https://dergipark.org.tr/tr/pub/ijhmt Doi Number: 10.31201/ijhmt.1492798

Int Journal Of Health Manag. And Tourism 2024, 9(2), 221-243

JHMT Editorial

Internatıonal Journal Of Health Management And Tourism

Acceptance of Telerehabilitation Among Physiotherapists in Turkey and Factors Affecting Acceptance: A Cross-Sectional Analysis

Meral TİMURTAŞ* Gonca MUMCU**

* Research Asst., Marmara University, Faculty of Health Sciences, Istanbul, Turkey, ORCID Number: 0000-0002-8382-1976

** Professor, Okan University, Faculty of Dentistry, Istanbul, Turkey, ORCID Number: 0000-0002-2280-2931

Received: 30.05.2024
Accepted: 12.07.2024
Research Article

Abstract

Aim: This study aimed to assess the factors influencing the acceptance of telerehabilitation among physiotherapists in Istanbul.

Methods: A cross-sectional study was conducted among 170 PTs (F/M: 94/76, mean age:29.4 years) working in Istanbul. Data were collected through a questionnaire regarding scales of ‘‘Unified Theory of Acceptance and Use of Technology’’ (UTAUT) and ‘‘Perception of Innovation’’ (PoI). UTAUT has 5 components which are ‘‘Performance Expectancy’’ (PE), ‘‘Effort Expectancy’’ (EE), ‘‘Social Influence’’ (SI), ‘‘Facilitating Conditions’’ (FC), ‘‘Behavioral Intention’’ (BI). The model was modified by adding ‘‘Telerehabilitation Usage Behavior’’ (TUB) and ‘‘PoI’’ to these structures. After preliminary analyses, structural equation modelling was employed to assess relationships between key constructs and variables within the proposed model.

Corresponding author: Research Assistant., Meral TİMURTAŞ, e-mail: meral.timurtas@marmara.edu.tr

Cite This Paper:
Timurtaş, M., Mumcu, G. (2024). Acceptance of telerehabilitation among physiotherapists in Turkey and factors affecting acceptance: A cross-sectional analysis. *International Journal Of Health Management And Tourism, 9(2): 221-243.*

Results: The modified UTAUT model demonstrated a good fit for understanding the acceptance of telerehabilitation among physiotherapists, as indicated by favorable goodness-of-fit indices (SRMR = 0.03, GFI = 0.99, AGFI = 0.92, CFI = 0.97, and RMSEA = 0.00). This model accounted for 68% of the variance in ‘‘BI’’ to use telerehabilitation and 28% of the variance in ‘‘TUB’’. The results revealed that ‘‘BI” directly influenced ‘‘TUB’’ (β = 0.53) and ‘‘SI’’ directly affected ‘‘BI’’ (β = 4.96). Additionally, the relationship between ‘‘SI’’ and ‘‘BI’’ was found to vary with age (β =-5.81, p <0.05) when examining moderator variables.

Conclusion: This study emphasized the need to bridge the intention-behavior gap and consider context-specific factors to develop strategies for integrating telerehabilitation into clinical practice.

Keywords: Telerehabilitation, technology acceptance, physiotherapist, UTAUT, innovation perception.

INTRODUCTION

Modern technology advancements are causing a quick evolution in healthcare services. Numerous digital health applications that seek to improve healthcare's accessibility, efficacy, and affordability are at the core of this revolution. Digital hospital concepts, mobile health, e-health, and telemedicine are some of the more notable uses among them. E-health services are the most comprehensive among digital health concepts that differ from each other conceptually. E-Health services include a broader range of digital health applications, such as health information systems, electronic health records, and online health services (Moro-Visconti R. 2021). On the other hand, mobile health is used to provide health behavior interventions and healthcare services through mobile devices such as smartphones and tablets. Mobile health applications are becoming increasingly common to monitor patients via mobile devices and increase patient self-management (Riley et al., 2011).

Digital hospitals, characterized by high-tech infrastructure and advanced communication networks, refer to the delivery of largely digitized healthcare services by establishing systems that increase patient safety, quality of care, cost effectiveness and patient-centeredness through technologies such as artificial intelligence and mobile data (Brand et al., 2023). Telemedicine, a subset of e-health, specifically refers to the use of communication networks to deliver health services and medical education in different geographical locations. This allows for remote diagnosis, treatment, and follow-up, significantly enhancing access to healthcare for patients who are geographically isolated or have mobility issues (Sood et al., 2007).

Transitioning from telemedicine to more specialized applications, we encounter the concept of telerehabilitation. While telemedicine provides a broad range of healthcare services, telerehabilitation focuses specifically on the delivery of physiotherapy services remotely. Tele-rehabilitation is defined as the delivery of physiotherapy services remotely using telecommunication technologies, which has emerged as a promising approach to healthcare. It offers numerous advantages, including increased access to care for patients in geographically remote areas, improved convenience for those with transportation difficulties and potential cost savings for healthcare systems (McCue et al., 2010). Acceptance of telerehabilitation by both patients and physiotherapists (PTs) is crucial for its successful integration into mainstream healthcare, as their endorsement and utilization are critical to its success (Alonazi, 2021; Tousignant et al., 2011). Considering patients' perspectives, existing literature suggests a positive trend towards accepting telerehabilitation (Niknejad et al., 2021). Patients who have experienced it acknowledge its convenience and effectiveness, often highlighting the benefits of reduced travel time and the comfort of receiving therapy from home (Niknejad et al., 2021; Tyagi et al., 2018). However, studies focusing on PT's acceptance of telerehabilitation are limited. These are concentrated around telerehabilitation effectiveness, awareness, expectations, satisfaction and attitudes for physiotherapists (Albahrouh & Buabbas, 2021; Başer Seçer & Çeliker Tosun, 2022; Morri et al., 2024; Saaei & Klappa, 2021; Seron et al., 2021; Vellata et al., 2021). Additionally, existing studies extensively discuss PT's acceptance of telerehabilitation in relation to the Covid - 19 pandemic process and focus on telerehabilitation practices specific to stroke, Parkinson's or chronic diseases (Barry Walsh et al., 2024; Bezuidenhout et al., 2022; D'Souza & Rebello, 2021; Stephenson et al., 2022; Vellata et al., 2021).

The integration of telerehabilitation into standard practice not only expands service delivery models but also offers substantial advantages in terms of convenience, cost-efficiency, and patient engagement. Yet, despite these benefits, the rate of adoption and acceptance by PTs remains an essential factor influencing its widespread implementation (Suso-Martí et al., 2021). So, there is a critical need to understand the factors that facilitate or hinder PT's acceptance of telerehabilitation (Buabbas et al., 2022). Since PT's acceptance plays a key role in the successful implementation of telerehabilitation services, identifying and analyzing these factors is crucial for the evolution of rehabilitation services and healthcare delivery models (Alrushud et al., 2022; Buabbas et al., 2022). Our study is the first to investigate the factors affecting technology

acceptance of physiotherapists in the Turkish population. It also modifies the ‘‘Unified Theory of Acceptance and Use of Technology’’(UTAUT) model while investigating the factors affecting physiotherapists' acceptance of telerehabilitation within the UTAUT framework. It examines the factors in this modified acceptance model and the relationships between these factors.

