ISSN: 2757-6817

Unika Sağlık Bilimleri Dergisi
Unika Journal of Health Sciences

Araştırma Makalesi/Research Article

Validity and Reliability of Turkish Version of Physiotherapy Mobile Acceptance Questionnaire

Fizyoterapi Mobil Kabul Anketi Türkçe Versiyonunun Geçerliliği ve Güvenirliği

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Abstract: Objective: The aim of this study is to examine the validity and reliability of the Physiotherapy Mobile Acceptance Questionnaire (PTMAQ). Method: Structural equation modeling was used to analyze data collected by convenience sampling from a total of 421 physiotherapists actively working in health institutions in Turkey. Results: The reliability will increase when the reverse coded questions in the scale related to PEOU are revised and converted into positive statements. In addition, since the "Gait speed", "Gait Quality and balance" and "Pain/cognitive status" dimensions that make up the Likelihood of Recommending an mHealth Tool for Specific Clinical Purposes (LRMH) scale measure the same structure, it was seen that they should be collected in one dimension. In addition, it is thought that it would be appropriate to remove the ACTIV1, GAITQUAL3, BALANCE1, PAIN3 expressions, which are among the dimensions that make up the LRMH scale in the third part of the questionnaire, because they distort the factor structure, and the SPEED1, GAITQUAL1, PAIN1 expressions are expressions that measure similar situations within the same structure. Conclusions**:** It is predicted that a more valid and reliable measurement tool will be obtained as a result of the revisions to be made in the PTMAQ.
Keywords: Health, Mobile health apps, Physiotherapy mobile acceptance questionnaire, Technology assessment, Validity.

Öz: Amaç: Bu çalışmanın amacı Fizyoterapi Mobil Kabul Anketi'nin (PTMAQ) geçerlik ve güvenirliğini incelemektir. Gereç ve Yöntem: Türkiye'deki sağlık kurumlarında aktif olarak çalışan toplam 421 fizyoterapistten kolayda örnekleme yoluyla toplanan verilerin analizinde yapısal eşitlik modellemesi kullanıldı. Bulgular: Ölçekte PEOU ile ilgili ters kodlanan soruların revize edilerek olumlu ifadelere dönüştürülmesiyle güvenirlik artacaktır. Ayrıca Spesifik Klinik Amaçlar için mSağlık Aracı Önerilme Olasılığı (LRMH) ölçeğini oluşturan "yürüyüş hızı", "yürüyüş kalitesi ve denge" ile "ağrı ve bilişsel durum" boyutları aynı yapıyı ölçtüğü için tek boyutta toplanması gerektiği görülmüştür. Ayrıca anketin üçüncü bölümünde LRMH ölçeğini oluşturan boyutlardan ACTIV1, GAITQUAL3, BALANCE1 ve PAIN3 ifadelerinin faktör yapısını bozduğu için çıkarılmasının uygun olacağı düşünülmektedir. SPEED1, GAITQUAL1 ve PAIN1 ifadeleri ise aynı yapı içerisinde benzer durumları ölçen ifadelerdir. Sonuç: PTMAQ'da yapılacak revizyonlar sonucunda daha geçerli ve güvenilir bir ölçme aracının elde edileceği öngörülmektedir.
Anahtar Kelimeler: Sağlık, Mobil sağlık uygulamaları, Fizyoterapi mobil kabul anketi, Teknoloji değerlendirmesi, Geçerlilik.

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Makale Gönderim:05.05.2024 Makale Kabul:23.06.2024 Makale Yayın:27.08.2024

