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Research

Adoption of tele health technology in mental and psychiatric services in Lebanon: a quantitative study

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Abstract

Background The rapid adoption of telemedicine during the COVID-19 pandemic showcased its capacity to revolutionize healthcare by augmenting accessibility, decreasing expenses, and improving patient outcomes. This study evaluated Lebanon's preparedness for the implementation of tele-mental health, concentrating on identifying critical factors affecting its adoption by mental health experts.

Methods A self-administered questionnaire was created and disseminated through email to mental health practitioners in Lebanon. The study employed the Extended Technology Acceptance Model (TAM2) and utilized the Partial Least Squares- Structural Equation Modeling (PLS-SEM) to provide a quantitative analysis of the determinants influencing the adoption of tele-mental health in psychiatric services.

Results Among the 138 respondents including psychiatrists, psychologists, and mental health nurses, 20% indicated they had never utilized telehealth for mental health services, whereas 54% had employed telehealth prior to the COVID-19 shutdown and expressed a desire to persist with its use. Furthermore, 19% utilized telehealth throughout the lockdown and continued its application, while 8% ceased its usage after the lockdown. The research revealed five primary factors affecting tele-mental health adoption: perceived usefulness, perceived ease of use, perceived risk, subjective norms, and job relevance.

Conclusion This study highlights the significance of perceived usefulness, ease of use, perceived risk, subjective norm, and job relevance as essential factors influencing the uptake of tele-mental health services. Policymakers, healthcare administrators, and technology developers must concentrate on these criteria to optimize the introduction and sustainability of tele-mental health services in clinical practice, thereby ensuring enhanced mental health care delivery in Lebanon.

Keywords Telehealth · Tele mental health · Mental health · Technology adoption · User acceptance · TAM2 · Health technology

1 Background

The delivery of healthcare has experienced significant transformations in the last twenty years, propelled by the swift integration of technological innovations. Digital advances have facilitated substantial advancements in mental health services, especially in care delivery and treatment [1].The COVID-19 pandemic highlighted the critical importance of digital transformation, exposing the global rise in mental health issues and the urgent need for uninterrupted access

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to care [2]. Physicians and other health professionals experienced a substantial rise in telehealth visits, ranging from 50 to 175 times the number of patients via telehealth compared to pre-pandemic levels with notable acceptance in both high-income and low- to middle-income countries [1, 3]. To ensure long-term improvements in mental health care, it is critical to address the factors influencing the adoption of technological innovations, particularly Tele Mental Health (TMH). Studies from the United States reported a 683% increase in telehealth visits at major health institutions, highlighting its scalability and impact [4]. Similarly, in Europe, telehealth adoption rates tripled across primary and mental health services, addressing the growing mental health crisis exacerbated by the pandemic [5]. Se individuals in Low- and Middle-Income Countries (LMICs) encounter restricted access to mental health providers, notwithstanding the increasing prevalence of disorders such as anxiety, depression, and stress. Obstacles including geographic remoteness, financial constraints, societal shame, and a deficiency of mental health practitioners intensify this problem. Moreover, insufficient healthcare infrastructure in LMICs limits access for significant segments of the population [6]. The World Psychiatric Association-Lancet Psychiatry Commission on the Future of Psychiatry has emphasized the need for digital psychiatry to reform traditional mental health care services, a need that has only become more pressing in the post-COVID-19 era [5]. Mental health services constituted 32% of all telehealth consultations worldwide throughout the pandemic, highlighting their essential function in maintaining care provision amid limited circumstances [7]. Tele mental health has distinctly enhanced mental health care by surmounting obstacles such as geographic distance, stigma, and the scarcity of professionals. Overcoming the obstacles to TMH adoption is essential for the progression of mental health care delivery.

1.1 Mental health in Lebanon

Lebanon is a distinctive case study, illustrating both the potentials and obstacles of TMH implementation in LMICs. The mental health situation in Lebanon has been exacerbated by economic collapse, political instability, and the COVID-19 pandemic. The pandemic and the Beirut port explosion has markedly elevated the incidence of depression, anxiety, post-traumatic stress disorder (PTSD), and stress [8, 9]. Moreover, the economic hardship and social isolation have exacerbated the demand for mental health care [10]. Nevertheless, societal stigma frequently hinders individuals from seeking assistance, resulting in just 19% of those with mental health illnesses in Lebanon obtaining treatment [11].Furthermore, the nation encounters a deficiency of professionals, with merely two psychiatrists for every 100,000 individuals [12]. This has led to straining the health care system.

