Validity and Reliability of the Turkish Version of the Novel Instrument for Measuring Older People's Attitudes Towards Technology (TechPH)

Yaşlıların Teknolojiye Yönelik Tutumlarını Ölçmek için Yeni Bir Aracın (TechPH) Türkçe Versiyonunun Geçerliliği ve Güvenirliği

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ABSTRACT

Aim: Determining attitudes and interests of older adults, who require special care and monitoring, towards technology affects the planning and application of care and other services to be provided. The aim of this study is to evaluate the reliability and validity of the original 6-item form of the Novel Instrument for Measuring Older People's Attitudes Toward Technology (TechPH) among the Turkish population.

Materials and Methods: This study has a methodological cross-sectional design and was conducted with a sample of 300 community-dwelling older adults in a province in the Eastern Black Sea Region of Türkiye.

Results: The average age of the participants was 71.08±5.71 years (65-90). Most of the participants were male (71.3%) and primary school graduates (42.7%). The content validity index of the TechPH is 0.97. The confirmatory factor analysis (CFA) of the two-factor model of the scale revealed an excellent fit. The Cronbach's alpha reliability coefficient of the scale was found to be 0.71. CFA model fit index values of the scale were found to be chi-square minimum (CMIN) =16,913, degrees of freedom (DF) =8, CMIN/DF =2,114, root mean square residual =0.048, goodness of fit index =0.98, normed fit index =0.94, Tucker-Lewis index =0.94 and comparative fit index =0.97.

Conclusion: It was concluded that the Turkish version of the TechPH is a valid and reliable instrument and is suitable to be used by health professionals to measure older adults' attitudes towards technology.

Keywords: Older Adults, Psychometrics, Reliability, Technology, Validity

ÖZ

Amaç: Özel bakım ve izlem gereken yaşlı yetişkinlerin teknolojiye yönelik tutum ve ilgilerinin belirlenmesi, bakımın ve sağlanacak diğer hizmetlerin planlanması ve uygulanmasını etkiler. Bu çalışmanın amacı, Yaşlıların Teknolojiye Yönelik Tutumlarını Ölçmek için Yeni Bir Aracın (TechPH) orijinal 6 maddelik formunun Türk popülasyonunda güvenilirliğini ve geçerliliğini değerlendirmektir.

Gereç ve Yöntem: Bu araştırma, metodolojik kesitsel bir tasarıma sahip olup, Türkiye'nin Doğu Karadeniz Bölgesi'ndeki bir ilde toplum içinde yaşayan 300 yaşlıdan oluşan bir örneklemle yürütülmüştür.

Bulgular: Katılımcıların yaş ortalaması 71,08±5,71 yıl (65-90) idi. Katılımcıların çoğu erkek (%71,3) ve ilkokul mezunu (%42,7) idi. TechPH'nin kapsam geçerlilik indeksi 0,97'dir. Ölçeğin iki faktörlü modelinin doğrulayıcı faktör analizi (DFA) mükemmel bir uyum ortaya koymuştur. Ölçeğin Cronbach alfa güvenilirlik katsayısının 0,71 olduğu bulunmuştur. Ölçeğin DFA model uyum indeks değerleri ki-kare minimum (CMIN) =16.913, serbestlik derecesi (DF) =8, CMIN/DF = 2.114, kare-kök ortalama artık =0,048, uyum iyiliği indeksi =0,98, normalleştirilmiş uyum indeksi =0,94, Tucker-Lewis indeks =0,94 ve karşılaştırmalı uyum indeksi =0,97 olarak bulunmuştur.

Sonuç: TechPH Türkçe formunun geçerli ve güvenilir bir araç olduğu ve yaşlı yetişkinlerin teknolojiye yönelik tutumlarını ölçmek amacıyla sağlık profesyonelleri tarafından kullanılmaya uygun olduğu sonucuna varılmıştır.

