment exhibited significantly higher TechPH scores ($P = 0.001$ and $P = 0.020$, respectively). Socioeconomic factors also showed a positive correlation, with both employment and higher economic status being significantly associated with more favorable attitudes ($P < 0.05$). Furthermore, digital experience was a strong predictor; daily internet users and those with higher self-reported technical proficiency

demonstrated significantly higher technophilia (P = 0.001, f^2 = 0.08). In contrast, demographic variables such as gender, marital status, and family structure did not show any statistically significant relationship with TechPH scores (P > 0.05).

Table 3 Mean and standard deviation of TechPH index by demographic characteristics, internet usage, and technological skill

Variables	Subgroup	TechPH index Mean (SD)	t-test t	Sig.	Effect Sizes [a]	95% Confidence Intervals
Gender	Male	3.57 (0.39)	-0.703	0.483	0.40	-0.26 – 0.12
	Female	3.60 (0.40)				
Marital status	Have spouse	3.60 (0.38)	-1.346	0.179	0.40	-0.38 – 0.70
	Have no spouse	3.54 (0.42)				
Employment status	Employed	3.65 (0.33)	2.360	0.019	0.40	0.04 – 0.45
	Non-Employed	3.55 (0.41)				
Variables	**Subgroup**	**TechPH index Mean (SD)**	**ANOVA F**	**Sig.**	**Effect Sizes [b]**	**95% Confidence Intervals**
Age	60-64	3.72 (0.32)	16.815	0.001	0.08	0.03 – 0.12
	65-69	3.54 (0.40)				
	70 & more	3.46 (0.41)				
Number of children	0	3.64 (0.38)	8.309	0.001	0.07	0.03 – 0.12
	1	3.69 (0.40)				
	2	3.70 (0.36)				
	3	3.55 (0.380)				
	4	3.41 (0.382)				
Education level	Under Diploma	3.47 (0.44)	3.311	0.020	0.02	0.00 – 0.05
	Diploma	3.58 (0.40)				
	Academic	3.63 (0.35)				
Economic status	Weak	3.40 (0.46)	4.937	0.008	0.02	0.00 – 0.03
	Average	3.58 (0.39)				
	Good	3.64 (0.35)				
Who do you live with?	Lone	3.58 (0.41)	0.770	0.545	0.02	0.00 – 0.02

	With spouse	3.57 (0.38)				
	With children	3.54 (0.46)				
	With spouse and children	3.63 (0.36)				
	Nurse and others	3.55 (0.38)				
Internet use frequency	Less than once a week	3.27 (0.46)	17.221	0.001	0.08	0.03 – 0.13
	At least once a week but not daily	3.54 (0.38)				
	Daily	3.64 (0.36)				
Self-assessed technological skill	Low	3.44 (0.39)	14.623	0.001	0.07	0.03 – 0.11
	Medium	3.64 (0.40)				
	Good	3.66 (0.30)				

[a] *The denominator used in estimating the effect sizes. Cohen's d uses the pooled standard deviation*

[b] *Eta-squared and Epsilon-squared are estimated based on the fixed-effect model*

Discussion

This study examined older adults' attitudes towards technology in Iran and explored sociodemographic and technology-related factors associated with these attitudes, as measured by the TechPH index. Overall, participants demonstrated a moderately positive attitude towards technology (mean TechPH = 3.59 ± 0.40). Higher levels of technophilia were observed among younger older adults (aged 60–64 years), individuals with higher educational attainment, those who were employed, participants with higher economic status, daily Internet users, and those reporting greater technological proficiency. Together, these findings provide a clearer profile of older adults' attitudes towards technology in the Iranian context and identify key factors that may inform the development of targeted and culturally appropriate interventions.

Principal findings and comparison with prior work

The average TechPH score observed in this study indicates a relatively favorable attitude towards technology among the surveyed older adults. This finding is broadly comparable to the results reported by Anderberg et al. (2019), who found a mean technophilia score of 3.01 ± 0.86 [21]. The similarity between these findings suggests that older adults in Iran, like their counterparts in other settings, demonstrate moderate openness towards digital technologies. At the same time, the results point to considerable potential for further improvement through structured exposure, training, and supportive interventions aimed at enhancing digital engagement.

Gender was not significantly associated with the TechPH index in the present study. This finding contrasts with Anderberg et al. (2019), who reported higher levels of technophilia among men [21], and with Berner et al. (2015), who found male gender to be positively associated with Internet use among older Swedish adults [28]. Such discrepancies may reflect sociocultural differences in gender roles, access to technology, and perceived relevance of digital tools across contexts. These findings suggest that gender-related patterns of technology engagement in later life are not universal but are shaped by broader social and cultural environments.

Age emerged as a significant determinant of technophilia, with younger segments of the older adult population exhibiting more positive attitudes towards technology. This finding is consistent with previous research by Anderberg et al. (2019) and Berner et al. (2015), who observed a gradual decline in Internet use with increasing age [21, 28]. Their work highlights that even small increases in age may correspond to meaningful reductions in digital engagement, potentially due to age-related changes in cognitive functioning, confidence, perceived usefulness, and prior exposure to technology. These results underscore the importance of early engagement and continuous support as individuals transition into later life.