1.2 Tele health and the pandemic

TMH provides mental health treatments by telephone and videoconferencing, ensuring prompt care delivery, addressing transportation barriers, and minimizing absenteeism [13]. The COVID-19 pandemic expedited the implementation of telehealth, facilitating the continuity of care amid social isolation and increased stress [14]. Research has evidenced TMH's efficacy in augmenting accessibility, reducing expenditures, and enhancing patient outcomes [13, 14]. Researchers emphasize the capacity of digital technology to close the mental health care disparity in the Middle East [12]. The swift embrace of telehealth in Lebanon amid the pandemic indicates an increasing receptiveness to digital healthcare alternatives. During the pandemic, telehealth adoption in Lebanon escalated from 6 to 74%, propelled by the pressing demand for accessible services [15, 16]. Studies indicate that telehealth can reduce expenses [17] and improve healthcare accessibility, particularly in rural regions [18].Moreover, a study done on young Lebanese adults indicated that 64% demonstrated a desire to utilize tele-dermatological treatments, implying a greater acceptance of telehealth modalities that may also encompass mental health care [19]. Although these developments underscore the potential for TMH adoption, there is a lack of thorough review into its application in mental health services, especially concerning the factors that affect healthcare practitioners' ongoing use of TMH technologies.

1.3 Adoption of tele mental health in Lebanon

TMH offers substantial economic and logistical advantages while tackling mental health issues [20]. Nonetheless, other obstacles impede its implementation, such as privacy issues, limitations in technology infrastructure, and inadequate training for providers [21, 22]. Establishing trust via stringent data protection and thorough training for healthcare personnel is crucial for effective TMH deployment [23]. Mobile technologies provide creative ways to enhance access to mental

health services in LMICs such as Lebanon, where healthcare infrastructure is frequently insufficient [6, 24]. The National Mental Health Strategy of Lebanon (2023–2030) prioritizes the incorporation of digital tools to improve mental health treatment. TMH ought to be regarded as a dependable, effective, and lasting healthcare option, rather than merely a transient measure for crises [25]. Comprehending the determinants influencing TMH adoption in Lebanon is essential for tackling obstacles and promoting effective integration. Additional studies are required to investigate these issues, providing significant insights for healthcare practitioners, governments, and IT firms to enhance TMH preparedness and implementation [11, 26, 27]. TMH notably developed as a crucial resource for mental health services, enabling specialists to access patients in remote or underserved regions while alleviating the strain on overburdened healthcare facilities. Nonetheless, despite its potential, the adoption of TMH encounters obstacles, all of which require rigorous investigation within the Lebanese context.

This study seeks to correlate the Lebanese experience with global trends by assessing the preparedness for tele-mental health implementation among mental health practitioners. The study employs the Extended Technology Acceptance Model (TAM2) to investigate critical aspects affecting the adoption of TMH (an essential although inadequately explored domain of digital psychiatry), hence enhancing the comprehension of telehealth integration in LMICs. It examines the factors affecting telehealth adoption in mental and psychiatric healthcare services. It aims to answer the study research question: *What elements affect providers' decisions and intentions to implement telehealth in mental and psychiatric services?* This study will validate the pertaining hypotheses to help answer this research question.

2 Methods

2.1 Study design and target population

This research employed quantitative modeling methodology to examine the determinants affecting telehealth adoption in mental and psychiatric healthcare services. The study explicitly examined the determinants influencing telehealth adoption through TAM2 among mental health practitioners in Lebanon.

2.2 Study population and sampling

The research focused on psychiatrists, psychologists, and nurses affiliated with the Lebanese Order of Physicians, Psychologists, and Nurses, who specialize in mental and psychiatric care. Psychiatrists administer pharmacotherapy and psychotherapy, psychologists implement therapeutic procedures, and nurses furnish essential support in patient education, medication management, and treatment facilitation.

2.3 Study design

A systematic, self-administered questionnaire was created following a comprehensive literature review and in accordance with the conceptual framework. The questionnaire was designed to evaluate critical factors affecting the adoption of tele-mental health (TMH) among mental healthcare providers. The questionnaire (refer to appendix 1) consisted of nine parts containing 24 items, evaluated on a 5-point Likert scale ranging from strongly disagree [1] to strongly agree [5]. It comprised sections aimed at gathering sociodemographic characteristics (e.g., age, gender, occupation, and years of professional experience) and telehealth-specific dimensions, including perceptions of job relevance, perceived usefulness, intention to use, subjective norm, quality of interaction, perceived ease of use, perceived risk, and subjective norms. In addition, participants were inquired about their initiation of TMH services, specifically whether it occurred before, during, or after the COVID-19 lockdown, or whether they had never utilized TMH services.

The completed survey was validated to verify consistency, adherence to the TAM2 framework, and its appropriateness for evaluating factors affecting tele-mental health adoption. This meticulous method guaranteed the survey's dependability and pertinence to the study's objective. The questionnaire pilot testing and validation procedure entailed the selection of experts according to their knowledge and relevance to the study, the collection of comments, and the refinement of items to guarantee clarity and alignment with research objective. Input from experts in public health, psychiatry, and psychology improved the survey's content validity and practical significance. Substantial modifications encompassed enhancing item articulation, incorporating alternatives tailored to the Lebanese context (e.g., "widowed"

for marital status), and integrating a neutral Likert scale response. In addition, two more questions were incorporated to examine previously neglected facets of tele-mental health adoption.