Aiming to contribute to the literature on technology acceptance within the healthcare field, this research advocates for the utilization of a well-established theoretical framework to comprehensively evaluate the multifaceted factors influencing healthcare professionals' acceptance (Venkatesh & Davis, 2000; Venkatesh et al., 2003).

UTAUT has emerged as a reliable and well-validated model within healthcare research for such investigations (Williams et al., 2015). UTAUT posits that ‘‘Behavioral Intention’’ (BI) to use a technology, ultimately leading to its actual use, is influenced by four key constructs: ‘‘Performance Expectancy’’ (PE), ‘‘Effort Expectancy’’ (EE), ‘‘Social Influence’’ (SI), and ‘‘Facilitating Conditions’’ (FC). Additionally, factors like age, gender, experience, and voluntariness of use can moderate these primary constructs (Venkatesh & Davis, 2000; Venkatesh et al., 2003; Williams et al., 2015). By incorporating these additional elements into UTAUT structures, it is possible to investigate a broader range of factors affecting telerehabilitation acceptance and use. This study aims provides a richer interpretation of PTs' acceptance of telerehabilitation by taking into account the influence of all actors (such as colleagues, institutions, technological environment, social environment) with whom they interact in the provision of health services (Rahimi et al., 2018).

The current UTAUT model may overlook certain significant impacts on PT’s adoption of telerehabilitation. To address this, we will consider two additional factors. These factors are ‘‘Perception of Innovation’’ (PoI) and ‘‘Telerehabilitation Usage Behavior’’ (TUB). ‘‘Perception of Innovation’’ tells us how physiotherapists view telerehabilitation in terms of its newness and usefulness. ‘‘Telerehabilitation Usage Behavior’’, on the other hand, focuses on PT’s past experiences and current habits of using this technology (AlQudah et al., 2021; Rahimi et al., 2018). Through this tailored framework, the study’s goal is to offer a nuanced understanding that could inform strategies for the broader integration of telerehabilitation within the physiotherapy domain. Exploring PT’s acceptance of telerehabilitation affects strategies for patients receiving remote physiotherapy and telerehabilitation services to receive more effective and efficient service. It enables physiotherapists to understand the resistances of telerehabilitation. This makes it easier to

identify institutional actions aimed at breaking down resistances. It enables more effective planning of resource allocations for investments in the field of telerehabilitation. It facilitates the successful integration of the design of "better patient outcomes and a more efficient health system", which is the main purpose of remote health services, in the field of physiotherapy and rehabilitation. By understanding and addressing the particular concerns and expectations of PTs, greater acceptance can be encouraged, thereby enhancing the quality of patient care and strengthening the role of telehealth within rehabilitative sciences. This study aimed to investigate the factors influencing the acceptance and utilization of telerehabilitation for rehabilitation services among PTs at public hospitals in Istanbul.

1. RESEARCH METHODOLOGY

Study Design and Setting: In this cross-sectional study, data were collected from 13 public hospitals in Istanbul, to assess the acceptance of telerehabilitation by physical therapists and determine the influence of ‘‘Behavioral Intention’’, ‘‘Innovation Perception’’, ‘‘Age, ‘‘Gender’’, and ‘‘Professional Experience’’ on this acceptance.

Participants: The research population consisted of public hospitals located in Istanbul. The research sample was determined through convenience sampling from Istanbul Public Hospitals Administration 2.

13 hospitals with physical therapy units, affiliated with the Istanbul Public Hospitals Administration 2., were included in the study. Following obtaining permission from the Istanbul Provincial Health Directorate, introductory emails explaining the purpose of the study and containing a Google Forms link to the survey were sent to the administrators of the selected hospitals, who then forwarded it to the PTs working in their clinics. Participants were able to access the electronic survey by clicking on the link. The survey was conducted between March 2023 and May 2024. A total of 170 completed questionnaires were received from the 190 distributed, yielding a response rate of 89,47%.

The study was performed according to the principles of the Declaration of Helsinki and was approved by the Ethical Committee of Marmara University Institute of Health Science (23.05.2022-66).

Variables: The questionnaire consisted of three sections: The UTAUT questionnaire, the

Innovation Perception Scale, and questions obtaining to sociodemographic characteristics such as age, gender, number of working years, education levels.

The UTAUT is a well-established questionnaire for the assessment of technological acceptance and usage, known for its strong internal consistency and construct reliability, and proven convergent and discriminant validity. This questionnaire has been used within the Turkish demographic in prior research, presenting psychometric elements such as ‘‘Performance Expectancy’’, ‘‘Effort Expectancy’’, ‘‘Social Influence’’, ‘‘Facilitating Conditions’’, ‘‘Behavioral Intention’’, and ‘‘Technology Usage Behavior’’ (Venkatesh & Davis, 2000; Venkatesh et al., 2003). The UTAUT questionnaire includes a total of 19 items: 1-3 as part of ‘‘Performance Expectancy’’, 4-7 as part of ‘‘Effort Expectancy’’, 8-10 as part of ‘‘Social Influence’’, 11-14 as part of ‘‘Facilitating Conditions’’, and 15-17 as part of ‘‘Behavioral Intention’’. Responses to these items are scored on a five-point scale, from 'strongly disagree' (1) to 'strongly agree' (5). Additionally, the questionnaire utilized the innovation perception scale to assess PTs attitudes towards innovation (Karaçelik et al.). With 19 items also scored on a five-point scale, higher scores indicate a greater ‘‘Perception of Innovation’’.

Theoretical Framework: The present cross-sectional study operationalized the UTAUT as the conceptual framework underpinning the inquiry into the determinants of PTs’ ‘‘Behavioral Intentions’’ and ‘‘Technology Usage Behavior’’ in the field of telerehabilitation technology. The UTAUT model consist of our other four key theoretical constructs as pivotal in shaping an individual’s engagement with new technology ‘‘Performance Expectancy’’, ‘‘Effort Expectancy’’, ‘‘Social Influence’’, and ‘‘Facilitating Conditions’’ (Venkatesh & Davis, 2000; Venkatesh et al., 2003).