Anahtar Kelimeler: Yaşlı Yetişkinler, Psikometrik, Güvenilirlik, Teknoloji, Geçerlilik

INTRODUCTION

Technology makes our lives easier in many areas today. Health services is one of these spheres, as it is becoming increasingly more effective, more efficient and more accessible (1). Health information technologies are widely used in chronic disease management and prevention, health protection and health promotion (1,2). Considering that older adults look to benefit the most from health services, the normalized use of technology in health services is especially important for this group (3,4). It has been argued that improving the health of the aging population through the use of technology will help us achieve several objectives at once, such as improving public health and alleviating the burden on health systems (4,5). The use of technology and the internet among older adults has been linked to an improved quality of life and a reduction in depressive symptoms (6,7). Although some elderly adults utilize technology to conduct research on health issues, there exist several barriers to technology adoption within this population (8-10). These barriers primarily encompass inadequate knowledge regarding technology, physical impairments related to vision and hearing, economic challenges, and fear and resistance towards using technology (9,11,12).

The use of technology entails acceptance and adoption of technology. Anderberg et al. (13) reported that positive attitudes and interest in technology (technophilia)

affect satisfaction with technology and perceptions of health intervention outcomes. Although there is no universal definition of technophilia, the term mainly refers to an intense enthusiasm and affection for modern technology (13). Technophilia can help individuals to discover technological innovations and access more information and entertainment (14,15).

Anderberg et al. (13) developed a short and simple tool to measure older people's attitudes toward technology [technophilia- the Novel Instrument for Measuring Older People's Attitudes Toward Technology (TechPH)]. Although TechPH was first applied to adopting health information technology (i.e., telemedicine), it was later used in the healthcare industry to measure users' feelings and attitudes toward health information technologies (16,17). Considering the increasing use of technology in healthcare, understanding healthcare seekers' personal feelings and attitudes towards technology is very important (18). Determining attitudes and interests of older adults, who require special care and monitoring, towards technology affects the planning and application of care and other services to be provided (5,19,20). Technology use among older adults requires both acceptance and willingness, shaped by techEnthusiasm and techAnxiety. Positive attitudes, reflected in techEnthusiasm, can encourage engagement with healthcare innovations, boosting satisfaction with health services and enhancing quality of life. In contrast, techAnxiety marked by discomfort or

hesitation can hinder adoption and limit access to beneficial tools (13). One study reported that advanced technophilia in older adults is associated with a better quality of life (14). No valid and reliable measurement tool that can assess the attitudes of older adults towards technology was uncovered in Turkish literature. Considering the increasing use of technology in healthcare services, it was determined that adapting the TechPH scale into Turkish could be greatly beneficial (21,22). It can help all healthcare professionals who serve older adults, especially nurses who have started to integrate technology into their care (23). Nurses can guide older adults in accordance with their needs, interests, and skills, and provide support in utilizing technology. This can facilitate the cultivation of positive attitudes toward technology among older adults (24).

TechPH can serve as a guide for nurses in evaluating older adults' perspectives on technology utilization. This research intends to assess the reliability and validity of the original six-item version of TechPH within the Turkish older adult population.

MATERIALS AND METHODS

Study Design

The current study has a methodological and cross-sectional research design. STROBE guidelines were followed to conduct this study.

Participants

The study was conducted between January 2023 and May 2023 in a province in the Eastern Black Sea Region of Türkiye. A family health center was selected by casting lots, and older adults registered in the selected family health center were recruited using a convenience sampling method. Adults aged 65 and above, who volunteered and did not have any communication impairments or neuropsychiatric conditions, as determined by self-report, were enrolled in the study. The literature suggests that the sample size for psychometric studies should range from 5 to 50 times the number of items on the scale (25). For this study, a sample size equivalent to 50 times the number of scale items (6 items) was deemed suitable (n=300).

Data Collection Tools

A Personal Information Form and TechPH were utilized as data collection instruments.

Personal Information Form

This form was developed by the researchers and consists of 8 questions in total, covering participants' age, gender, education level, marital status, income, and technology use (13).

TechPH

The scale was developed by Anderberg et al. (13). "The Novel Instrument for Measuring Older People's Attitudes Toward Technology" was named "TechPH", which is the abbreviation of technophilia, in the original study. The scale consists of 6 items. The scale is a five-point Likert type (1= strongly disagree to 5= strongly agree) and includes two sub-dimensions: techEnthusiasm and techAnxiety. There is a low an inverse correlation between the sub-dimensions. Anderberg et al. calculated the Cronbach's alpha coefficient of the scale as 0.71, and the Cronbach's alpha coefficients of the sub-dimensions as 0.72 and 0.68, respectively. The factors were confirmed in the confirmatory factor analysis (CFA) and showed good model fit [chi-square minimum (CMIN) =21.2, CMIN/degrees of freedom (DF) =2.65, comparative fit index (CFI) = 0.97, adjusted goodness of fit index (GFI) =0.95, root mean square (RMR) error of approximation (RMSEA) =0.067, standardized RMR =0.036)]. Items 2, 4 and 6 are scored negatively. The total scale score is the arithmetic mean of the sum of scores obtained from all items. Greater scores on the scale suggest that the older adult respondent has a more favorable attitude towards technology and a stronger interest in it (13).