2.4 Research model: extended technology acceptance model

This study adopted TAM 2 because of its robust connection with the objective and contextual data of TMH adoption in Lebanon. TAM is a conceptual framework to assess their attitudes of healthcare practitioners on the implementation of information technology [28]. TAM2 enhances the original TAM by integrating dimensions like subjective norms, job relevance, and perceived risk, which are essential for comprehending the adoption behaviors of mental health professionals in intricate social and organizational contexts [29]. It provides a comprehensive framework for understanding technology adoption. These categories encompass critical elements such as sociocultural effects, the perceived usefulness of TMH in professional activities, and apprehensions regarding privacy and security—obstacles particularly prominent in Lebanon's resource-limited healthcare system [30]. This approach has been extensively utilized to examine developing technologies, such as mobile health services [31, 32]. Research substantiates the efficacy of TAM2 in anticipating adoption trends and mitigating user difficulties [33–35]. Literature established the reliability of TAM2 in developing countries, highlighting its adaptability [36].

In reference to other models such as the Unified Theory of Acceptance and Use of Technology (UTAUT), this model prioritizes facilitating conditions and performance expectancy, which presupposes a strong technological infrastructure and institutional preparedness. However, these factors are less applicable in Lebanon, where the adoption of TMH is influenced more by individual attitudes and sociocultural dynamics which serve as foundational factors in the process of technology adoption. Hence, TAM2 has been thoroughly evaluated in telemedicine and healthcare settings, including LMICs, demonstrating its adaptability in contexts with infrastructural difficulties. TAM2 has been effectively utilized to examine mobile health adoption in sub-Saharan Africa and telehealth uptake in India, where perceived usefulness, subjective norms, and perceived risk markedly impacted acceptance [37, 38]. Furthermore, TAM2 provides a comprehensive paradigm for examining TMH adoption in Lebanon by effectively capturing the intricate interactions among behavioral, organizational, and technological aspects, thereby resolving both theoretical and practical deficiencies. Hence, this research utilizes TAM2 as the research model, integrating essential constructs to analyze TMH adoption in Lebanon (refer to Fig. 1).

Figure 1 illustrates the different constructs or latent variables in this research model, which are subjective norm, job relevance, quality of interaction, user experience, perceived usefulness, perceived ease of use, intention to use, and perceived risk in reference to the modified technology acceptance model (extended TAM or TAM 2).

2.5 Selection of variables

These variables form the foundation of the conceptual framework, offer a comprehensive understanding of the factors influencing healthcare professionals' adoption of telehealth technologies and their intention to use them. Subjective