This study assessed ‘‘Performance Expectancy’’ to measure PT’s beliefs regarding the potential benefits and job performance improvements associated with telerehabilitation in their practice. Additionally, ‘‘Effort Expectancy’’ was included to evaluate the perceived ease or complexity of telerehabilitation systems from the PTs’ standpoint in a clinical context. ‘‘Social Influence’’ was included to assess the degree to which PT’s feel that their professional circle or organizational hierarchy values the acceptance of telerehabilitation technologies. Finally, ‘‘Facilitating Conditions’’ was included to elucidate the perceived availability and adequacy of infrastructural support for telerehabilitation. In this study, the UTAUT model was extended by incorporating a construct for innovation perception. This construct aimed to capture the inclination

of physiotherapists toward telerehabilitation and the degree to which this inclination influences both their behavioral intentions and usage behavior concerning telerehabilitation. Additionally, demographic variables, for age, gender, and duration of professional experience were included as exogenous variables to estimate their potential moderating effects on the primary UTAUT constructs. The integration of these demographic factors, along with innovation perception, as shown in Figure 1, into the UTAUT model, aims to propose an updated model of technology acceptance telerehabilitation practice.

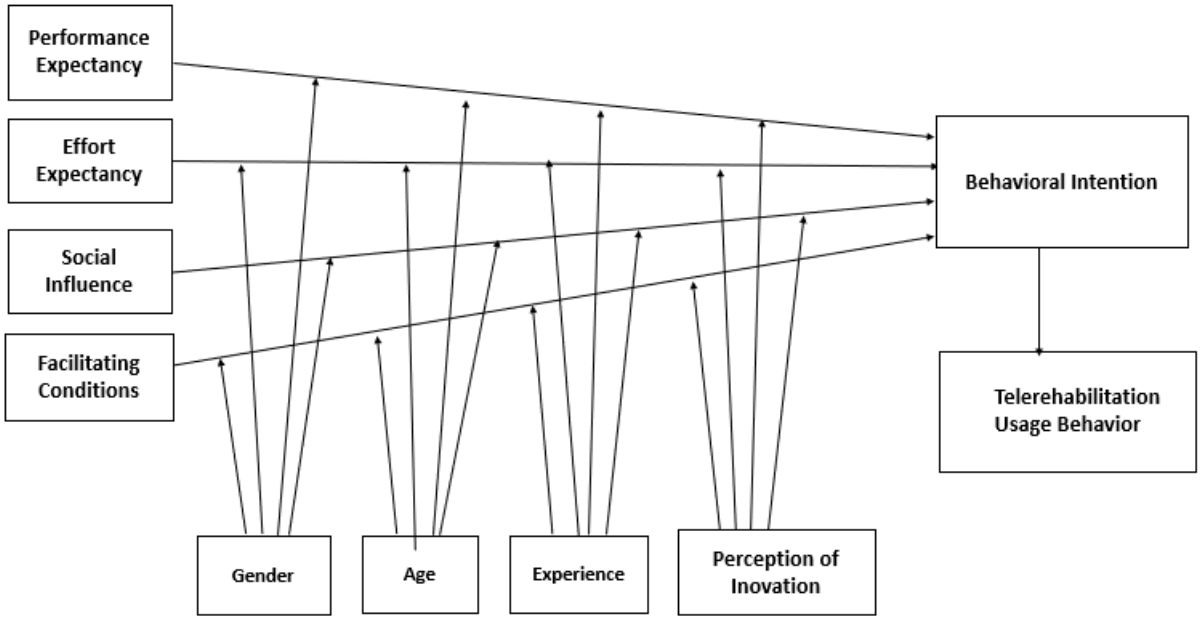

Figure 1: Modified UTAUT Model

2. ANALYSIS

This cross-sectional study was described using descriptive statistics were used the present the demographic profile of the participants. Structural equation modeling (SEM) was used to evaluate the alignment of the collected data with the UTAUT theoretical framework. SEM was particularly selected as it facilitates the concurrent examination of structural relationships (associations between observed variables) and measurement models (relationships involving latent constructs), thereby offering a comprehensive assessment of complex theoretical models (Avkiran, 2018). To evaluate the measurement model's reliability, we computed Cronbach's Alpha for the questionnaire sections to determine their internal consistency. The normality of the data distribution for each

questionnaire item was assessed via their skewness and kurtosis values, subsequent to which a confirmatory factor analysis was conducted.

Data were analyzed using Jamovi version 2.5 (The Jamovi Project, Sydney, Australia), a user-friendly, an open-source software statistical package. A series of fit indices, the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR) were selected to determine the model's goodness of fit. Acceptable model fit was inferred from CFI values of 0.95 or greater, RMSEA values below 0.08, and SRMR values under 0.10 (Avkiran, 2018; Ding et al., 1995; Smith & McMillan, 2001). The numerical values for the model fit indices are consolidated in Table 3. Once the fitness of the SEM model was confirmed, a detailed examination followed. This included an exploration of the interactions between the exogenous variables and ‘‘Behavioral Intention’’ as well as ‘‘Telerehabilitation Usage Behavior’’, the exploration of non-linear relationships, an analysis of the covariance structures among the endogenous variables, and an assessment of the latent variables' direct and indirect impacts on ‘‘Behavioral Intention’’ and ‘‘Telerehabilitation Usage Behavior’’.

Results of Analysis: A total of 170 PTs (F/M:94/76, age mean: 29,4 ± 5,8, years of practice: 9,5 ± 3,9) participated in the study, as their sociodemographic distributions are summarized in Table 1. The average age of participants was 29,4 years (±5,8), with females comprising 55,3% of the study population. A majority of the participants, 70.6%, practiced in general physiotherapy clinics. The average professional experience among the PTs was 9,5± (3,9) years. Additionally, a significant portion of the participants (82,4%), possessed an undergraduate educational level (Table 1). The preliminary analysis of correlations among variables in our path model revealed that while gender (r=0.068) and age (r=0.072) showed minimal direct influence on “Telerehabilitation Usage Behaviors”, experience (r=0.082) and “Perception of Innovation” (r=0.323) demonstrated modest correlations with usage behavior and perceptions of technology (Table 2). Age strongly correlated with experience (r=0.877), suggesting an intertwined relationship impacting other variables. Including moderating variables such as gender, age, experience, and “Perception of Innovation” is justified as they provide insights into how personal characteristics and professional background influence the adoption and utilization of telerehabilitation, underlined by their respective influences on the primary variables in the model.

