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Socioeconomic differences in older adults' intention to use mhealth applications

Floris van Elburg^{1*}, Anna Petra Nieboer¹ and Marjan Askari¹

Abstract

Background Older adults with lower socioeconomic status (SES) are most affected by chronic diseases and in need of effective interventions to manage their conditions. Despite the proven benefits of mobile health (mHealth) in chronic disease management, the stimulation of mHealth adoption among people with lower SES is challenging. Such socioeconomic differences have not been investigated among older adults. The aims of this study were to identify factors associated with mHealth acceptance among older adults in the Netherlands with low and non-low SES, and to determine whether the influences of these factors differ between socioeconomic groups.

Methods This cross-sectional study was performed using a questionnaire based on technology acceptance model (TAM) factors. The participants were aged ≥ 65 years, lived independently or in senior living facilities, and had no cognitive impairment. Associations between average TAM factor scores and respondents' intention to use mHealth applications were analyzed separately for low- and non-low-SES groups using controlled multivariable logistic regression. Models including interaction terms were then computed to investigate differences between groups.

Results The sample comprised 360 respondents (mean age, 74.9 ± 7.0 years). Scores for the eight TAM factors were significantly lower in the low-SES group than in the non-low-SES group, indicating that it is more difficult to motivate the former to use mHealth. All factors except feelings of anxiety and social relationships were associated significantly with the use intention in the low-SES group, and all factors showed significant associations in the non-low SES group. The models including interaction terms showed that perceived usefulness, perceived ease of use, and service availability had significantly stronger relationships with the intention to use mHealth in the non-low SES group than in the low-SES group.

Conclusion This study revealed differences in the associations of TAM factors with the intention to use mHealth applications between older adults with low and non-low SES. A stronger and more comprehensive approach is needed to stimulate mHealth adoption among low-SES older adults. Policy development with the consideration of specific TAM factors will increase mHealth adoption among older adults. To reduce health disparities, policies should be tailored to older adults' needs.

Keywords Technology acceptance model, Intention to use, Older adult, Socioeconomic status, mHealth

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Introduction

In 2024, approximately 10.9 million people in the Netherlands (60% of the population) were living with one or more chronic conditions. Among these individuals, 6.1 million (34%) had two or more chronic conditions, a phenomenon commonly referred to as multimorbidity [1]. The global population of adults aged 65 and older is projected to triple, rising from 562 million in 2012 to 1.6 billion by 2050, and will represent 16.7% of the world's population [2]. With populational aging in the Netherlands, the prevalence of people with one or more chronic diseases is increasing; 85% of Dutch older adults have at least one chronic condition [3]. Socioeconomic status (SES), commonly defined in health-related research as a combination of income and education level, is associated with chronic disease prevalence and mortality [4–12]. The risk of chronic disease development is twice as high for Dutch older adults with lower SES than for those with higher SES [13]. Moreover, Dutch adults with low SES have less knowledge about their conditions, and have more difficulty managing them and following therapeutic regimens [14]. To reduce disparities in health among socioeconomic groups, the ability of those who are at a disadvantage to use (digital) health interventions is crucial [15, 16].

Mobile health (mHealth) has been proven to contribute to the treatment and management of chronic diseases [17, 18]. The World Health Organization has defined mHealth as “the use of mobile wireless technologies for public health,” and stated that “mHealth has been shown to improve the quality and coverage of care, increase access to health information, services and skills, as well as promote positive changes in health behaviours to prevent the onset of acute and chronic diseases” [19]. mHealth applications have also been promised to overcome socioeconomic barriers [20, 21], and their implementation is believed to improve healthcare quality and accessibility for groups with low SES [22, 23]. For this reason, the implementation of digital applications has been an important pillar of the development of policies related to the treatment of chronic diseases in the Netherlands [14, 24]. Concordantly, the Dutch government invests in digital health applications to stimulate remote care [25], and the numbers of digital innovations and services introduced in healthcare are increasing rapidly [14].