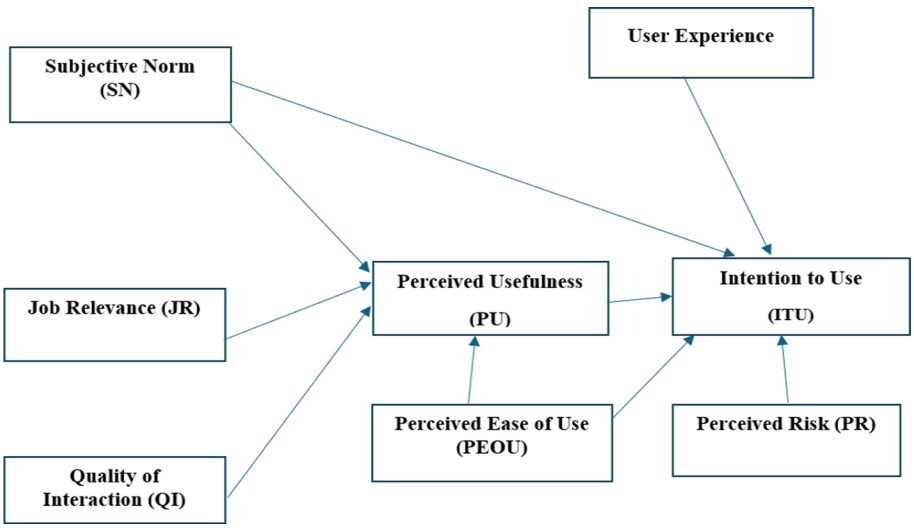

Fig. 1 Tele-health Services in Mental and Psychiatric Services Research Model

Norm (SN), derived from the Theory of Reasoned Action (TRA) and TAM2, denotes the perceived social pressure or impact in a workplace about the adoption of contemporary technologies [29]. Job Relevance (JR) emphasizes the perceived relevance of a technology to professional responsibilities; technologies that directly assist in job functions are more likely to gain acceptance [29, 39]. Quality of Interaction (QI) refers to user interaction with technology, including system usability and communication efficiency, and emphasizes the importance of user experience for sustained adoption [29]. User Experience (Exp) encompasses the emotional dimensions of user interaction, which are vital in telemedicine contexts, as a favorable user experience might affect ongoing platform utilization [29]. Perceived Risk (PR) denotes the potential negative outcomes or uncertainties associated with technology adoption, such as privacy and security concerns or clinical errors, which are particularly relevant in healthcare settings [29]. Perceived Usefulness (PU) is the belief that using a particular technology enhances job performance; technologies perceived as improving efficiency and patient outcomes are more likely to be adopted [28]. Moreover, perceived ease of use (PEOU), assesses the effort required to use a system, with user-friendly systems being more readily adopted by healthcare practitioners [28]. Lastly, Intention to Use (ITU) signifies an individual's preparedness and inclination to embrace a technology, shaped by attitudes, subjective standards, perceived ease of use, and perceived risk [28, 29].

2.6 Data collection

We initiated direct communication with the pertinent professional organization of psychiatrists, psychologists, and nurses. Data from these organizations and the Ministry of Public Health in Lebanon indicated that there are 70 psychiatrists and roughly 200 psychologists registered in the ministry and currently practicing in Lebanon. Nonetheless, precisely determining the quantity of nurses specialized in mental health has been difficult due to the lack of a current database that outlines their workplace places. This constraint impeded our capacity to accurately target a greater number of mental health nurses during the survey dissemination process. To improve clarity, we delineated the study's objective, estimating that participants could finish the questionnaire in 3–5 min. Data collection was executed using electronic mail, including a link that detailed the study's objective, methods, and informed consent process, so ensuring participants' willingness to engage. Follow-up reminders were dispatched to promote participation and underscore the significance of their contributions in the prompt submission of the questionnaire [39]. The data collection period extended from February 2023 to January 2024. Of the 70 psychiatrists contacted, 31 responded, while 94 out of 200 psychologists responded. Hence, the response rates for the study were 44.3% for psychiatrists and 47% for psychologists. The response rates demonstrate a significant degree of participation from both professional categories, indicating a wide representation of mental health practitioners in Lebanon. This degree of engagement improves the validity of the results while recognizing the possibility of response bias.

2.7 Data analysis

Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected for data analysis because of its ability to accommodate small to medium sample sizes, manage intricate models, and prioritize the maximization of explained variance (R^2) in dependent variables, rendering it particularly appropriate for exploratory and predictive research [40, 41]. In contrast to Covariance-Based SEM (CB-SEM), which necessitates higher sample sizes and presumes multivariate normality, PLS-SEM demonstrates resilience to non-normal data and is particularly suitable for exploratory settings where theoretical models are in development [42]. This adaptability is especially pertinent to the adoption of TMH in Lebanon, were infrastructural limitations and restricted population size pose difficulties. Furthermore, PLS-SEM adeptly manages both reflective and formative constructs, guaranteeing that essential elements such as perceived usefulness, subjective norm, and perceived risk are precisely collected and represented. The predictive emphasis corresponds with the study's objective to discover and examine factors affecting TMH adoption, offering practical insights for enhancing healthcare delivery in resource-limited environments. The selection of PLS-SEM instead of CB-SEM demonstrates its enhanced adaptability to the methodological and contextual demands of the investigation, hence bolstering the reliability and validity of the results [43, 44].

Moreover, we employed SMART PLS version 4 to evaluate construct reliability and validity, as well as to compute path coefficients. The data gathered from google forms was exported to excel for validation, annotation, and refinement. Responses from the Likert scale were transformed into ordinal variables and stored in a.csv file and subsequently loaded

into SMART PLS for analysis. Questions for each construct were designated appropriately (e.g., SN1, SN2 for subjective norm indicators). The Likert scale data [1–5] was organized for reporting purposes. Throughout the data cleansing procedure, missing values and inaccurate entries were meticulously addressed to maintain the dataset's integrity. Entries with significant missing data that could jeopardize the analysis were eliminated. A listwise deletion method was employed for minor missing values to preserve consistency among variables and constructs, ensuring that only complete data points were utilized for PLS-SEM analysis. This approach mitigated bias and enhanced the dependability of the findings. Moreover, all data were meticulously examined for precision prior to being input into SMART PLS for analysis.

Descriptive statistics were employed for demographic analysis. The measurement model was initially evaluated for reliability and validity through metrics like Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE) [45]. Upon validation, the structural model was assessed by analyzing path coefficients, R-squared values, predictive relevance (Q2), and effect sizes (f2). Methods such as bootstrapping and blindfolding were utilized to guarantee robustness. The findings from these analyses corroborated hypothesis testing and facilitated the identification of factors affecting participants' intention to utilize telehealth. The results of the data analysis were subsequently evaluated based on the study's objective, hypotheses, and existing literature, yielding significant insights and practical implications for both policy and practice.