Table 2. Sociodemographic Characteristics of Participants

Sociodemographic Variables	
Age, mean ± SD	29,4 ± 5.8
Years of practice, mean ± SD	9,5 ± 3,9
Gender, n (%)	
Female	94 (55,3)
Male	76 (44,7)
Education, n (%)	
Undergraduate	140 (82,4)
Master	25 (14,7)
PhD	5 (2,9)
Clinics (%)	
General rehabilitation	120 (70,6)
Orthopedic rehabilitation	32 (18,8)
Cardiopulmonary rehabilitation	10 (5,9)
Neurological rehabilitation	8 (4,7)
Total	170

Table 3: Correlation Coefficient Between Variables Under the Model

		PE*	SE*	FC*	BI*	TUB*	Gender	Age	Exp.*	PoI*
Performance Expectancy	**r**	,623**	,534**	,421**	,625**	,424**	-,025	-,012	,025	,206**
	p	,000	,000	,000	,000	,000	,752	,877	,761	,007
Effort Expectancy	**r**		,527**	,516**	,534**	,402**	-,019	-,065	-,027	,295**
	p		,000	,000	,000	,000	,811	,406	,740	,000
Social Influence	**r**			,675**	,648**	,451**	,032	-,083	-,066	,214**
	p			,000	,000	,000	,681	,285	,411	,005
Facilitating Conditions	**r**				,585**	,423**	-,103	-,165*	-,110	,163*
	p				,000	,000	,188	,034	,174	,036
Behavioral Intention	**r**					,534**	-,049	,007	,043	,302**
	p					,000	,532	,924	,595	,000
Telerehabilitation Usage Behavior	**r**						-,057	,072	,082	,323**
	p						,460	,348	,306	,000

Gender	**r**							,010	,014	,068
	p							,894	,864	,379
Age	**r**								,877**	-,024
	p								,000	,756
Experience	**r**									,061
	p									,443

**PE: Performance Expectancy *EF: Effort Expectancy *FC: Facilitating Conditions *BI: Behavioral Intention*

** TUB: Telerehabilitation Usage Behavior *Exp: Experience *PoI: Perception of Innovation*

Model Fit: Our model was reliable in terms of fit indices, and our model had acceptable fit values for SRMR (=0,03), GFI (=0,99), AGFI (=0,92), CFI (=0,97) and RMSEA (=0,08). In SEM analysis, fit index values range from 0 to 1 with 0 indicating the worst degree of fit, and 1 indicating the perfect fit (Ding et al., 1995). So, there was no value in the model test analysis that would prevent model fit. Model fit results are presented in Table 3.

Table 3: Model Fit Values

Model Fit Criteria	Value	Good fit	Acceptable fit
SRMR	0,03	0≤ SRMR ≤0,05	0,05≤ SRMR ≤0,10
GFI	0,99	0,95≤ GFI ≤1,00	0,90≤ GFI <0,95
AGFI	0,92	0,90≤ AGFI ≤1,00	0,85≤ AGFI <0,90
CFI	0,97	0,97≤ CFI ≤1,00	0,95≤ CFI <0,97
RMSEA	0,08	0≤ RMSEA ≤0,05	0,05≤ RMSEA ≤0,08

SRMR: Standardized Root Mean Square Residual, GFI: Goodness of Fit, AGFI: The (Adjusted) Goodness of Fit, CFI: Comparative Fit Index, RMSEA: Root Mean Square Error of Approximation

Direct and Indirect Effects: The independent variables of the UTAUT that we modified and used for this study were ‘‘Performance Expectation’’, ‘‘Effort Expectation’’, ‘‘Social İmpact’’, ‘‘Facilitating Conditions’’ and ‘‘Innovation Perception’’. The independent variables were ‘‘Behavioral Intention’’ and ‘‘Telerehabilitation Usage Behavior’’. We tested our hypothesized model against the data, which assumes that ‘‘Performance Expectancy’’, ‘‘Effort Expectancy’’, ‘‘Social Influence’’ and ‘‘Facilitating Conditions’’ had direct effects on ‘‘Behavioral Intention’’ and indirect effects on ‘‘Telerehabilitation Usage Behavior’’ through ‘‘Behavioral Intention’’. We

analyzed how the direct and indirect relationships among the mentioned variables were moderated by gender, age, experience, and ‘‘Perception of Innovation’’ variables. After completing the model fit test, direct and indirect effects were analyzed to estimate the relationships between the variables. Figure 2 presents the direct and indirect effects tested in the model.

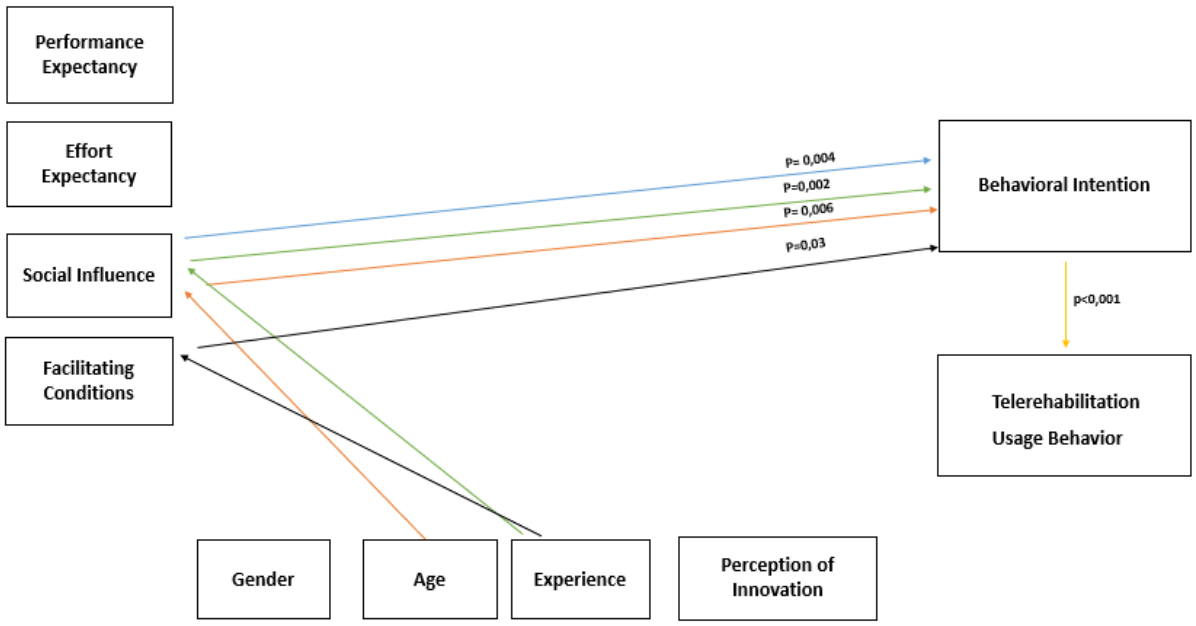

Figure 2: Final Path Analysis Results for the Direct and Indirect Relationships in the Modified UTAUT Model

Blue pathway: β:4,96 (0,004); Yellow pathway: β:0,53 (p<0,001); Orange pathway: β: -5,81 (0,006) Green pathway: β:4,42 (0,002); Black pathway: β: -3,03 (0,03)

Only significant pathways in model with p<0,05 are presented.

For the hypotheses tested in the model, only two **direct** effects were found to be statistically significant (p<0,005). These pathways are the direct effect of ‘‘Behavioural Intention’’ on ‘‘Telerehabilitation Usage Behaviour’’ (β = 0,53) and the direct effect of ‘‘Social Influence’’ on ‘‘Behavioural Intention’’ (β = 4,96). When the **indirect** effects were examined, the effect of ‘‘Social Influence’’ on ‘‘Telerehabilitation Usage Behaviour’’ through ‘‘Behavioural Intention’’ was found to be statistically significant (β=2,64, p<0,05), (Figure 2; See Supplementary Table I).