Introduction

Numerous studies have been done on the factors that influence and the level of acceptability of wearable or mobile health technologies (mHealth) (Gagnon et al., 2012; Glegg et al., 2013; Ho, 2013; Rai et al., 2013; Wu et al., 2007). However, little research was done on physiotherapists' thinking regarding the use of mHealth (Alam et al., 2020; Blumenthal et al., 2018; Hoque and Sorwar, 2017; Keel et al., 2023; Palos-Sanchez et al., 2021; Sezgin et al., 2018; Shiferaw and Mehari, 2019). Drawing on this gap in the literature, Blumenthal et al. (2018) aimed to measure physiotherapists' attitudes towards mHealth and evaluate the content validity of this measurement tool by using a modified technology acceptance model survey. In this direction, the perceived ease of use of mobile or wearable technology (MWT) has a positive and significant effect on perceived ease of use. In addition, the perceived usefulness of MWT also showed a significant and positive effect on the intention to use of early adopters. In addition, the MWT use intentions of early adopters were found to be correlated with clinical components identified. The effect of early adopters' MWT usage intentions on the probability of recommending an mHealth device for both gait speed and balance and gait quality was found to be statistically significant. However, its effect on non-biomechanical structure (pain-cognitive state) was not significant (Alam et al., 2020; Keel et al., 2023; Palos-Sanchez et al., 2021).

The purpose of this study was to determine whether the Physiotherapy Mobile Acceptance Questionnaire (PTMAQ), created by Blumenthal et al. (2018), was appropriate for assessing physiotherapists' attitudes and potential barriers to using mobile or wearable technology in their clinical practices. The Technology Acceptance Model (TAM) by Blumenthal et al. (2018) served as the foundation for PTMAQ, which was translated into Turkish and given to physiotherapists employed in Turkey. As a result, it is anticipated that the outcomes of applying the scale to the Turkish sample and language will aid in the scale's continued development. This work is significant because it adds a new PTMAQ to the body of literature and offers recommendations to scholars and researchers who plan to employ this scale in the future. From this perspective, the objective of the study was stated clearly. Then, the research methodology and analysis procedure were disclosed. Based on the findings, structural model and hypothesis tests were then conducted. On the basis of these findings, results and recommendations were shared. The aim of this study is to test the validity and reliability of the PTMAQ scale to measure the perceptions of physiotherapists towards the use of mHealth technologies, and to bring it into the literature.

Methods

Sample of the Study and Data Collection Process

To measure the physiotherapists' perceptions of using mHealth technologies and their probability of recommending, the Physiotherapy Mobile Acceptance Questionnaire (PTMAQ) scale was adapted into Turkish, and validity, reliability and hypothesis tests were carried out with the help of Explanatory and Confirmatory factor analyzes. The population of the research consists of physiotherapists who were active in health institutions in Turkey at the time of the study. However, since it is not possible to reach the population due to time and cost constraints, our students collected data from 421 physiotherapists with convenience sampling method from physiotherapists in health institutions where they did their school internship. All questionnaires were included in the analysis because there were no missing or incorrectly filled questionnaires. Structural Equation Modeling (SEM) was used to examine the relationships established between the variables in the research model.

As SEM models rely on tests that are sensitive to the significance of differences in the covariance matrix and sample size, the sample size should not be too small. Although there is no agreed-upon sample size, it is stated that the sample size should be determined by taking the model's complexity and the number of indicator variables into account. MacCallum et al. (1999) stated that a sample size of 10 times the number of expressions on the scale would be sufficient based on the ratio rule. According to the ratio rule, the sample size for the study involving 30 Likert expressions should be 300. Considering these limits that the sample size must meet, it is seen that the 421 questionnaires included in the evaluation provide the required sample size.

Data Collection Tools

The questionnaire was selected as the data collection tool since testing the research's assumptions would require gathering information from a sizable sample. Data on the study's variables were gathered using a Turkish translation of Blumenthal et al. (2018)'s Physiotherapy Mobile Acceptance Questionnaire (PTMAQ) scale. This scale revealed the attitudes of the participants (physiotherapists) that might influence their intentions towards mHealth practice by using a total of 8 expressions from the Perceived usefulness (4 expressions) and Perceived ease of use (4 expressions) variables. These expressions were obtained by applying the TAM model. The impact of these variables on early adopters' intention to use was then determined by asking a question with four assertions in it. Lastly, the influence of intention to use on intention/likelihood to suggest a mHealth tool for particular clinical goals was measured using 18 statements.