With regard to marital and employment status, technophilia was not associated with marital status but showed a significant relationship with employment. Although the relationship between technophilia and these variables has received limited attention in previous studies, employment may facilitate more positive attitudes towards technology by increasing opportunities for social participation, routine exposure to digital systems, and practical use of technology in occupational settings. Such experiences may help maintain digital skills and foster confidence, even in later life.

Educational attainment demonstrated a strong and significant association with technophilia, supporting earlier findings by Anderberg et al. (2019) [21]. Similarly, Berner et al. (2015) reported that higher education was positively associated with Internet use [28], while Nimrod (2018) found higher levels of technophobia among individuals with fewer years of education [29]. Collectively, these findings suggest that education plays a critical role in shaping digital literacy, perceived competence, and attitudes towards technology, potentially reducing anxiety and resistance to technological adoption.

Economic status also emerged as an important factor associated with technophilia. Older adults with higher economic status reported more positive attitudes towards technology, which may be explained by greater access to digital devices, increased purchasing power, and the ability to participate in training or learning opportunities. These resources may create a reinforcing cycle in which familiarity and competence reduce anxiety and promote more favorable perceptions of technology.

In addition, both technical skills and frequency of Internet use were positively associated with the TechPH index. Consistent with Anderberg et al. (2019), older adults who used the Internet daily and reported higher levels of proficiency with digital devices such as mobile phones and tablets exhibited more positive attitudes towards technology [21]. Regular interaction with digital tools may enhance confidence and perceived control, thereby reducing fear and uncertainty and reinforcing technophilic orientations.

Overall, the relatively high level of technophilia observed among older adults in this Iranian sample is encouraging. Nevertheless, these findings should be interpreted with caution and within an evidence-based framework, recognizing that attitudes towards technology are shaped by a complex interplay of demographic, educational, socioeconomic, and experiential factors. A more nuanced understanding of these determinants may support the design of targeted interventions and tailored educational programs, ultimately enabling older adults to engage more confidently and effectively with an increasingly digital society.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, characteristics of the target population and the data collection method may have influenced the results. Some older adult participants may have experienced difficulties with reading, vision, or responding to questionnaire items due to age-related sensory or visual impairments. These challenges may have affected how participants understood questions or expressed their attitudes towards technology. Second, the use of self-report questionnaires represents an inherent limitation. Self-reported data are susceptible to response bias, including social desirability bias, whereby participants may provide responses they perceive as favorable rather than entirely accurate. In addition, respondents with lower general literacy levels or limited familiarity with digital technologies may have misinterpreted certain questions, potentially affecting the reliability of their responses. Participants' mood or situational factors at the time of data collection—such as fatigue, stress, or reduced motivation—may also have influenced their answers.

Furthermore, self-report measures limit the researcher's ability to clarify participants' interpretations or probe more deeply into their experiences and attitudes. As a result, the data may not fully capture actual behaviors, knowledge, or nuanced attitudes towards technology. External contextual factors, including the quality, availability, and accessibility of technological resources, as well as restrictions on their use, may also have influenced older adults' attitudes. In addition, social stigma associated with technology use in later life may have reduced some individuals' willingness to engage fully or respond openly. Another limitation relates to the scope of measurement. The instrument used in this study primarily assessed general attitudes towards technology. More specific or technology-focused measurement tools may be required to generate deeper insights into attitudes towards particular digital technologies or applications relevant to older adults.

Finally, participants were recruited from comprehensive health centers, which may have introduced selection bias. Older adults with lower health literacy, limited mobility, or less frequent contact with

healthcare services may have been underrepresented. Consequently, the sample may disproportionately reflect individuals who are more proactive about their health or have better access to primary care services. This limitation may restrict the external validity and generalizability of the findings, particularly to older adults who are less connected to the healthcare system. Future research would benefit from employing community-based or mixed recruitment strategies to ensure broader representation.

Conclusions

This study, among the first of its kind in Iran, provides policymakers, planners, and practitioners with a clearer and more nuanced understanding of older adults' attitudes towards technology. The findings indicate that, overall, older adults demonstrate a relatively positive and technophilic orientation, as reflected by the TechPH index. Although these results suggest a generally favorable baseline attitude, they also highlight the need for targeted and practical strategies to further strengthen engagement with digital technologies among this population.

Interventions aimed at enhancing digital inclusion among older adults should priorities accessibility, confidence-building, and sustained support. In-person or offline digital literacy programs tailored to older adults' needs, as well as intergenerational initiatives in which younger family members or volunteers provide guidance, may be particularly effective. Skills-based workshops that focus on improving confidence and practical competence can further support meaningful technology use. In addition, peer-based support groups may help older adults share experiences, address challenges, and maintain motivation, thereby fostering longer-term engagement.

From a broader perspective, the findings underscore the importance of age-friendly technology design. Developers and industry stakeholders should priorities intuitive interfaces, high usability, and inclusive design principles to reduce barriers to adoption and mitigate technophobia. By translating these insights into concrete policies, programs, and design practices, stakeholders can promote technology acceptance and support older adults' active participation in an increasingly digital society.