Despite the versatility of mHealth applications and the governmental stimulation of their implementation, the rate of mHealth use among older adults remains low [26–29]. People with low SES are also less likely to use mHealth, although this disparity has not been studied in the older adult population [15, 30–37]. This research gap is problematic, as older adults with low SES are most vulnerable and are often most in need of effective interventions to manage their chronic diseases [22]. To develop

effective interventions for people with low SES, a better understanding of disparities in mHealth adoption among older adults from different socioeconomic classes is needed.

To investigate how to enable the use of mHealth among older adults with low SES, we applied the extended technology acceptance model (TAM) in this study. The TAM, introduced in 1989 by Davis [38], states that technology adoption can be predicted solely by one's intention to use that specific technology, which in turn is influenced by the technology's perceived usefulness and ease of use. It has been modified to better fit the context of health technology adoption, with the addition of other factors that influence the intention to use [17, 39–43]. The TAM has been used widely to study mHealth adoption in the general population [44–46] and among older adults [27, 29, 40, 47, 48]. However, evidence for the intention to use mHealth in low-SES populations is limited. In the general population, higher perceived usefulness has been found to be an important factor for health application use; when present, low- and high-SES groups are equally likely to use health technologies [36]. Furthermore, the intention to use mHealth among people with low SES was found to be influenced more by social networks than it is that among people with high SES [36]. Additionally, people with lower socioeconomic backgrounds have been found to feel more anxiety about the use of digital health technology, and to be more reluctant to use it [33].

Although these studies provide evidence on important factors for technology acceptance among different socioeconomic groups in the general population, no research has explored socioeconomic differences in the relationships between technology acceptance factors and the intention to use mHealth specifically among older adults. Thus, this study was performed to investigate differences between socioeconomic groups in factors influencing the intention to use mHealth applications in a large sample of older adults in the Netherlands. The aims were to identify the most important factors for mHealth use among older adults with low and non-low SES, and differences between these groups in the associations of technology acceptance factors with the intention to use mHealth.

Methods

Study design and data collection

Data were collected through the distribution of a questionnaire among Dutch older adults between January 1st and June 1st 2020. The study cohort consisted of participants aged 65 and older, free of cognitive impairments and living either independently or in senior living facilities. Participants were recruited through multiple channels, including these living facilities, healthcare organizations (a hospital, general practitioners, and a home care organization), leisure activity clubs for older

adults, and social media platforms in different regions in the Netherlands. The data have mainly been collected in the regions of Noord-Brabant, Utrecht, and Zuid-Holland. To enhance accessibility and encourage participation, the questionnaire was made available in both paper and digital formats". The questionnaire was validated by a geriatric nurse, a diversity expert, and two eHealth experts and is available upon request. In addition, we collected feedback from four older adults to improve the questionnaire's readability. The reporting of the online questionnaire follows the Checklist for Reporting Results of Internet E-Surveys (Multimedia Appendix 1).

The participants were informed of the purpose of the study, the names of the main researchers, sources of assistance, how to fill in the questionnaire, what mHealth applications are (with multiple examples), how their data would be managed, and how their privacy would be safeguarded. Data assistants provided any assistance or additional information that participants needed by telephone or email, or in person. The online questionnaires were filled in anonymously. All respondents provided written informed consent, and the study was approved by the Medical Ethics Commission of the Erasmus University Medical Center (MEC-2018-120).

The data were entered into an SPSS database (IBM Corporation, Armonk, NY, USA). Their representativeness of the general older adult population in the Netherlands was checked by comparison with data from Statistics Netherlands. To increase external validity, the data assistants collected data in different regions of the Netherlands.

Measurement of variables

Demographic data, including age and gender, were collected, along with information on health literacy, prior internet use, and prior experience with medical apps. The latter three variables were measured as binary (yes/no) responses.