These 18 statements seek to ascertain the likelihood that physiotherapists will suggest MWT to patients based on the therapeutic utility of utilizing MWT in three dimensions: gait speed, gait quality and balance, and pain/cognitive condition. The statements on the scale were asked to be answered in a 5-point Likert format, where "1=Strongly Disagree" and "5=Strongly Agree." The authors of the PTMAQ scale, Blumenthal et al., were contacted via email and consent was obtained for the scale adaption process. Following that, it was translated into Turkish by five academicians with outstanding English language skills. An attempt was made to use the back translation approach in order to establish linguistic authenticity. An expert in the subject of English translated it into the target language, and then another expert in the target language translated it into English to find the similarities. As a result, it was concluded that the forms made separately in the two languages are similar. Forty physiotherapists were given a draft questionnaire prior to doing field research, and they were then in-person interviewed regarding concepts and expressions. In this way, the questionnaire's phrasing problems that might have caused misunderstandings were examined, and the final version was produced. The following pages include the findings from the scales' validity and reliability analyses.

Data Analysis

In this study, firstly, Exploratory Factor Analysis (EFA) was performed with SPSS 22 program to investigate the conceptual factors of the scales belonging to each variable forming the research model. A two-stage process was then adopted to test the research model with the aid of AMOS 22. While in the first stage, Confirmatory Factor Analysis-CFA was used for the measurement model, Structural Equation Modeling-SEM was used in the last one. The research model tested within the scope of the study is given in figure 1.

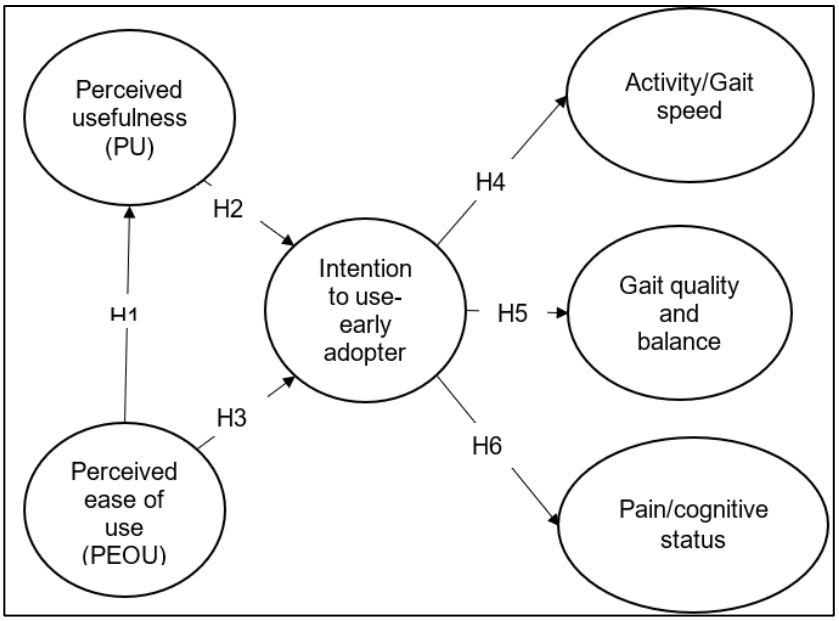

Figure 1. Research Model for Physiotherapy Mobile Acceptance Questionnaire

Results

The demographic characteristics of the participants are given in Table 1. 46.79% of the participants are male and 53.21% are female. It is seen that a majority of 60.33% of the participants are between the ages of 25-34. In addition, 60.57% of them have 1-4 years of professional experience, while 81.95% of them have a bachelor's degree.

Explanatory Factor Analysis

Exploratory Factor Analysis (EFA) was conducted to reveal the factor structure of 30 statements in the research sample. As a result of the factor analysis, the factor loads of the expressions, Cronbach's Alpha and explained variance values are shown in Table 2. It was observed that ACTIV1, GAITQUAL3, BALANCE1, PAIN3 expressions were not loaded on the relevant factor sufficiently and loaded on more than one factor. Since these coded statements disrupt the factor structure, it was deemed appropriate to remove them. When these factors were removed in different combinations, it was observed that factor concordance and distribution were impaired. In addition, the responses of the whole model in DFA were checked before discarding these factors.