Analysis of Moderator Relationships: The results on how the direct and indirect relationships between the variables are moderated by the variables of gender, age, experience, and ‘‘Perception of Innovations’’ are presented in the Table 4 and Table 5. As for the direct relationships, the

examination of moderator variables revealed that the influence of age significantly alters the relationship between ‘‘Social Influence’’ and ‘‘Behavioral Intention’’ (β =-5.81, p <0.05). This suggests that as age increases, the impact of ‘‘Social Influence’’ on ‘‘Behavioral Intentions’’ progressively decreases. In addition, experience, which is measured by the length of time working in the profession, appeared to be important among the moderator variables. Experience moderated the effect on ‘‘Behavioural Intention’’ in terms of both ‘‘Social Influence’’ (β = 4,42, p<0,005) and ‘‘Facilitating Conditions’’ (β = -3,03, p<0,05). This indicates that greater experience enhances the effect of ‘‘Social Influence’’ on ‘‘Behavioral Intentions’’, while simultaneously reducing the impact of ‘‘Facilitating Conditions’’. We did not find a statistically significant effect of any other moderator variable on the **direct** relationships (Figure 3; See Supplementary Table II).

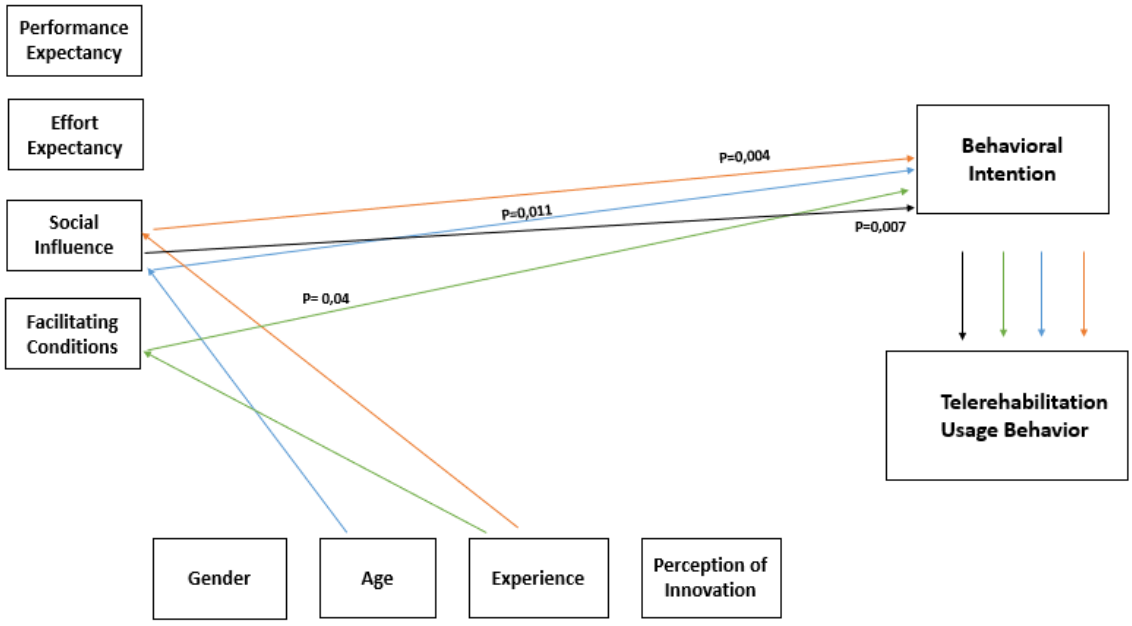

Figure 3: Path Analysis Results for Behavioral Intention as Moderating Variable in the Modified UTAUT model

Black pathway: β:2,64 (p:0,007); Blue pathway: β: -3,10 (p:0,011); Red pathway: β:2,35 (0,004); Green pathway: β: -1,61 (0,04) Only significant pathways in model with p<0,05 are presented.

We also analyzed the effects of moderator variables on **indirect** relationships. Age moderated the indirect effect of ‘‘Social Influence’’ on ‘‘Telerehabilitation Usage Behavior’’ through ‘‘Behavioral Intention’’ (β = -3,10, p<0,05). Similarly, to direct relationships, we found statistically significant results for experience. The indirect effect of both ‘‘Social Influence’’ (β = 2,35, p<0,005) and ‘‘Facilitating Conditions’’ (β = -1,61, p<0,05) on ‘‘Telerehabilitation Usage

Behavior'' through ''Behavioral Intention'' varied depending on professional experience (Figure 3). We did not find a statistically significant effect of any other moderator variable on the indirect relationships (See Supplementary Table III). According to the modified UTAUT framework, the Structural Equation Model depicting the acceptance of telerehabilitation is illustrated in Figure 2. "Behavioral Intention" explanatoryness was found to be R^2=0.68, while "Technology Usage Behavior" explanatoryness was found to be R^2=0.28.

3. DISCUSSION/CONCLUSION AND RECOMMENDDATIONS

This study investigated factors influencing PTs' acceptance of telerehabilitation. Specifically, it explored how these factors contribute to behavioral intention to use telerehabilitation, employing the modified UTAUT model with SEM analysis.

Our model shows good fit based on acceptable values for SRMR, GFI, AGFI, CFI, and RMSEA. This suggests the model effectively captures the underlying relationships in the data. The findings suggest that "Social Influence" and "Facilitating Conditions" indirectly influence "Telerehabilitation Usage Behavior" through "Behavioral Intention". This indirect effect, however, is contingent upon both the PT's age and experience.

The study revealed that two notable direct correlations: firstly, the PTs' intent predicted their actual use of telerehabilitation, and secondly, the extent to which their community influences them correlated with this intent. Furthermore, a significant indirect effect was identified, with "Social Influence" affecting "Telerehabilitation Usage Behavior" through "Behavioral Intention". In evaluating the acceptance of telerehabilitation among PTs, current literature has predominantly focused on "Behavioral Intention" as a principal outcome indicator (Cranen et al., 2012; Whitten et al., 2010). However, we opted for a more comprehensive assessment approach by integrating both "Behavioral Intention" and actual "Telerehabilitation Usage Behavior" into our model of telerehabilitation acceptance.