techEnthusiasm: The sub-dimension of "techEnthusiasm" includes statements that indicate older adults' positive feelings towards technology (items 1, 3, 5). The items in this sub-dimension express different aspects of interest in technology.

techAnxiety: The sub-dimension "techAnxiety" includes statements that indicate older adults' negative

feelings towards technology (items 2, 4, 6). The items in this sub-dimension express different aspects of anxiety regarding technology familiarity and usage.

Procedure

Permission was obtained by e-mail from Anderberg et al. for the Turkish adaptation of TechPH. Ethics committee approval (Bayburt University Ethics Committee, date: 16.12.2022/decision no: 315-13) and institutional permission were obtained for the study. Scientific and universal principles were adhered to while conducting the study. The research was carried out in compliance with the Declaration of Helsinki. The data were collected face to face from January to May 2023. The data collection forms were administered by researchers to elderly individuals visiting the family health center. Prior to administering the data collection tools, consent was obtained from participants. The questions in the data collection form were read to the older adults one by one, and their responses were recorded. The administration of the data collection tools took approximately 15 minutes on average.

The translation of the TechPH into Turkish was based on the guidelines described by World Health Organization (WHO) (26). The initial phase of the scale adaptation process involved verifying language validity. Two linguists proficient in both English and Turkish independently translated the scale items from English to Turkish. After this process, these two linguists compared their translations and decided by consensus which translations best corresponded to the original item. The Turkish version of the scale was created. Subsequently, a specialist in Turkish language and literature assessed the scale for grammatical accuracy and clarity. The form was then presented to 12 experts in the field of nursing for evaluation of content and language validity. After expert opinions were taken, the content validity index (CVI) of the scale form was analyzed. Once the required revisions were completed, two different language experts translated the scale back into the original language. The researcher and another language expert compared the original scale and the backtranslated version to assess the degree of similarity between the two forms. After back translation, the scale was finalized and a pilot study was conducted with 30 participants possessing characteristics similar to the study sample proper. Following the pilot study, data for the study proper was then collected from 300 older adults via face-to-face interviews. The adequacy of the sample size of the study for validity and reliability analyses was evaluated via Kaiser-Meyer-Olkin (KMO) coefficient and Bartletts test. CVI and construct validity analyses were conducted to assess the validity of the scale. For construct validity evaluation, confirmatory factor analysis (CFA) was conducted using AMOS. For convergent and discriminant validity, composite reliability (CR) and average variance extracted (AVE) were calculated. The reliability of the scale was evaluated through test-retest analysis, item analysis, and the Cronbach's alpha reliability coefficient. Response bias in the scale was assessed using Hotelling's T^2 test. Tukey's test of additivity was used to confirm that the total score reflects the sum of the item scores accurately.

Statistical Analysis

The data analysis was performed using the IBM SPSS statistical software (v.25). The descriptive characteristics of the sample group were assessed by calculating frequency counts and percentage distributions. The CVI of the scale was determined using the Davis technique. CFA was performed with AMOS (v.21) to assess the construct validity of TechPH. Before conducting CFA, data were assessed for multivariate normality and multicollinearity. The scale's reliability was measured by computing the "Cronbach's Alpha," which indicates the internal consistency reliability coefficient. For the test-retest analysis, Pearson correlation and paired samples t-tests were utilized. Item-total and item-sub-dimension correlations were calculated for item analysis. For convergent and discriminant validity, composite reliability (CR) and AVE values were calculated. Tukey's test of additivity assessed the additivity of the scale, while the Hotelling T^2 test was applied to evaluate potential response bias in the scale.

RESULTS

Participant characteristics

The descriptive characteristics of the participants are shown in Table I.