Table 1: Socio-Demographic Information of Respondents (n=421)

Demographic Variables	Frequency	Percentage (%)
Gender		
Male	197	46.79
Female	224	53.21
Age, years		
<25	126	29.93
25-34	254	60.33
35–44	32	7.60
45–54	5	1.19
55+	4	0.95
Education Level		
Associate degree	7	1.66
Licence	345	81.95
Degree	57	13.54
Doctorate	12	2.85
Number of Professional Years		
>20	16	3.80
0 (Student)	19	4.51
1-4	255	60.57
11-20	37	8.79
5-10	94	22.33

In these controls, it was observed that it also disrupted the modification indices and fit indices values in the measurement model. Except for the PEOU scale (0.60), the Cronbach's Alpha values of all scales were over 0.70, and it can be said that the questionnaire has a reliable structure about the subject to be measured (Tabachnick and Fidell, 2013). George and Mallery (2010) stated that values between 0.70 and 0.60, which are considered as debatable, are acceptable values in social sciences. In addition, KMO (0.919) and Bartlett's Test of Sphericity results (7438.520; p=0.000) were found to be suitable for analysis because they provided the desired values (George and Mallery, 2010).

Confirmatory Factor Analysis

It was observed that the data obtained as a result of CFA were in the range of acceptable goodness-of-fit (brown, hu, George). Then, the validity and goodness-of-fit of the scales were tested with CFA. The CR (Composite Reliability = Combined Reliability; CR > 0.70) and AVE (Average Variance Extracted = Mean Variance Extracted; AVE > 0.50) values showing the reliability of the model and the values showing the goodness-of-fit of the model are presented in Table 3.

Table 2: Factor Analysis Results for the Variables

Item	**Mean**	**Factor loadings**	**Cronbach Alfa**
Usefulness in engagement and communication			0.858
PU1	4.07	0.717	
PU2	3.84	0.842	
PU3	4.01	0.634	
PU4	4.02	0.797	
Perceived difficulty of using MWT			0.600
PEOU1	2.90	0.407	
PEOU2	2.40	0.610	
PEOU3	3.43	0.491	
PEOU4	3.05	0.585	
Early adoptive behavior (Intention to use)			0.760
EA1	3.56	0.609	
EA2	3.89	0.644	
EA3	3.84	0.833	
EA4	4.03	0.383	
Clinical usefulness: activity and gait speed			0.901
ACTIVITY2	4.13	0.694	
ACTIVITY3	4.17	0.590	
SPEED1	4.15	0.882	
SPEED2	4.11	0.834	
SPEED3	4.19	0.886	
Clinical usefulness: gait quality and balance			0.907
GAITQUAL1	4.17	0.729	
GAITQUAL2	4.18	0.681	
BALANCE2	4.17	0.758	
BALANCE3	4.23	0.855	
Clinical usefulness: non-biomechanical measures			0.911
PAIN1	4.11	0.832	
PAIN2	4.11	0.868	
COG1	4.11	0.774	
COG2	4.05	0.682	
COG3	4.15	0.755	

EA= Early adopter; MWT= Mobile or wearable technology; PEOU=Perceived ease of use; COG= Cognitive status; Cronbach Alpha=0.883; KMO: 0.919; Total Variance Explained: %54.699

Table 3: AVE and CR Values of the Structural Model

Variables	**CR**	**AVE**
Gait quality Balance	0.898	0.687
PU	0.860	0.607
PEOU	***0.608***	***0.286***
EA	0.776	***0.468***
Pain Cognitive	0.902	0.650
Activity Gait speed	0.893	0.626

*Model Fit Results**:** $\chi 2=905.311$, DF=288, CMIN/DF=3.143, RMSEA=0.071, GFI=0.853, AGFI=0.821, CFI=0.915, TLI=0,904*

The two-stage approach proposed by Gerbing and Anderson (1988) was adopted for testing the measurement model. According to Values of fit indices, the AVE (0.286<0.50 and CR 0.608<0.7) values of the PEOU (0.608) scale and the AVE (0.468<0.50) of the EA scale

were found to be below the acceptable limit level to ensure convergent validity. In discriminant validity, correlation coefficients between constructs and square roots of AVE values are compared. Correlation values between constructs should be less than the square roots of the AVE values (Gerbing and Anderson, 1988). Table 4 shows the mean, standard deviation, correlation, and AVE values of the variables in the model.