2.8 Sample size determination and verification

A primary method for establishing the minimum sample size in PLS-SEM is the '10-times rule,' which indicates that the sample size must be no less than 10 times the maximum number of formative indicators for a construct [46]. Literature recommends that a minimum of 90 participants is necessary for this model, which has 9 arrows linking the components (refer to Fig. 1) [46]. To ensure precision, we retrospectively confirmed the sample size with the minimum R-squared method and referencing Cohen's power tables [47]. The significance level was established at 0.05, with a statistical power of 0.8 and a minimum R-squared criterion of 0.225. The upper limit of arrows aimed at a construct, specifically Intention to Use (ITU), is five. The sample size of 138 surpassed the requisite minimum, therefore affirming adherence to sample size standards.

2.9 Ethical considerations

This study obtained permission from the Ethics Committee of Saint Joseph University of Beirut (reference number 2095), affirming adherence to ethical principles concerning autonomy and participant protection. Voluntary involvement of participants was guaranteed, and consent was secured prior to the initiation of data collection. All methods employed in this study were performed in strict accordance with the applicable ethical guidelines and regulations, as approved by the ethics committee of Saint Joseph University of Beirut. In addition, all data were anonymously secured and stored, with access limited to approved personnel alone.

3 Results

3.1 Descriptive analysis

A total of 138 participants filled out the questionnaire.75% of the participants were females. Geographically, Mount Lebanon accounted for the largest percentage of responders (47%), with Beirut coming in second (31%). According to the age distribution, 42% of participants were between the ages of 20 and 30, and 28% were between the ages of 31 and 40. Although participants' levels of education varied, most had a master's degree (59%), followed by a doctoral degree (20%). Moreover, psychologists made up the largest category in terms of professional roles (68%), with psychiatrists coming in second (23%). Most respondents stated that they have practiced their profession for 0–5 years (45%). The demographic variables were analyzed using descriptive statistical methods and the significant findings presented above are displayed and elaborated upon Table 1.

Table 1 Socio-demographic characteristics of study participants (n = 138)

Variable	n [%]
Geographical Location	
Beirut	43 [31%]
Bekaa	7[5%]
Mount Lebanon	65 [47%]
Nabatiyeh	2 [1%]
North Lebanon	5[4%]
Unanswered	16[12%]
Gender	
Male	29 [21%]
Female	104 [75%]
Unanswered	5[4%]
Age	
> 70 years old	1 [1%]
20–30 years	58 [42%]
31–40 years	39 [28%]
41–50 years	24 [17%]
51–60 years	8[6%]
61–70 years	3 [2%]
Unanswered	5 [4%]
Education	
Bachelor's degree	11 [8%]
Doctorate/Post Doc Degree	11 [8%]
Master's degree	82 [59%]
Medical Doctor	27 [20%]
Unanswered	5 [5%]
Practice	
Nurse	13 [9%]
Psychiatrist	31 [23%]
Psychologist	94 [68%]
Experience	
0–5 years	62 [45%]
6–10 years	25 [18%]
11–15 years	20 [14%]
16–20 years	16 [12%]
21 + years	15 [11%]

3.2 Evaluation of the model

Following the literature, we performed our analysis by importing our model into SmartPLS and running the Partial Least Squares (PLS) algorithm. The preliminary phase of assessing the reflective measurement model involves examining the indicator loadings. A factor weight of 0.708 or greater is deemed to possess adequate validation to interpret latent constructs [48]. Following literature, we perform the convergent validity test by examining the loading factor value of each indicator against the construct [48]. Indicators with loadings of ≥ 0.708 were considered significant, and an AVE value for each construct exceeding 0.5 was acceptable. Subsequently, we assessed the construct reliability. In conclusion, all constructions met the required validity and reliability standards. The model now satisfies its convergent reliability criteria and is considered the definitive valid model (refer to Fig. 2) with outer loading factors. Through the estimation of several regression equations, we identified the coefficients in the structural model pertaining to the relationships among the constructs.