Validity

To evaluate the validity of the scale, CVI and construct validity analysis were conducted. The scores given by 12 experts (an expert in the fields of geriatrics and nursing) who were consulted for content validity were examined by content validity analysis. The CVI of the items calculated with the Davis technique ranged between 0.91-1.00 and the total CVI of the items was found to be 0.97. The adequacy of the sample size of the study for validity and reliability analyses was evaluated via KMO coefficient and Bartletts test. The KMO coefficient of the study was found to be 0.757 and the Bartletts test results of the study were found to be $\chi 2$ =330.899; p=0.000. Based on these results, it was deemed that the sample size of the study was adequate for following analyses. For construct validity evaluation, CFA was conducted using AMOS. The maximum likelihood estimation method was used. CFA model fit values of the scale were CMIN =16.913, DF =8, CMIN/DF =2.114,

RMR =0.048, GFI =0.98, normed fit index (NFI) =0.94, Tucker-Lewis index (TLI) =0.94 and CFI =0.97. For convergent and discriminant validity, the CR value was found to be 0.772 for the first sub-dimension and 0.802 for the second sub-dimension. The AVE values were determined to be 0.544 and 0.734 for the respective sub-dimension. The analysis results indicated that CR > AVE, confirming that the scale possesses both discriminant and convergent validity. The factor loadings of the scale items determined via CFA are presented in the path diagram (Figure 1). When the standardized parameter values in the path diagram are examined, it is observed that factor loadings of the items vary between 0.29 and 0.84. The factor loadings of the items in the techEnthusiasm sub-dimension vary between 0.50 and 0.72, while the factor loadings of the items in the techAnxiety sub-dimension vary between 0.29 and 0.84.

Table I. Descriptive characteristics of the participants

Age		
Mean ± SD (min-max)	71.08 ± 5.71 (65-90)	
	n	**%**
Gender		
Female	86	28.7
Male	214	71.3
Marital status		
Married	228	76.0
Single	72	24.0
Educational status		
Literate	86	28.7
Primary school	128	42.7
Secondary school and above	86	28.6
Income status		
Income less than expenses	87	29.0
Income equal expenses	175	58.3
Income more than expenses	38	12.7
Smartphone use		
Yes	187	62.3
No	113	37.7
Smartphone-savvy level		
Low	139	46.3
Medium	133	44.3
High	28	9.3
Internet use frequency		

Table I. Continued

None	119	39.7
Low (less than once a week)	27	9.0
Medium (at least once a week, but not daily)	49	16.3
High (daily)	105	35.0

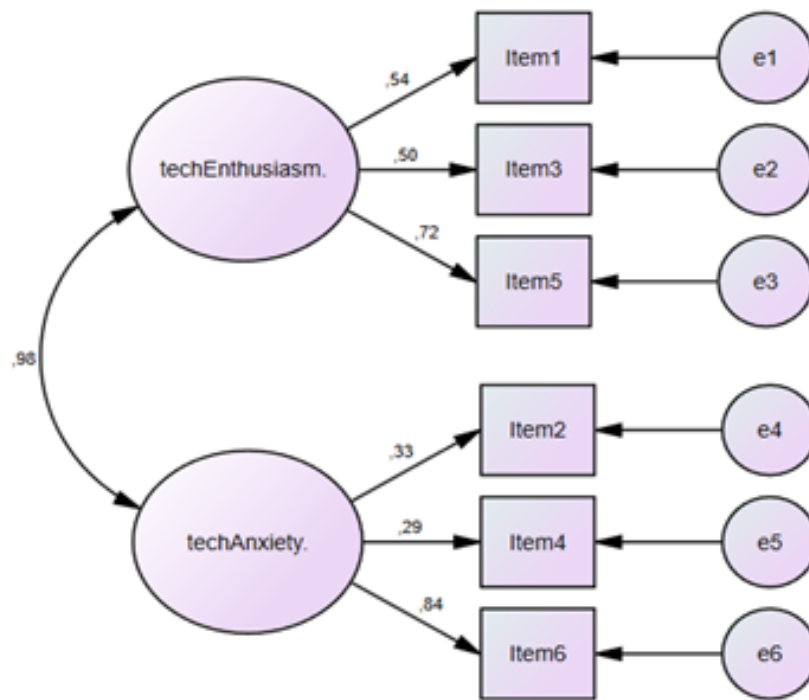SD: Standard deviation, min: Minimum, max: Maximum