In our model, "Behavioral Intention" explanatoryness was found to be R^2=0.68, while "Telerehabilitation Usage Behavior" explanatoryness was found to be R^2=0.28. This suggests that factors beyond intention, potentially including access, technical fluency, and perceived usefulness, also influence PTs' ultimate acceptance of telerehabilitation. These results highlight the importance of employing a comprehensive approach to assess telerehabilitation acceptance. While

"Behavioral Intention" serves as a strong predictor, it is essential to consider actual "Telerehabilitation Usage Behavior" to gain a more complete understanding of PTs' engagement with this technology (Turner et al., 2010). This dual criterion not only enriches the understanding of the predisposition towards usage but also encapsulates the translation of that intention into tangible engagement with telerehabilitation services. The correlation between the PTs' intentions and their usage behaviors is crucial for a rounded interpretation of acceptance, reflecting the gap or congruence between what practitioner's plan to do and what they actually do in practice. By deploying the UTAUT model in our study, we capitalize on its ability to account for multiple determinants that influence users' acceptance and usage, providing a model and a nuanced arc of understanding regarding telerehabilitation acceptance amongst PTs. This model's comprehensive nature allows for a more accurate estimation of acceptance, capturing not only the antecedents of intention but also the conversion of that intention into actual use, which is particularly relate in the context of PTs adopting telerehabilitation paradigms. Furthermore, our study explored the moderating effects of "Perception of Innovation", experience, "Facilitating Conditions", and "Social Influence" on the relationships between the core constructs. While the moderating effect of "Perception of Innovation" was not statistically significant with the significant moderating effects of experience, "Facilitating Conditions", and "Social Influence" warrant further discussion. This finding aligns with other studies that have reported mixed results on the influence of demographic factors on technology acceptance. For instance, in their comprehensive UTAUT model, suggest that while age can affect technology use, its impact can be minimal in contexts where the technology is perceived as highly innovative or where usage is deemed essential regardless of age (Venkatesh & Davis, 2000; Venkatesh et al., 2003). This suggests that the perceived novelty or utility of innovations like telerehabilitation may override traditional age-related differences in technology adoption. Further research might explore whether these results hold in differing cultural or clinical settings, or whether shifts in technological landscapes could alter these dynamics.

The experience effect suggests that PTs with more telerehabilitation experience demonstrate a stronger link between "Behavioral Intention" and "Telerehabilitation Usage Behavior" (Cottrell et al., 2017; Theodoros et al., 2008). This aligns with established theories like the Theory of Planned Behavior, which posits that past behavior influences "Behavioral Intention" and "Facilitating Conditions" (Godin & Kok, 1996). This indicates that the environment can

influence how intention translates into action, suggesting the importance of providing PTs with the necessary resources to effectively utilize telerehabilitation tools. Future research could explore the specific factors that bridge the intention-behavior gap in the context of telerehabilitation acceptance among PTs. This exploration could involve qualitative studies to delve deeper into PTs' experiences and the facilitators or barriers they encounter when using telerehabilitation tools.

In the present study, which employed the modified UTAUT model, it was demonstrated that "Social Influence" impacts "Behavioral Intention", and in turn, "Behavioral Intention" acts as a mediator in determining the "Telerehabilitation Usage Behavior" of PTs toward telerehabilitation. A possible interpretation of these nuanced dynamics is the voluntary basis of the PTs' participation. Studies indicates that in situations where participation is voluntary, the impact of "Social Influence" tends to fade (Godin et al., 2008). In contrast, when technology adoption is compulsory, social effect exerted by colleagues or networks gain a heightened significance (Lu et al., 2005). It is crucial to consider that "Social Influence" can manifest and operate through three separate pathways: compliance, where behavior is shaped by external pressures; internalization, where actions are guided by the integration of beliefs and values; and identification, where individuals adopt behaviors to align with the norms of a specific social group (Venkatesh & Davis, 2000). In inquiries into the role of "Social Influence" on the "Behavioral Intention", to use technology, it's noted that "Social Influence" may not significantly impact professionals' populations such as physicians, given their inherent professional independence (Duyck et al., 2010). Similarly, a study with Canadian PTs revealed a small effect of "Social Influence" on "Behavioral Intention", which stands in contrast to our study (Liu et al., 2015; Schaper & Pervan, 2007). This variation could be explained by the degree of autonomy within the practice environments; PTs Canada probably operate more autonomously than those in Turkey.

According to the UTAUT model, "Facilitating Conditions" were identified not only as a direct determinant of "Behavioral Intention" to utilize telerehabilitation but also indirectly influence "Telerehabilitation Usage Behavior" through the mediating role of "Behavioral Intention". This mediation implies that while facilitating conditions directly affect the intention, their impact on usage behavior is realized through the intention to use telerehabilitation. Additionally, the moderating factors like organizational and technical support enhance or alter the effect of "Facilitating Conditions" on "Behavioral Intentions". The more robust these supports, the higher the acceptance rate among PTs. Indeed, this complex interplay illustrates that "Facilitating

Conditions" predominantly influence PTs' employment of telerehabilitation in rehabilitation. Multiple studies, including those by Aggelidis & Chatzoglou (2009) and Zhou (2012), have demonstrated a positive association between "Facilitating Conditions" and "Behavioral Intention" across various technologies among healthcare professionals, thus underscoring the critical role of moderators in shaping these relationships.

In our study, in which the Unified Theory of Technology Acceptance and Use (UTAUT) was used, UTAUT was compared to other models such as Technology Acceptance Model (TAM and TAM2), Unified TAM and Theory of Planned Behavior (C-TAM-TPB), Innovation Diffusion Theory (IDT), Social Cognitive Theory showed superior predictive power. (SCT) and Motivation Model (MM), but its application in telerehabilitation, a subset of rehabilitation, has not been widely studied. The primary contribution of our study is to demonstrate how UTAUT can be effectively applied to telerehabilitation admission in a hospital specializing in rehabilitation. Additionally, our research builds on existing theoretical work on telerehabilitation for physiotherapy by detailing the key factors that influence both the purpose and actual adoption of telerehabilitation practices. This study investigated the factors influencing PTs' acceptance of telerehabilitation. We employed the Unified Theory of Acceptance and Use of Technology (UTAUT) model and found that "Social Influence and "Facilitating Conditions" indirectly influence "Telerehabilitation Usage Behavior" through "Behavioral Intention". It was found that 68% of "Behavioral Intention" to use telerehabilitation and 28% of "Telerehabilitation Usage Behavior" are explained by our modified UTAUT model. The importance of both intention and actual usage for a comprehensive understanding of telerehabilitation acceptance is also highlighted by this study. This study contributes to the field in several ways. First, it demonstrates the effectiveness of UTAUT in predicting telerehabilitation acceptance among PTs Second, it identifies key factors influencing both intention and actual usage. Finally, it explores the moderating effects of experience and "Facilitating Conditions", providing valuable insights for promoting telerehabilitation acceptance.