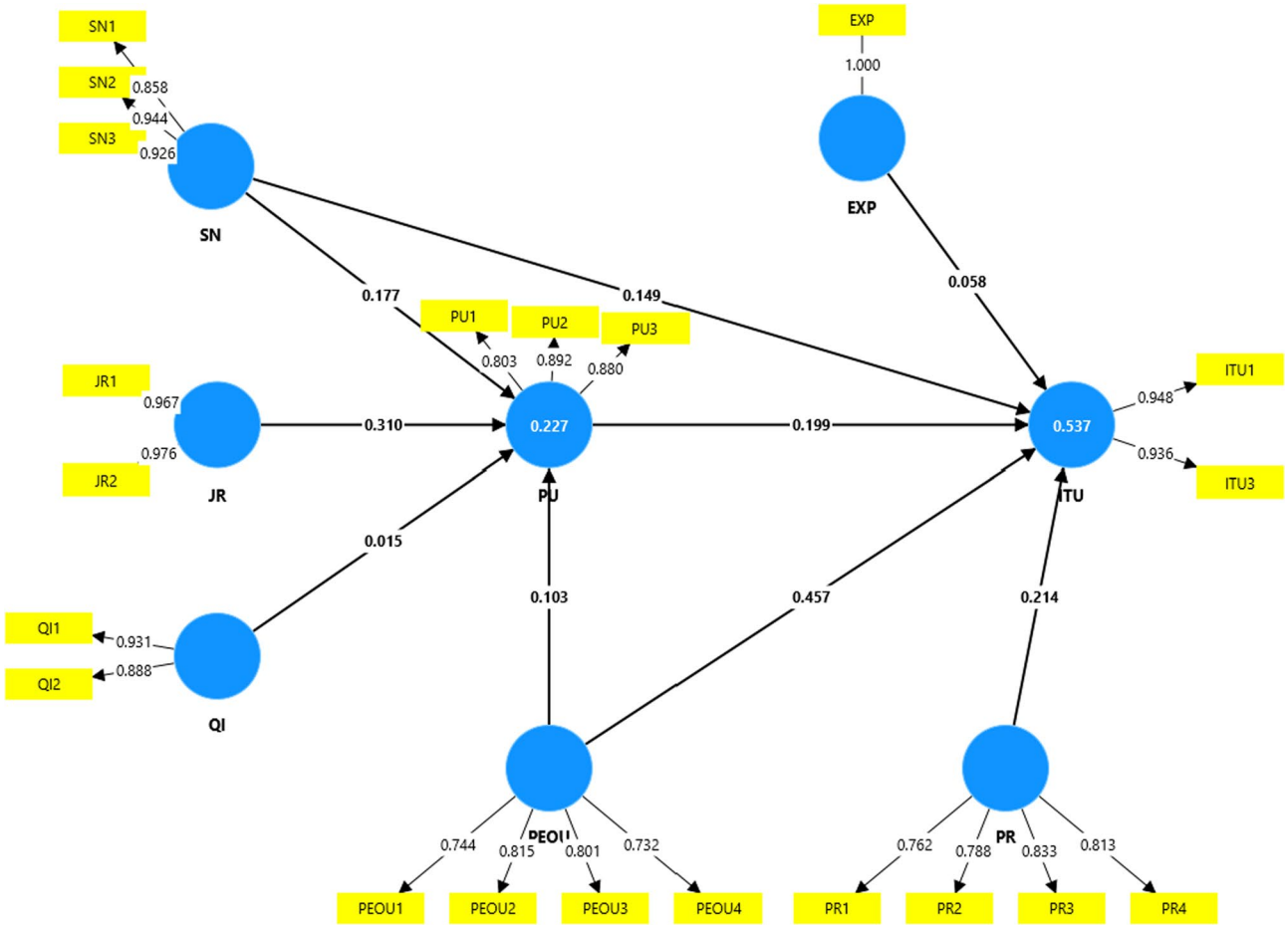

Fig. 2 Final valid model-with outer loading factors

Figure 2 shows the two R values for the endogenous constructs: perceived usefulness and intention to use. In PLS-SEM, R-squared signifies the extent to which the variation in endogenous latent variables (dependent variables) is elucidated by external latent factors (independent variables). The scale extends from 0 to 1, with elevated values signifying more explanatory ability. R values of 0.75, 0.50, and 0.25 denote considerable, moderate, and weak explanatory capacities, respectively [45].The R2 value for perceived usefulness is 0.227, whereas the R2 value for intention to use is 0.537. Specifically, the R value of 0.227 for perceived usefulness suggests weak explanatory power, with the following exogenous constructs accounting for 22.7% of its variation: subjective norm, job relevance, quality of interaction, and perceived ease of use. On the other hand, intention to use showed a higher R of 0.537, indicating moderate explanatory power. This suggests that 53.7% of its variance is accounted for by the exogenous variables: perceived risk, experience, perceived ease of use, perceived usefulness, and subjective norm.

3.3 Discriminant validity

The model is reflective; thus, validation can be achieved via confirmatory factor analysis (CFA), encompassing convergent and discriminant validity, as well as reliability testing. Table 2 presents the HTMT ratios for the constructs EXP, ITU, JR, PEOU, PR, PU, QI, and SN, evaluating the Discriminant Validity Heterotrait-Monotrait Ratio (HTMT). The Fornell-Larcker criterion was employed to compare the Average Variance Extracted (AVE)for each construct with the squared correlations among constructs. The research indicated that the shared variance among constructs did not surpass their respective AVE values, demonstrating good discriminant validity.