Finally, we examined discriminant validity by comparing correlations between constructs and AVE values. As shown in Tables 5 the square root of the AVE for each factor is significantly greater than the correlation coefficients with the other factors and shows good discriminant validity (Brown and Cudeck, 1993).

Table 4: Differential Validity Results of the Measurement Model

Structures	Gaitquality Balance	PU	PEOU	EA	Pain Cognitive	Activity Gaitspeed
Gait quality balance	*0.829***					
PU	0.463**	0.779**				
PEOU	-0.041**	-0.091**	0.535**			
EA	0.537**	0.557**	0.006**	0.684**		
Pain cognitive	0.879**	0.415**	-0.026**	0.395**	*0.806***	
Activity gait speed	0.997**	0.486**	-0.047**	0.518**	0.902**	*0.792***
Mean	4.201	2.517	2.950	3.833	4.112	4.155
Standard deviation	0.501	0.385	0.703	0.608	0.550	0.488

*Note: ** p <0.01; The square root of the AVE is shown in bold on the diagonal, and italics indicate that it does not show good discrimination since the correlation coefficients are small.*

According to Table 4, the square root of the AVE for each factor, excluding Gait Quality Balance and Pain Cognitive, is significantly greater than the correlation coefficients for the other factors, demonstrating good discriminant validity (Joseph). Consequently, it is not true that all scales demonstrate reliability, convergent validity, and discriminant validity. However, it was determined to switch from CFA to path analysis in order to determine whether the goodness-of-fit values exceeded the determined reference values and how the research model (hypothesis test results).

Table 5: Hypothesis Results

Hypothesis	Structural paths			Estimates	p	S.E.	Statistical significance
H1	PU	<---	PEOU	-0.092	0.171	.070	Rejected
H2	EA	<---	PU	0.493	***	.086	Accepted
H3	EA	<---	PEOU	0.007	0.901	.072	Rejected
H4	AvtivityGaitspeed	<---	EA	1.004	***	.084	Accepted
H5	GaiqualityBalance	<---	EA	0.991	***	.103	Accepted
H6	PainCognitive	<---	EA	0.887	***	.090	Accepted

*Notes: ***p < 0.001;* ***Goodness-of-fit values:*** *$\chi 2$= 905.311, DF= 288, CMIN/DF= 3.143, p= 0.000, RMSEA=0.071, GFI= 0.853, AGFI= 0.821, CFI= 0.915, TLI= 0.904*

Structural models and testing hypotheses

The reliability and validity of the measurement model could not be ensured. However, since the goodness-of-fit values of the measurement model were within acceptable limits (3.143<5) and in order to see the hypothesis test results, the structural equation model was used. The AMOS output for the path analysis of the structural model is shown in figure 2.

It was determined that the fit indices obtained as a result of the path analysis were at an acceptable level of fit by meeting the values accepted in the literature. In table 5, hypothesis test results and goodness-of-fit values regarding the structural model of the research are given. In addition, standardized regression coefficients, significance (p) values and R^2 values are included.

In table 5, it is seen that the goodness-of-fit values of the Structural Model are in the desired range and the model exhibits a good fit. In addition, other hypotheses were accepted except H1 and H3 hypotheses. When the standardized regression coefficients were examined, no statistically significant effect of PEOU on PU and EA was found. When the R^2 values are examined; The ratio of PU and EA variables to explain the PEOU variable is 24%. Additionally, EA's Activity Gait speed, Gait Quality Balance, and Pain Cognitive disclosure rate exceeds 89 percent. The high rate of this rate is attributable to the propensity of physiotherapists, who are early adopters of new mobile or wearable technologies, to recommend them when they find them beneficial. It can be concluded that combining the LRMH scale into a single dimension would be appropriate, given that these physiotherapists intend to recommend a mHealth tool for specific clinical purposes if they find it to be useful and effective.