Independent variables

The examination of differences between SES groups in the intention to use mHealth applications was based on factors from an adapted version of the TAM, used previously to study the intention to use mHealth in older adult populations [26–28, 48]. The TAM posits that perceived usefulness and perceived ease of use are central determinants of individuals' intention to use, and subsequent adoption of, a technological system [37, 39]. In addition, several constructs were incorporated from the Senior Technology Acceptance Model (STAM) [40], from which STAM is derived. Furthermore, acceptance factors specific to the use of medical applications among older adults were identified from the literature and included in the model. We included the following factors as independent variables: perceived ease of use (four statements,

e.g., "It is easy to use medical applications for remote care"), perceived usefulness (three statements, e.g., "I find it useful to use medical applications for remote care"), attitude toward use (four statements, e.g., "Using medical applications for remote care would be a good idea"), and subjective norms (three statements, e.g., "People who are important to me think I should use medical applications for remote care"). We also adopted the following factors that are specific to older adults: sense of control (two statements, e.g., "I have resources, knowledge and ability to use medical applications for remote care"), anxiety toward use (two statements, e.g., "I hesitate to use medical applications for remote care for fear of making mistakes that I cannot correct"), personal innovativeness (four statements, e.g., "I like to experiment with new information technology"), social relationships (three statements, e.g., "I am satisfied with the support of my family and friends"), perceived effectiveness of use (two statements, e.g., "I could perform a task on a medical application if I only had the manual"), service availability (three statements, e.g., "I have the ability to use medical applications for remote care anytime, anywhere"), and facilitating circumstances (five statements, e.g., "I have the knowledge needed to use medical applications"). Full descriptions of the TAM factors can be found in Appendix 2. Responses were provided on a 5-point Likert scale (1 = completely disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = completely agree).

For each TAM factor, an average score was calculated and used in the analysis.

Dependent variables

Given that the intention to use can be seen as the primary determinant of technology use [37], this intention served as the outcome variable in this study. It was measured using three statements (e.g., "Assuming I have access to medical applications for remote care, I plan to use them") to which responses were provided on a 5-point Likert scale. The mean score was calculated, and for ease of interpretation the outcome variable was dichotomized, with an average score of 3 or higher coded as 1 (indicating intention to use).

The SES factor was composed of respondents' income and education level. Eight levels of educational attainment were distinguished, ranging from no formal education to university education. Income was measured as the net monthly household income on a 5-point ordinal scale ranging from "less than 1000" to "more than 3500" euros. Education and income were transformed into binary variables. The threshold for low income was set at 1750 euros based on the national standard [49]. Of the three educational levels defined by Statistics Netherlands, the middle and high levels were combined, resulting in the categories of lower (up to senior general secondary) education

and higher (senior general secondary and/or higher) education [50]. The low-SES group consisted of respondents assigned to the low-income and low-education groups.

Control variables

The control variables included in the multivariable regression models were: age, sex, Assessment of Activities of Daily Living, Self-care and Independence (ADL) score [50, 51], number everything accordingly and quality of life. For the ADL measure, participants self-rated the assistance they required for 16 skills essential for the management of basic needs. The total score was the sum of all activities for which no help was needed, with lower scores reflecting greater need for help with self-care. The quality of life was measured as self-reported satisfaction with life on a 1–10 scale.

The control variables were selected based on expert opinion and significant associations with the intention to use mHealth applications in a univariable regression analysis. Multicollinearity was examined using a correlation matrix. Items with values representing correlation with other items of >0.5 or <-0.5 were removed. In the regression analyses, responses with missing values for any TAM or control variable were deleted listwise.

Statistical analyses

Frequency distributions and descriptive statistics were computed to analyze the population characteristics.

Table 1 Population characteristics

Characteristics	Total population (<i>N</i> = 360)
Age in years, mean (SD)	74.9 (7.0)
Socioeconomic status (low), no. (%)	106 (29.4)
Gender (female), no. (%)	205 (56.9)
Marital status, no. (%)	
Married	189 (52.9)
Divorced	51 (14.3)
Widowed	87 (24.4)
Never married	22 (6.2)
Sustainable cohabitation	8 (2.2)
Living arrangement, no. (%)	
Living independently, alone	126 (35.5)
Living independently, with other	160 (45.1)
Senior living facility, alone	34 (9.6)
Senior living facility, with other	35 (9.9)
Health literacy, no. (%)	
Adequate	293 (85.7)
ADL score, mean (SD)	14.7 (2.3)
Quality of life (0–10), mean (SD)	7.6 (1.2)
Prior experience with internet, no. (%)	306 (85.2)
Prior experience with medical apps, no. (%)	58 (16.2)
Intention to use mobile medical apps, no. (%)	181 (50.3)