This study has several limitations. First, unlike the original UTAUT study which tracked participants over time (Venkatesh et al., 2003), our research captured PTs' perceptions, intentions, and current use of telerehabilitation at a single point (cross-sectional design). Given that only limited number of studies have applied UTAUT to technology acceptance, it is necessary from the perspective of validating and extending the model's applicability over time, that future longitudinal studies are conducted to compare our findings with those of Venkatesh's seminal work (Mącznik

et al., 2015) Further studies using UTAUT are recommended to explore its limitations, validity, and applicability in the context of telerehabilitation adoption. The other limitation of this study lies in the omission of the specific telerehabilitation technologies employed. The study shows telerehabilitation as a monolithic concept, neglecting the possibility that the type of technology (e.g., video conferencing, virtual reality applications) may significantly influence both usage patterns and behavioral responses. Future research efforts in this domain would benefit from a more nuanced approach that considers the diverse types of telerehabilitation technologies and their potential impact. Another limitation is there's a potential for social desirability bias. Participants may have been more likely to express positive views on telerehabilitation due to a desire to please researchers. Additionally, we did not receive managerial opinions in terms of health policy, which is another significant limitation as such insights could provide valuable context for the implementation and scalability of telerehabilitation practices. Further studies using UTAUT are recommended to explore its limitations, validity, and applicability in the context of telerehabilitation adoption.

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

Funding: The authors declared that this study had received no financial support.

References

Albahrouh, S. I., & Buabbas, A. J. (2021). Physiotherapists' perceptions of and willingness to use telerehabilitation in Kuwait during the COVID-19 pandemic. *BMC medical informatics and decision making*, *21*, 1-12.

Alonazi, A. (2021). Effectiveness and acceptability of telerehabilitation in physical therapy during COVID-19 in children: findings of a systematic review. *Children*, *8*(12), 1101.

AlQudah, A. A., Al-Emran, M., & Shaalan, K. (2021). Technology acceptance in healthcare: a systematic review. *Applied Sciences*, *11*(22), 10537.

Alrushud, A., Alamam, D., Alharthi, A., Shaheen, A., Alotaibi, N., AlSabhan, R., Alharbi, S., Ali, N., Mohammed, E., & Sweeh, J. (2022). Physical therapists' perceptions of and satisfaction with delivering telerehabilitation sessions to patients with knee osteoarthritis during the Covid-19 pandemic: Preliminary study. *Musculoskeletal Care*, *20*(4), 926-936.

Avkiran, N. K. (2018). An in-depth discussion and illustration of partial least squares structural equation modeling in health care. *Health care management science*, *21*, 401-408.

Barry Walsh, C., Cahalan, R., Hinman, R. S., & O'Sullivan, K. (2024). Exploring attitudes of people with chronic health conditions towards the use of group-based telerehabilitation: A qualitative study. *Clinical Rehabilitation*, *38*(1), 130-142.

Başer Seçer, M., & Çeliker Tosun, Ö. (2022). Examination of telerehabilitation knowledge, awareness, and opinions of physical therapy and rehabilitation students. *Medical Science Educator*, *32*(6), 1355-1365.

Bezuidenhout, L., Joseph, C., Thurston, C., Rhoda, A., English, C., & Conradsson, D. M. (2022). Telerehabilitation during the COVID-19 pandemic in Sweden: a survey of use and perceptions among physiotherapists treating people with neurological diseases or older adults. *BMC health services research*, *22*(1), 555.

Brand, D., Nienaber McKay, A. G., & Cengiz, N. (2023). What constitutes adequate legal protection for the collection, use and sharing of mobility and location data in health care in South Africa?. *South African Journal of Science*, *119*(5-6), 1-7.

Buabbas, A. J., Albahrouh, S. E., Alrowayeh, H. N., & Alshawaf, H. (2022). Telerehabilitation during the COVID-19 pandemic: patients and physical Therapists' experiences. *Medical Principles and Practice*, *31*(2), 156-164.

Cottrell, M. A., Hill, A. J., O'Leary, S. P., Raymer, M. E., & Russell, T. G. (2017). Service provider perceptions of telerehabilitation as an additional service delivery option within an Australian neurosurgical and orthopaedic physiotherapy screening clinic: a qualitative study. *Musculoskeletal Science and Practice*, *32*, 7-16.

Cranen, K., Drossaert, C. H., Brinkman, E. S., Braakman-Jansen, A. L., IJzerman, M. J., & Vollenbroek-Hutten, M. M. (2012). An exploration of chronic pain patients' perceptions of home telerehabilitation services. *Health expectations*, *15*(4), 339-350.

D'Souza, A. F., & Rebello, S. R. (2021). Perceptions and willingness of physiotherapists in India to use telerehabilitation during the COVID-19 pandemic. *International journal of telerehabilitation*, *13*(2).

Ding, L., Velicer, W. F., & Harlow, L. L. (1995). Effects of estimation methods, number of indicators per factor, and improper solutions on structural equation modeling fit indices. *Structural Equation Modeling: A Multidisciplinary Journal*, *2*(2), 119-143.

Duyck, P., Pynoo, B., Devolder, P., Voet, T., Adang, L., Ovaere, D., & Vercruysse, J. (2010). Monitoring the PACS implementation process in a large university hospital--discrepancies

between radiologists and physicians. *J Digit Imaging*, *23*(1), 73-80. https://doi.org/10.1007/s10278-008-9163-7

Godin, G., Bélanger-Gravel, A., Eccles, M., & Grimshaw, J. (2008). Healthcare professionals' intentions and behaviours: a systematic review of studies based on social cognitive theories. *Implementation science*, *3*, 1-12.

Godin, G., & Kok, G. (1996). The theory of planned behavior: a review of its applications to health-related behaviors. *American journal of health promotion*, *11*(2), 87-98.

Karaçelik, B. T., Beyhan, T. E., Aksu, P. K., Kitapçı, N. Ş., Kitapçı, O. C., Köksal, L., Yay, M., İşçi, E., Çatar, R. Ö., & Mumcu, G. THE INNOVATION PERSPECTIVE OF EMPLOYEES IN A PRIVATE HOSPITAL. *International Journal of Health Management and Tourism*, *6*(3), 579-593.

Liu, L., Miguel Cruz, A., Rios Rincon, A., Buttar, V., Ranson, Q., & Goertzen, D. (2015). What factors determine therapists' acceptance of new technologies for rehabilitation – a study using the Unified Theory of Acceptance and Use of Technology (UTAUT). *Disability and Rehabilitation*, *37*(5), 447-455. https://doi.org/10.3109/09638288.2014.923529

Lu, J., Yao, J. E., & Yu, C.-S. (2005). Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology. *The Journal of Strategic Information Systems*, *14*(3), 245-268. https://doi.org/https://doi.org/10.1016/j.jsis.2005.07.003

Mącznik, A. K., Ribeiro, D. C., & Baxter, G. D. (2015). Online technology use in physiotherapy teaching and learning: a systematic review of effectiveness and users' perceptions. *BMC medical education*, *15*, 1-12.

McCue, M., Fairman, A., & Pramuka, M. (2010). Enhancing quality of life through telerehabilitation. *Physical Medicine and Rehabilitation Clinics*, *21*(1), 195-205.

Moro-Visconti, R., & Moro-Visconti, R. (2021). E-Health and Telemedicine Startup Valuation. *Startup Valuation: From Strategic Business Planning to Digital Networking*, 341-361.