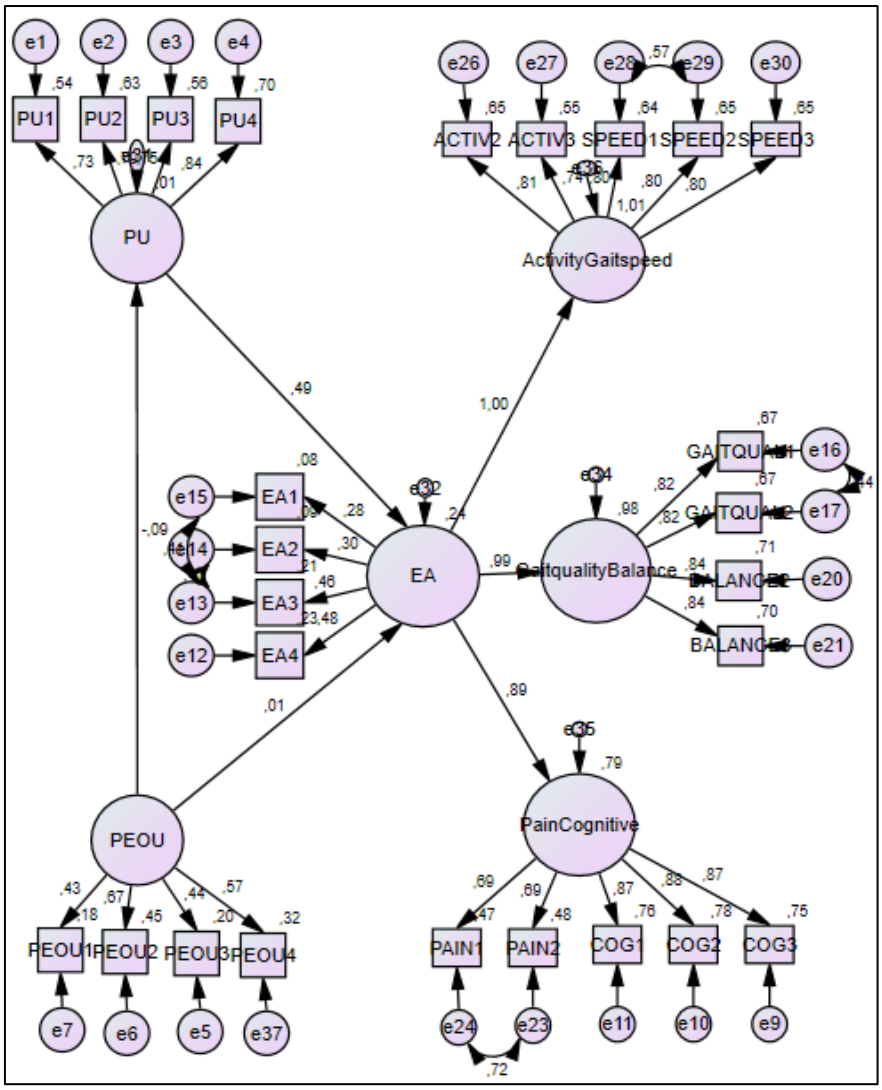

Figure 2. Structural Equation Model Used to Examine the Items of the Physiotherapy Mobile Acceptance Questionnaire