Table 2 Discriminant validity

Discriminant Validity-Heterotrait-monotrait (HTMT)-Matrix								
	EXP	ITU	JR	PEOU	PR	PU	QI	SN
EXP								
ITU	0.086							
JR	0.147	0.708						
PEOU	0.039	0.732	0.603					
PR	0.338	0.616	0.403	0.421				
PU	0.191	0.578	0.491	0.361	0.697			
QI	0.131	0.741	0.592	0.635	0.565	0.31		
SN	0.323	0.386	0.42	0.17	0.483	0.358	0.18	

3.4 Construct reliability and validity

Table 3 presents the composite reliability values (rho_a and rho_c) span from 0.778 (PEOU) to 0.958 (JR) for rho_a, and from 0.856 (PEOU) to 0.971 (JR) for rho_c, all exceeding the 0.7 threshold. AVE values span from 0.599 (PEOU) to 0.943 (JR), with all constructions, excluding PEOU, exceeding the 0.5 criterion. Although most constructs satisfied these standards, PEOU demonstrated a marginally lower AVE, suggesting possible constraints in comprehensively representing its fundamental aspects. The diminished AVE indicates that although PEOU is a significant construct, its assessment may require further modification to enhance its convergent validity. These findings underscore the necessity for future study to investigate if more context-specific items could more effectively assess the ease with which healthcare professionals embrace telehealth technologies. Notwithstanding this constraint, the overall reliability and validity of the measurement model remain strong. These measures demonstrate that the constructs possess high reliability and validity, rendering them appropriate for further research. In conclusion, all constructions have satisfied the necessary criteria for validity and reliability.

3.5 Hypothesis testing

Table 4 displays the path coefficients (original sample [O]) together with their corresponding means, standard deviations, T statistics, and P values for different relationships in a structural model. PEOU has a substantial impact on the ITU with coefficients of 0.457. The corresponding P values are 0.000 and 0.312, respectively.

We conducted the effect test using the p-value tests and t-statistics in the partial least squares (PLS) analysis model of the SmartPLS 4.0 software (refer to Table 4). A p-value less than 0.05 (typically ≤ 0.05) is considered statistically significant [48].T-statistics show how many standard errors the coefficient is away from zero. In our model, the t-statistics are within the acceptable range. For the hypotheses where p-values are ≤ 0.05, any t-value greater than + 2 or less than − 2 is acceptable [48]. The higher the T-value, the greater the confidence we have in the coefficient as a predictor.

Figure 3 categorizes the percentage of respondents based on the circumstances under which they initiated tele mental health use. According to the data in Fig. 3, 20% of respondents have never used telehealth in mental and psychiatric

Table 3 Construct reliability and validity

Construct Reliability and Validity Overview				
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
ITU	0.873	0.88	0.94	0.887
JR	0.94	0.958	0.971	0.943
PEOU	0.777	0.778	0.856	0.599
PR	0.812	0.818	0.876	0.639
PU	0.822	0.827	0.894	0.738
QI	0.793	0.823	0.905	0.827
SN	0.896	0.907	0.935	0.828

Table 4 Path coefficient

Path Coefficients—Mean, STDEV, T values, P values					
Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
EXP—> ITU	0.058	0.065	0.068	0.847	0.397
JR—> PU	0.310	0.306	0.109	2.837	0.005
PEOU—> ITU	0.457	0.465	0.068	6.731	0.000
PEOU—> PU	0.103	0.111	0.102	1.01	0.312
PR—> ITU	0.214	0.216	0.080	2.691	0.007
PU—> ITU	0.199	0.193	0.064	3.002	0.003
QI—> PU	0.015	0.017	0.117	0.126	0.899
SN—> ITU	0.149	0.148	0.072	2.074	0.038
SN—> PU	0.177	0.180	0.089	1.983	0.047

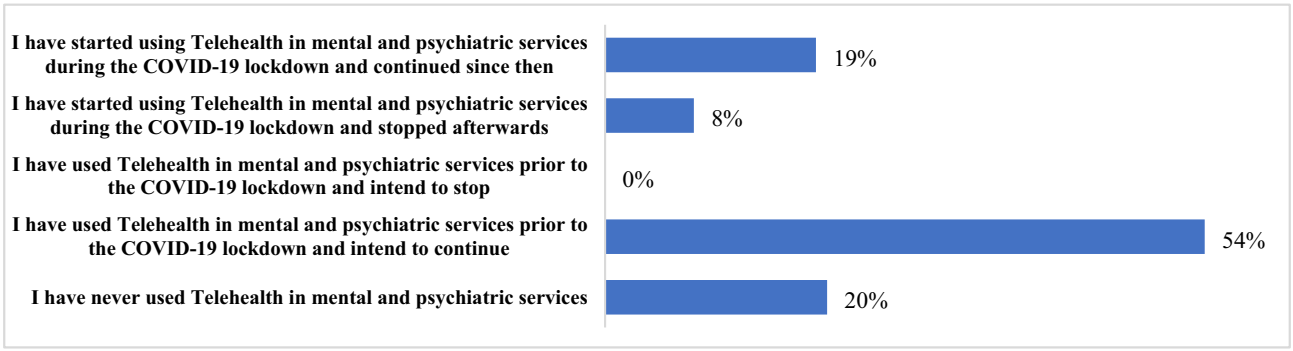

Fig. 3 Percentage of Respondents Regarding the Circumstances of Initiating Tele-Mental Health Use

services. A sizable portion, 54%, reported that they had used telehealth prior to the COVID-19 lockdown and intend to continue using it. In contrast, none of the respondents reported using telehealth before the COVID-19 lockdown but planning to discontinue it. In addition, 8% of participants initiated the utilization of telehealth services during the COVID-19 lockdown but subsequently discontinued, whereas 19% commenced utilizing telehealth during the lockdown and have since maintained its usage.