Figure I. TechPH's CFA path diagram

TechPH: The Novel Instrument for Measuring Older People's Attitudes Toward Technology, CFA: Confirmatory factor analysis

Reliability

The reliability of the scale was evaluated through test-retest analysis, item analysis, and the Cronbach's alpha reliability coefficient. In this study, TechPH was administered to 30 older adults, who represented the study population, on two separate occasions with a three-week interval. These participants were not part of the main population sample. An examination of the relationship between the results of the first and second administrations for both the sub-dimensions and the overall TechPH revealed a significant positive correlation (Table II). The paired samples t-test results indicated no significant difference between the two administrations (p=0.096). Analysis results showed that the average scores for the first (2.96±0.48) and second (2.88±0.50) administrations were quite comparable.

The results of the item analysis based on item-total correlation conducted to determine the internal consistency reliability of the scale are presented in

Table III. The item-total score correlations of the TechPH were found to vary between 0.264-0.643 and the item-sub-dimension score correlations of the TechPH were found to vary between 0.241-0.595.

The overall Cronbach's alpha reliability coefficient for TechPH was 0.71. The reliability coefficients of the scale's sub-dimensions are displayed in Table III.

Table II. Test-retest results based on overall TechPH and its subscales (n=30)

First application	Second application					
	Overall		**techEnthusiasm**		**techAnxiety**	
	r	p	r	p	r	p
Overall	0.855	.000	**	**	**	**
techEnthusiasm	**	**	0.706	.000	**	**
techAnxiety	**	**	**	**	0.745	.000

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Table III. Reliability results of the TechPH (n=300)

Items	Item-total score correlations	Item-sub-dimension score correlations	Cronbach alpha
techEnthusiasm			0.62
Item-1	0.450	0.440	
Item-3	0.440	0.438	
Item-5	0.567	0.423	
techAnxiety			0.46
Item-2	0.275	0.273	
Item-4	0.264	0.241	
Item-6	0.643	0.595	
Overall scale			0.71

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The additivity of a scale refers to the extent to which the sum of the scores obtained from scale items correctly represent the total scale score. As a result of Tukey's test of additivity, the additivity of the scale was found to be F=78,178 (p=0.000) and the non-additivity of the scale was found to be F=2,881 (p=0.090). Upon application of the Hotelling T2 test conducted to evaluate whether the responses of the individuals to the scale items were equal or not, the T2 value of the scale was found to be 404.285 (p=0.000).

DISCUSSION

This study, in which the TechPH was adapted into Turkish, adhered to the steps specified by WHO.

In scale adaptations, content validity analysis is employed to assess how well the overall scale and each individual item reflect the construct being measured (27,28). Among the various methods available for content validity analysis, the Davis technique was selected for this research. Using Davis's (1992) technique, expert opinions were evaluated

by a 4-point Likert type scale that includes four options: (a) "Item is appropriate", (b) "Item should be slightly revised", (c) "Item should be extensively revised" and (d) "Item is not appropriate" (29). In this method, the count of experts who chose options (a) and (b) was divided by the total number of experts to calculate the CVI value for the item. A CVI value of 0.80 is accepted as the threshold for content validity (28,30). In the current study, the content validity of the scale adapted to Turkish was found to be very high. It has been observed that the TechPH adequately measured the relevant construct and content validity of the scale in the Turkish population was achieved. Factor analysis is commonly employed to evaluate the structural validity of scales. Before examining the factor structure of the scale, the KMO coefficient is calculated, and Bartlett's test is conducted to determine the sample's suitability for factor analysis (30,31). A KMO coefficient of 0.60 or above is considered adequate. A Bartlett's test result of $p<0.05$ indicates that the correlation matrix of the scale is significant, the data set is appropriate, and the sample is adequate (30). In this study, the KMO coefficient of the scale was found to be 0.75 and the result of the Bartlett's test was $p<0.001$. Therefore, it was concluded that the sample was sufficient and the data set was appropriate for factor analysis. In the original study, the KMO coefficient of the original scale was reported to be 0.76 and a Bartlett's test result of $p<0.001$ was found (8). These results were consistent with the current study.