Discussion

The PTMAQ scale used by Blumenthal et al. (2018) was translated into Turkish and applied to Physiotherapists working in Turkey with convenience sampling method. First, the factor loads of the items (maximum likelihood), the dimensions under which these loads were collected, and the reliability coefficients of the scales were determined by performing explanatory factor analysis. Except for the PEOU scale (0.60), all scales' Cronbach's Alpha values were greater than 0.70, indicating that the questionnaire has a reliable structure regarding the subject being measured (Tabachnick and Fidell, 2013). In the literature, values between 1 and 0.9 are deemed excellent, values between 0.90 and 0.80 are deemed good, and values between 0.80 and 0.70 are deemed acceptable. However, George and Mallery (2010) stated that values between 0.70-0.60 are debatable. However, Jumnally (1978) and Hulin et al. (2001) stated that the range considered as debatable by George and Mallery (2010) is acceptable in

social sciences. Therefore, the PEOU scale with a reliability coefficient of 0.60 was accepted as reliable. As a result of the explanatory factor analysis, it was decided to remove the ACTIV1, SPEED1, PAIN3 statements from the "Likelihood of Recommending an mHealth Tool for Specific Clinical Purposes (LRMH)" scale, on the grounds that it disrupted the factor structure. The validity and reliability tests of the measurement model were then conducted using confirmatory factor analysis on the research model. The measurement model was tested using the two-stage method suggested by Gerbing and Anderson (1988). Standardized item loadings, Cronbach's Alpha values, composite reliability (CR), and average variance extracted (AVE) were examined for this. Three criteria served as the foundation for convergent validity evaluation. These parameters include each construct's AVE, CR, and measurement item dependability. By comparing the AVE values and looking at relationships between the constructs, discriminant validity was investigated (Gerbing and Anderson, 1988). It was observed that the AVE (0.286<0.50 and CR 0.608<0.7) values of the PEOU (0.608) scale was below the acceptable limit level. This result indicates that the PEOU scale cannot be considered reliable. In addition, convergent and discriminant validity was not observed for the Gait Quality Balance and Pain Cognitive variables of the LRMH scale. However, due to the fact that the goodness-of-fit values were above the determined reference values, it was decided to proceed to the path analysis after CFA in order to see how the research model worked. As a result of the hypothesis tests carried out, no significant effect of PEOU on PU was found. Also, similar to the results of Blumenthal et al. (2018) no significant effect of PEOU on EA was found.

Limitations

As with any measurement tool, the PTMAQ has some limitations. The data of the study were obtained from the physiotherapists actively working in health institutions in Turkey by using the convenience sampling method due to time constraints and difficulty in sampling. The research findings' external validity and generalizability are constrained in this situation. Therefore, the fact that the participants may have filled it out hastily and carelessly during work hours is considered a limitation. In terms of reflecting the perspectives of a specific age group, the fact that the majority of participants are younger than 34 years old and have a high level of technology use may be a limitation. It is suggested that future research employ a larger sample size with distinct characteristics (such as a physician, social worker, etc.).

Conclusions

In future studies, asking the reverse coded questions about PEOU in a revised way by transforming them into positive statements will increase the reliability of the PEOU scale. In addition, it is recommended that the "Activity/Gait speed", "Gait Quality and balance" and "Pain/cognitive status" dimensions that make up the LRMH scale should be collected in one dimension, since they measure the same structure. In addition, since it is seen that the ACTIV1, GAITQUAL3, BALANCE1, PAIN3 expressions in these dimensions deteriorate the factor structure, the SPEED1, GAITQUAL1, PAIN1 expressions are considered to be expressions that measure similar situations in the same structure, and it is thought to be appropriate to remove them. Accordingly, it is recommended to create a research model in a 4-factor structure including PU, PEOU, EA and LRMH dimensions according to the regulations recommended in future studies.

Ethics Approval: This study was approved by the Karabuk University Non-Interventional Ethics Committee (Approved number: 2021/636, Date: 29.09.2021) and conducted by the Declaration of Helsinki.

Funding: This research received no external funding.

Conflict of Interest: The authors declare no conflicts of interest.

Author Contributions: Idea: MY, MG; Design: MY, MG; Check: MY, ADK; Sources: MY, MG, ADK; Ingredients: MY; Data collecting: MY, MG; Analysis: ADK, VT; Literature Review: MY, MG, ADK, VT; Posted by: MY; Critical Review: MY, MG, ADK, VT.

Peer Review: Internal/External independent.

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