SD Standard deviation

Means and standard deviations (SDs) were calculated for continuous variables, and percentages were calculated for categorical variables. To identify important technology acceptance factors for mHealth use in the two SES groups, we examined between-group differences in average factors scores using independent-sample *t* tests. Additionally, multivariable logistic regression analyses in which the TAM factors and selected control variables served as independent variables and the intention to use served as the dependent variable were conducted separately for the low- and non-low-SES groups. For each factor, the odds ratio (OR), β coefficient, *P* value, and standard error (SE) are reported.

To determine whether associations between TAM factors and the intention to use mHealth applications differed between SES groups, an additional regression model that included an interaction term was generated for each TAM factor. The inclusion of the interaction term (a function of the factor and SES) allowed the slopes of the independent variables to change as a function of SES. β coefficients, *P* values, and SEs for the interaction terms are reported. All statistical analyses were performed using SPSS (version 25; IBM Corporation).

Results

Population characteristics

The population characteristics are shown in Table 1. The population consisted of 360 respondents with an average age of 74.9 (SD = 7.0) years. More than half (56.9%) of the respondents were female. One hundred six (29.4%) respondents had low SES. Whereas 85.2% of the population had prior internet experience, only 16.2% had prior experience with medical applications. About half (50.3%) of the participants indicated that they had the intention to use medical applications.

Mean factor scores

Mean TAM factor scores are presented in Table 2. Relative to older adults with non-low SES, those with low SES had less-positive attitudes toward the use of mHealth applications (P 0.030), less perceived ease of use (P 0.007) and control over the applications (P 0.015), and less perceived ability to use them to accomplish particular jobs or tasks (self-perceived effectiveness) (P < 0.001). They also experienced less service availability and application accessibility (P 0.024) and fewer circumstances facilitating mHealth use (P 0.049), and had a lesser tendency to innovate (P 0.001) and more anxiety toward mHealth technology (P < 0.001). No significant difference was found in the extent to which the respondents perceived mHealth applications to be useful, their satisfaction with support from friends and family, or the subjective norms imposed by their social relationships regarding mHealth application use.

Table 2 Average TAM factor scores by SES group

Perceived usefulness	Low SES, mean (SD)	Non-low SES, mean (SD)	P- value
	3.05 (1.02)	3.25 (0.98)	0.112
Perceived ease of use	2.83 (1.02)	3.15 (0.91)	0.007
Attitude towards use	3.06 (0.96)	3.32 (0.96)	0.030
Subjective norm	2.55 (1.06)	2.38 (0.99)	0.174
Sense of control	2.72 (1.08)	3.05 (1.09)	0.015
Feelings of anxiety (digital health anxiety)	3.29 (0.99)	2.49 (0.98)	<0.001
Personal innovativeness	2.35 (1.04)	2.76 (1.02)	0.001
Social relationships	3.98 (0.62)	4.07 (0.65)	0.242
Self-perceived effectiveness	2.93 (1.04)	3.39 (0.92)	<0.001
Service availability	2.77 (1.02)	3.05 (0.91)	0.024
Facilitating circumstances	2.78 (0.82)	2.97 (0.65)	0.049

TAM Technology acceptance model, SES Socioeconomic status, SD Standard deviation

Regression analysis results

Table 3 shows the results of the multivariable logistic regression analyses which was meant to create better understanding of mHealth adoption disparities across socioeconomic groups. As mentioned before, TAM was used to explore factors influencing mHealth use among low- and non-low SES groups. The intention to

use mHealth applications of older adults with low SES was associated significantly with perceived usefulness (OR=2.91), perceived ease of use (OR=2.24), attitude toward use (OR=7.69), subjective norms (OR=1.93), sense of control (OR=3.08), personal innovativeness (OR=1.69), self-perceived effectiveness (OR=2.12), service availability (OR=2.23), and facilitating circumstances (OR=4.01), but not with digital health anxiety or social relationships. In the non-low SES group, all factors were associated significantly with the intention to use mHealth applications.