CFA is employed to assess the validity of the factor structure of a scale or model (32,33). In the present study, CFA was conducted to assess the structural validity of the scale. In CFA, various fit indices and factor loadings are examined and a path diagram is created (34). The scale's CFA fit index values, which consist of CMIN/DF, RMR, GFI, TLI, CFI, NFI and RMSEA, need to be at a desired level for adequate structural validity (32,33,35). A CMIN/DF values of 5 and below indicate an "acceptable fit" and values of 3 and below indicate a "perfect fit". CFI values of 0.95 and above are considered a "perfect fit" and CFI values of 0.85 and above are considered an "acceptable fit". NFI values of 0.95 and above indicate a "perfect fit" and NFI values of 0.80 and above indicate an "acceptable fit". GFI and TLI values of 0.90 and above are considered a "perfect fit", GFI and TLI values of 0.80

and above are considered an "acceptable fit". RMSEA and RMR values of 1.00 and below are considered an "acceptable fit" and RMSEA and RMR values of 0.05 and below are considered an "excellent fit" (35-37). In the present study, when the fit indices of the scale were examined, it was observed that CMIN/DF, RMR, GFI, TLI and CFI values of the scale indicated a perfect fit, while RMSEA and NFI values indicated an acceptable fit.

The standardized regression coefficients of a scale reflect the ability of the scale items to forecast the sub-dimensions, which are their factor loadings. High CFA factor loadings imply that the items are effectively associated with their respective dimensions. Factor loadings of 0.30 and above are considered desirable (38). In the current study, it was found that all items except for the fourth item in the second sub-dimension had CFA factor loadings above 0.30. It is recommended in the literature that the item-total score correlations be evaluated before removing items with low factor loadings from the scale. It is suggested that if their item-total correlation values are above 0.25, the items with low factor loadings remain in the scale and do not cause structural invalidity (39-41). Findings from this study revealed that the item-total score correlation of the fourth item in the second sub-dimension was higher than 0.25. It was decided that it is appropriate for this item to remain in the scale since the item did not affect the structural validity of the scale as evident by CFA result, and was thought to measure the related theoretical construct adequately. The CFA results obtained in this study indicated that the scale had an adequate construct validity and confirmed that the scale is a valid measurement tool. It is recommended to perform convergent and discriminant validity analyses to ensure that the scale items and sub-dimensions measure the intended concept without conflating it with other concepts (42). In the literature, it is reported that CR values should be above 0.70, AVE values should be above 0.50, and all CR values should be greater than AVE values (35,42). The analysis results indicated that the scale possesses both discriminant and convergent validity. One of the most fundamental concepts of scale studies is reliability (32). Test-retest analysis is among the analyses performed to determine scale reliability (28). This analysis is based on evaluating the relationship between the values obtained as a result of administering the same scale to the

same population at different times (with a 2-to-4-week interval) via Pearson correlation coefficient. The paired samples t-test can also be used to determine test-retest reliability (32). The test-retest correlation coefficient is evaluated based on specific ranges of values. Values ranging from 0.00 to 0.25 represent a very weak correlation coefficient, those from 0.26 to 0.49 indicate a weak correlation coefficient, values from 0.50 to 0.69 suggest a moderate correlation coefficient, those from 0.70 to 0.89 indicate a strong correlation coefficient, and values between 0.90 and 1.00 represent a very strong correlation coefficient (28,30). In this study, it was found that there was a high positive correlation between the scores obtained as a result of the first and second administrations of the scale. A high correlation coefficient, a.k.a. stability factor, indicates that measurements made at different instances are similar and that the scale is reliable (32). The results of the paired samples t-test conducted in this study also signified that score averages of the first and second administrations of the scale were quite similar. Accordingly, it can be said that the Turkish version of the scale is highly reliable.

One of the criteria used in evaluating the homogeneity and reliability of adaptations of Likert-type scales and their sub-dimensions is internal consistency (28,30). Cronbach's alpha reliability coefficient is utilized to assess the internal consistency of the items within the scale and their measurement of the same construct (28,30,43). Higher values of the Cronbach's alpha reliability coefficient are considered to indicate greater reliability of the scale (28). Cronbach's alpha reliability coefficients of $0.00 \leq \alpha < 0.40$, $0.40 \leq \alpha < 0.60$, $0.60 \leq \alpha < 0.80$ and $0.80 \leq \alpha < 1.00$ indicate that the scale is not reliable, has low reliability, has adequate reliability or has high reliability, respectively (44). In this study, the Cronbach's alpha coefficient of the whole scale was 0.71 and Cronbach's alpha coefficient of the sub-dimensions were 0.46 and 0.62. Cronbach's alpha coefficients obtained in the current study indicated that the reliability of the whole of the scale was adequate, while the reliabilities of the sub-dimensions were low and adequate, respectively. The low Cronbach's alpha value observed in one of the subdimensions may also be attributed to the small number of items (45). The Cronbach's alpha value of the whole of the original scale was reported to be 0.71 and the Cronbach's alpha values of the sub-dimensions were reported to be 0.72 and 0.68. Thus, it can be said that the structure of the Turkish version of the scale is nearly identical to the original structure and