Morri, M., Ruisi, R., Culcasi, A., & Peccerillo, V. (2024). The Effectiveness of Telerehabilitation for Functional Recovery After Orthopedic Surgery: A Systematic Review and Meta-Analysis. *Telemedicine Reports*, *5*(1), 78-88.

Niknejad, N., Ismail, W., Bahari, M., & Nazari, B. (2021). Understanding telerehabilitation technology to evaluate stakeholders' adoption of telerehabilitation services: a systematic

literature review and directions for further research. *Archives of Physical Medicine and Rehabilitation*, *102*(7), 1390-1403.

Rahimi, B., Nadri, H., Afshar, H. L., & Timpka, T. (2018). A systematic review of the technology acceptance model in health informatics. *Applied clinical informatics*, *9*(03), 604-634.

Riley, W. T., Rivera, D. E., Atienza, A. A., Nilsen, W., Allison, S. M., & Mermelstein, R. (2011). Health behavior models in the age of mobile interventions: are our theories up to the task?. *Translational behavioral medicine*, *1*(1), 53-71.

Saaei, F., & Klappa, S. G. (2021). Rethinking telerehabilitation: attitudes of physical therapists and patients. *Journal of patient experience*, *8*, 23743735211034335.

Schaper, L. K., & Pervan, G. P. (2007). ICT and OTs: A model of information and communication technology acceptance and utilisation by occupational therapists. *International Journal of Medical Informatics*, *76*, S212-S221.

Seron, P., Oliveros, M.-J., Gutierrez-Arias, R., Fuentes-Aspe, R., Torres-Castro, R. C., Merino-Osorio, C., Nahuelhual, P., Inostroza, J., Jalil, Y., & Solano, R. (2021). Effectiveness of telerehabilitation in physical therapy: a rapid overview. *Physical therapy*, *101*(6), pzab053.

Smith, T. D., & McMillan, B. F. (2001). A Primer of Model Fit Indices in Structural Equation Modeling.

Sood, S., Mbarika, V., Jugoo, S., Dookhy, R., Doarn, C. R., Prakash, N., & Merrell, R. C. (2007). What is telemedicine? A collection of 104 peer-reviewed perspectives and theoretical underpinnings. *Telemedicine and e-Health*, *13*(5), 573-590.

Stephenson, A., Howes, S., Murphy, P. J., Deutsch, J. E., Stokes, M., Pedlow, K., & McDonough, S. M. (2022). Factors influencing the delivery of telerehabilitation for stroke: A systematic review. *PLoS One*, *17*(5), e0265828.

Suso-Martí, L., La Touche, R., Herranz-Gómez, A., Angulo-Díaz-Parreño, S., Paris-Alemany, A., & Cuenca-Martínez, F. (2021). Effectiveness of telerehabilitation in physical therapist practice: an umbrella and mapping review with meta–meta-analysis. *Physical therapy*, *101*(5), pzab075.

The jamovi project (2024). jamovi (Version 2.5) [Computer Software]. Retrieved from https://www.jamovi.org

Theodoros, D., Russell, T., & Latifi, R. (2008). Telerehabilitation: current perspectives. *Studies in health technology and informatics*, *131*(1), 191-210.

Tousignant, M., Boissy, P., Moffet, H., Corriveau, H., Cabana, F., Marquis, F., & Simard, J. (2011). Patients' satisfaction of healthcare services and perception with in-home telerehabilitation and therapists' satisfaction toward technology for post-knee arthroplasty: an embedded study in a randomized trial. *Telemedicine and e-Health*, *17*(5), 376-382.

Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and software technology*, *52*(5), 463-479.

Tyagi, S., Lim, D. S., Ho, W. H., Koh, Y. Q., Cai, V., Koh, G. C., & Legido-Quigley, H. (2018). Acceptance of tele-rehabilitation by stroke patients: perceived barriers and facilitators. *Archives of Physical Medicine and Rehabilitation*, *99*(12), 2472-2477. e2472.

Vellata, C., Belli, S., Balsamo, F., Giordano, A., Colombo, R., & Maggioni, G. (2021). Effectiveness of telerehabilitation on motor impairments, non-motor symptoms and compliance in patients with Parkinson's disease: a systematic review. *Frontiers in neurology*, *12*, 627999.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

Whitten, P., Holtz, B., & Nguyen, L. (2010). Keys to a successful and sustainable telemedicine program. *International journal of technology assessment in health care*, *26*(2), 211-216.

Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of acceptance and use of technology (UTAUT): a literature review. *Journal of enterprise information management*, *28*(3), 443-488.

SUPPLEMENTARY

Table I: Direct and Indirect Effects Between Exogenous and Endogenous Variables

Variables	Standardized Regression Coefficients	P value
Behavioral Intention → Telerehabilitation Usage Behavior	,53	<0,001***
Performance Expectancy → Behavioral Intention	-2,51	0,11
Effort Expectancy → Behavioral Intention	,35	0,79
Social Influence → Behavioral Intention	4,96	0,004**
Facilitating Conditions → Behavioral Intention	-1,66	0,24
Indirect Effects		
Variables	**Standardized Regression Coefficients**	**P value**
Performance Expectancy→ Behavioral Intention → Telerehabilitation Usage Behavior	-1,33	0,11
Effort Expectancy → Behavioral Intention → Telerehabilitation Usage Behavior	,19	0,79
Social Influence → Behavioral Intention → Telerehabilitation Usage Behavior	2,64	**0,007***
Facilitating Conditions → Behavioral Intention → Telerehabilitation Usage Behavior	-,88	0,24

**** = p<0,001, ** = p<0,005, * = p<0,05,*

Table II: Moderator Analysis of the Direct Relationships

Variables	Standardized Regression Coefficients	P value
Performance Expectancy: Gender → Behavioral Intention	,47	0,27
Effort Expectancy: Gender →Behavioral Intention	-,40	0,34
Social Influence: Gender→ Behavioral Intention	-,38	0,23
Facilitating Conditions: Gender →Behavioral Intention	,28	0,36
Performance Expectancy: Age →Behavioral Intention	4,20	0,11
Effort Expectancy: Age →Behavioral Intention	-1,41	0,53
Social Influence: Age→ Behavioral Intention	-5,81	**0,006***
Facilitating Conditions: Age→ Behavioral Intention	3,17	0,12
Performance Expectancy: Experience→ Behavioral Intention	-3,28	0,11
Effort Expectancy: Experience→ Behavioral Intention	1,60	0,36
Social Influence: Experience→ Behavioral Intention	4,42	**0,002****
Facilitating Conditions: Experience→ Behavioral Intention	-3,03	**0,03***
Performance Expectancy: Perception of Innovation →Behavioral Intention	,98	0,27
Effort Expectancy: Perception of Innovation → Behavioral Intention	,40	0,64
Social Influence: Perception of Innovation →Behavioral Intention	-1,55	0,10
Facilitating Conditions: Perception of Innovation → Behavioral Intention	,24	0,73

**** = p<0,001, ** = p<0,005, * = p<0,05,*