The models including interaction terms showed that the intention to use mHealth applications of older adults with non-lowSES was associated more strongly than the intention of the low-SES group with the applications' perceived usefulness (OR=2.39), perceived ease of use (OR=2.47), and obtainability and accessibility (service availability; OR=2.14). The association of digital health anxiety with the intention to use also differed between groups (OR=0.50, $P=0.017$); it was significant in the non-low-SES group (OR=0.45, $P<0.001$), but not in the low-SES group, possibly because the mean score in the low-SES group was very high.

Table 3 Associations of acceptance factors with the intention to use mHealth applications according to SES

	Low SES (N=106)				Non-low SES (N=254)				Interaction between SES and TAM factors			
	OR (95%CI)	β	P-value	SE	OR (95%CI)	β	P-value	SE	OR (95%CI)	β	P-value	SE
Perceived usefulness	2.91 (1.52–5.59)	1.07	0.001	0.333	6.87 (3.94–11.97)	1.93	<0.001	0.284	2.39 (1.03–5.53)	0.87	0.042	0.428
Perceived ease of use	2.24 (1.26–3.96)	0.81	0.006	0.292	5.55 (3.22–9.56)	1.71	<0.001	0.277	2.47 (1.14–5.35)	0.91	0.021	0.394
Attitude towards use	7.69 (2.85–20.74)	2.04	<0.001	0.506	11.59 (5.83–23.03)	2.45	<0.001	0.351	1.64 (0.54–5.02)	0.5	0.385	0.57
Subjective norm	1.93 (1.14–3.27)	0.66	0.014	0.268	1.41 (1.06–1.89)	0.35	0.020	0.148	0.80 (0.45–1.40)	-0.23	0.429	0.288
Sense of control	3.08 (1.68–5.67)	1.13	<0.001	0.311	3.41 (2.34–5.00)	1.23	<0.001	0.192	1.11 (0.56–2.22)	0.1	0.771	0.353
Feelings of anxiety (digital health anxiety)	0.97 (0.59–1.60)	-0.03	0.901	0.255	0.45 (0.32–0.62)	-0.81	<0.001	0.172	0.50 (0.28–0.88)	-0.7	0.017	0.293
Personal innovativeness	1.69 (1.04–2.74)	0.52	0.033	0.246	2.34 (1.66–3.30)	0.85	<0.001	0.175	1.33 (0.75–2.35)	0.28	0.333	0.291
Social relationships	1.39 (0.63–3.06)	0.33	0.421	0.405	1.73 (1.06–2.85)	0.55	0.030	0.253	1.27 (0.52–3.11)	0.24	0.596	0.456
Self-perceived effectiveness	2.12 (1.18–3.80)	0.75	0.012	0.298	3.06 (2.01–4.67)	1.12	<0.001	0.216	1.45 (0.74–2.86)	0.37	0.281	0.346
Service availability	2.23 (1.22–4.05)	0.8	0.009	0.306	4.55 (2.74–7.57)	1.52	<0.001	0.26	2.14 (1.01–4.53)	0.76	0.047	0.383
Facilitating circumstances	4.01 (1.78–9.05)	1.39	0.001	0.415	4.02 (2.25–7.17)	1.39	<0.001	0.295	1.12 (0.44–2.86)	0.11	0.82	0.479

Control variables were age, sex, Assessment of Activities of Daily Living, Self-care and Independence (ADL) score, and quality of life

SES Socioeconomic status, OR Odds ratio, CI Confidence interval, SE Standard error

Discussion

Principal results

The findings of this study provide novel insights into important factors influencing mHealth adoption among older adults with low and non-low SES, and differences in adoption factors between these groups. In the low-SES group, most acceptance factors had low perceived importance. This group reported higher anxiety compared to non-low SES users, a lack of a sense of control over mHealth applications, a lack of perceived innovativeness, perceived limited accessibility of mHealth applications, and few conditions facilitating their use. These results indicate that low SES makes it more challenging to motivate older adults to use mHealth applications, as found previously in the general population [15, 35–37].