the adapted scale, therefore, has high internal consistency.

Item analysis evaluates whether the items in the scale function in line with the purposes of the scale. Item-total correlations indicate the internal consistency of a scale. Evaluating the item-total correlation of a scale elucidates the relationship between each item and the whole of the scale (32). The literature suggests that item-total correlation coefficients that don't have negative values and have values greater than 0.20 are desirable (32,46). Item-total score correlations and item-sub-dimension score correlations of this study were found to be above 0.20. Based on this result, it can be said that the reliability of the items in the Turkish version of the scale is high and they serve the purpose of measuring the same construct.

The additivity of a scale refers to the extent to which the sum of the scores obtained from scale items correctly represent the total scale score. As a result of Tukey's test of additivity, the additivity of the scale was found to be F=78,178 (p=0.000) and the non-additivity of the scale was found to be F=2,881 (p=0.090). Significance values of 0.05 or above indicate that the scale is additive (32). Accordingly, the Turkish version of this 6-question scale is additive.

The Hotelling T² test is employed to assess response bias, which can impact both the reliability and validity of the scale. The results of the Hotelling T² test indicate whether participants interpret the questions in the same manner and if the difficulty level of the questions is consistent (32). In this study, the Hotelling T² test was conducted to determine whether the responses of participants to the scale items were uniform. The analysis revealed that TechPH had a Hotelling T² value of 404.285 (p=0.000), indicating that there was no response bias present in the scale.

The use of technology entails acceptance and adoption of technology. Although TechPH was first applied to adopting health information technology (i.e., telemedicine), it was later used in the healthcare industry to measure users' feelings and attitudes toward health information technologies (16,17). This methodological study provides a new perspective on the reliability and validity of TechPH and the possibility of using the TechPH in another language version for international comparison. TechPH will enable enhanced research on older adults' attitudes toward

technology. Understanding older adults' attitudes toward technology will inform policies on appropriate strategies to improve the quality of services provided to older adults.

Study Limitations

The limitations of this study are that most of the participants are male and that the data was obtained via self-reporting by older adults. These limitations may affect the generalizability of the study results to the whole elderly population. Additionally, one of the subdimensions of the scale had a low Cronbach's alpha value, which may suggest issues with internal consistency. This could be due to the small number of items or the possibility that the items did not adequately measure the construct. Future studies could address this by revising the items in the subdimension or exploring alternative measures. These limitations should be taken into account when interpreting the results, particularly with respect to the generalizability and validity of the findings.

CONCLUSION

In summary, the findings indicate that the Turkish version of the TechPH is both a valid and reliable tool, making it suitable for use. TechPH is a six-item and five-point Likert scale (1 =strongly disagree to 5 =strongly agree). There are two subdimensions: techEnthusiasm (items 1, 3, 5) and techAnxiety (items 2, 4, 6). A high score in the techEnthusiasm and techAnxiety factors may suggest that the individual possesses a fundamental positive attitude or enthusiasm toward technology while also experiencing certain limitations. TechPH is a short, practical, and useful tool for health professionals to measure older adults' attitudes toward technology.

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Conflict of Interest

No conflict of interest has been declared by the authors. All authors read and approved the final manuscript.

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Ethical Statement

Ethics committee approval (Bayburt University Ethics Committee, date: 16.12.2022/decision no: 315-13) and institutional permission were obtained for the study.

Author Contributions

Concept: ESS; Design: ESS, VSÇ; Supervision: ESS, VSÇ; Data Collection and/or Processing: ESS, VSÇ; Analysis and/or Interpretation: ESS, VSÇ; Literature Search: ESS, VSÇ; Writing Manuscript: ESS, VSÇ; Critical Review: ESS, VSÇ

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