We identified eight factors associated significantly with the intention to use mHealth applications of older adults with low SES: perceived application usefulness and ease of use, the attitude toward application use, the perception that important others favor one's application use (subjective norm), perceived control of application use, personal innovativeness, and accessibility and facilitation of application use (service availability and self-perceived effectiveness). These findings suggest that the adapted TAM is applicable to low-SES groups, offering policymakers valuable insights into factors that could be leveraged to promote mHealth adoption. Policies targeting these factors are likely to enhance the use of mHealth applications among older adults with low SES - for example, by fostering positive perceptions of performance expectancy through support during the setup phase and initial use [52]. Additionally, improving the user-friendliness of mHealth applications—such as incorporating intuitive navigation, pre-typed responses, auto-fill features based on user preferences, and text-to-speech functionality—can further facilitate adoption among this population.

The same factors, as well as digital health anxiety and social relationships, were also associated significantly with the intention of older adults with non-low SES to use mHealth applications. Thus, factors that will increase mHealth adoption among individuals with low SES will also do so among those with non-low SES, and possibly to a greater extent. Accordingly, greater effort may need to be directed toward individuals with low SES than toward those with non-low SES to increase mHealth adoption at similar rates. Policies designed with a sole focus on adapted TAM factors, with no consideration of SES differences, may not effectively reduce health disparities. To address this issue, we recommend that policymakers adopt comprehensive approaches to factors influencing the use intentions of older adults with low SES, and exert more effort to reach this group specifically. Policies could be tailored to this group's needs, and/or initiatives could

be implemented primarily in areas with larger populations of older adults with low SES.

Our models that included interaction terms indicated that perceived usefulness, perceived ease of use, digital health anxiety, and service availability influenced the use intentions of older adults with low SES significantly less than they did those of older adults with non-low SES. Bao and Lee [36] reported contrasting results for perceived usefulness and ease of use: they found a stronger association among individuals with low SES than among those with high SES for the former, and no difference in association strength according to SES for the latter. A possible explanation for this contradiction is that Bao and Lee [36] studied the general population, whereas we studied the older adult population. Thus, factors that emerge as relevant for low-SES groups in the general population may be less relevant for older adults with low SES; in other words, different factors may motivate the latter to use mHealth applications. Our findings suggest that for older individuals with low SES, broader structural or contextual barriers—such as limited digital access or finance, privacy and trust [53] or lower digital literacy—may overshadow the role of individual perceptions. Given the multitude of factors influencing intention to use, policies are likely to be most effective when adopting a multifactorial approach rather than targeting a single determinant. Consequently, we recommend that policymakers aiming to reduce health disparities among older adults with different SES through the use of mHealth base their policy development on findings from research conducted with older adults.

This study showed that older adults with low SES are very anxious about mHealth use. However, digital health anxiety was not associated with the use intention in this group, contrary to previous findings that anxiety is a relevant predictor of mHealth use in the general population [15, 33] and among older adults [34]. One possible explanation for our finding is that the prevalence of digital health anxiety was uniformly high among older adults with low SES, minimizing within-group differences. The reduction of this type of anxiety in this population could positively impact their intention to use mHealth, as suggested in previous research [15, 33, 34, 54].

The average service availability score was low in the low-SES group in this study. In line with this result, individuals with low SES have been found to use health technology less promptly due to limited technology availability as compared to those with higher SES [15]. However, our findings indicate that the odds of intending to use mHealth in older adults with low SES still more than doubles when they perceive mHealth as readily available. Thus, the improvement of availability likely increases usage both among older adults with low SES and non-low SES, and it has been suggested as a viable strategy to

improve mHealth adoption in the general population in recent Dutch policy [55].

In addition to service availability, social network support and other facilitating conditions have been identified as strong facilitators of mHealth use in the general population [35, 36, 56] and among older adults [57]. In this study, perceived facilitating circumstances and subjective norms were associated positively with the use intention of older adults with low SES, but their average scores in this group were not high. These results suggest that older adults with low SES do not, on average, feel strongly motivated to use mHealth applications because of the opinions of others or objective environmental factors that can make technology use easy. However, those who perceive themselves as being facilitated and supported well are much more likely to adopt mHealth applications. Thus, opportunities exist to engage the social networks of older adults with low SES as facilitating entities, although such efforts could be hampered by difficulties such as the lack of the digital competency needed to provide effective support [35] or the lack of robust social networks altogether [58, 59]. Studies of mHealth acceptance among older adults have led to suggestions to involve other parties, such as healthcare institutions, in support provision [20, 21, 54, 57, 60–62]. Such efforts may specifically benefit older adults with low SES, and can be used to enhance policies in this context. Finally, future studies should investigate whether mHealth is independently associated with improved management of chronic diseases, accounting for factors such as socioeconomic status (SES).

Strengths and limitations

This study has several limitations. First, it had a cross-sectional design, preventing the examination of causality [63] and entailing susceptibility to self-report bias [64]. Longitudinal studies are essential to explore causal links between SES and acceptance factors.

Second, the measurement and application of the SES construct varies across studies of digital healthcare applications. In their scoping review of innovative technologies and social inequalities in health, Weiss et al. [7] identified three primary approaches to SES calculation, including that based on income and education levels used in this study. Weiss et al. [7] stated that the outcomes of research on socioeconomic disparities in health innovations may depend on the approach used to measure and define social groups, and thus that clear and thorough reporting of cutoff values and SES definition is crucial. In this study, we converted SES to a binary variable, defining groups using cutoff values for income and educational levels based on a recent report defining joint net monthly incomes <1750 euros in the Netherlands as low [49] and on the educational levels defined by

Statistics Netherlands, respectively. Given our focus on older adults, we included only respondents with both low incomes and low educational levels in the low-SES group. This approach allowed us to gain insight into the most disadvantaged group relative to all other older adults.

In addition, we considered an average score of 3 and above as indicating intention to use. Restricting the analysis to scores of 4 and 5 would indeed be of interest to examine potential changes in the results; however, due to limited statistical power, we were unable to conduct this analysis in the current study. The third study limitation was that the population comprised individuals aged ≥ 65 years. Adults, and particularly women, in this age category may have low educational levels due to the lack of opportunities for education, but high household incomes. The disparity in older men's and women's educational levels may decrease in the future [65], potentially impacting the relevance of our study's outcomes over time. Finally, a limitation of this study is the lack of differentiation between the various purposes of mHealth applications, as users' intention to adopt may differ depending on the specific type or functionality of the app.

Conclusions

This study showed that older adults in the Netherlands with low SES are less motivated than those with non-low SES to use mHealth applications. A specific approach is needed to stimulate mHealth adoption in the low-SES group. The adapted TAM provides viable factors to increase the intention to use mHealth applications of older adults with low and non-low SES. However, more effort needs to be focused on those with low SES to increase mHealth adoption at similar rates in both groups. To reduce health disparities, we recommend that policymakers focus on factors that significantly influence the use intention of older adults with low SES and tailor their policies specifically to the needs of this group.

Abbreviations

SES	Socioeconomic Status
mHealth	Mobile Health
TAM	Technology Acceptance Model
ADL	Activities of Daily Living, Self-care and Independence
SD	Standard Deviation
OR	Odds Ratio
SE	Standard Error

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12877-026-07340-x>.

Supplementary Material 1

Acknowledgments

Not applicable.

Authors' contributions

MA designed the research project and developed the questionnaire. MA and FvE collected the data with the assistance of data assistants. FvE conducted the analysis under the supervision of MA and APN. FvE wrote the initial version of the manuscript. Interpreting the results and revising the paper critically was done by all the authors. We thank the experts, older adults, participants, and data assistants who helped validate our questionnaire.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All respondents provided written informed consent, and the study was approved by the Medical Ethics Commission of the Erasmus University Medical Center (MEC-2018-120).

Competing interests

The authors declare no competing interests.

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