3.6 Hypothesis validation

The research indicated that JR significantly predicts perceived usefulness in telehealth, demonstrated by a p-value of 0.005 and a t-value of 2.837. The path coefficient of 0.310 indicates a robust correlation between job relevance and perceived usefulness, with job relevance explaining 31% of the variance in perceived usefulness (H1). The PU of telehealth emerged as a significant predictor of the intention to utilize it, evidenced by a p-value of 0.003 and a t-value of 3.002. The path coefficient of 0.199 signifies that perceived usefulness accounts for 19.9% of the variance in the intention to utilize telehealth (H6). The study demonstrated a significant influence of PEOU on the intention to use telehealth, evidenced by a p-value of 0.000 and a t-value of 6.731. The path coefficient of 0.457 indicates a predictability of 45.7% (H7). SN was recognized as a crucial predictor of the intention to utilize telehealth, demonstrated by a p-value of 0.038 and a t-value of 2.074. The path coefficient of 0.149 signifies a predictability level of 14.9% (H8). The perceived usefulness of telehealth was significantly predicted by SN, indicated by a p-value of 0.047 and a t-value of 1.983. The path coefficient of 0.177 signifies a predictability of 17.7% (H2). The perceived risk is an important predictor of intention to use which is indicated by a p-value of 0.007 and a t-value of 2.691. The path coefficient of 0.214 signifies a predictability of 21.4% (H3).

The validation of the hypotheses yielded significant insights. Although most hypotheses were corroborated, specific factors did not exert a substantial influence on the adoption of TMH, indicating areas need additional exploration. Hypothesis 4, which posited that the quality of interaction predicts perceived usefulness, was not substantiated, indicating that healthcare practitioners may prioritize functionality over the quality of communication in virtual settings.

Likewise, Hypothesis 5 (perceived ease of use as a predictor of perceived usefulness) was not supported, suggesting that although ease of use is significant, its direct impact on perceived usefulness may be concealed by other characteristics such as job relevance or perceived usefulness. Hypothesis 9 (user experience as a predictor of intention to use) was not validated, potentially due to the limited exposure of certain individuals to telehealth platforms, indicating a need for future investigation into how prior experience affects adoption across various contexts. The findings underscore the necessity for improved tactics to address these deficiencies, including the enhancement of telehealth platform design and the execution of more studies to gain a deeper understanding of provider-patient dynamics in virtual care. The below table (***refer to*** Table 5) summarizes the validation results of all hypotheses.

4 Discussion

4.1 Relevance of the model

The intention to use has a higher R value as observed in Fig. 2, representing a moderate explanatory power of it by the other constructs in the model. In other words, the information included in this study describes the outcome at a considerable level. The key insights from this study are collectively consistent with findings from similar studies, where the hypothesized models accounted for significant portions of the variance in behavioral intention to use health-related technologies. Previous studies found that their model accounted for 56% of the variability in young users' intention to utilize a health information portal [49]. In a similar inclination, other findings discovered that their model accurately explained 57.1% of the variation in the intention to use diabetes management apps [50]. Additional research has demonstrated significant variability in the degree to which behavioral intention is accounted for in the setting of health technology. Research on mobile nursing applications has identified influential elements that affect behavioral intention, emphasizing the significance of user engagement and perceived usefulness [51]. Moreover, the intention to use mobile cognitive behavioral therapy applications for insomnia has shown notable behavioral intention, influenced by factors such as ease of use and subjective norms [52].

4.2 Tele health usage patterns in mental and psychiatric services

Before the COVID-19 lockdown, 54% of participants reported using telehealth services for mental health and psychiatric reasons and indicated a desire to persist in their use. This underscores the significance and integration of tele-mental health into standard therapy, as evidenced by research conducted by [53] and [54].Nonetheless, a significant percentage of participants, specifically 20%, had not utilized telehealth. This suggests a possible opportunity to provide these practitioners with information and insights about the benefits and advantages of telehealth [55, 56]. All individuals who utilized telehealth services before lockdown have indicated their intention to persist with its use, demonstrating a high degree of acceptability and happiness [57]. Among the individuals that initiated the use of telehealth during the lockdown, 8% had chosen to discontinue, thus emphasizing the necessity to tackle barriers to improve retention [58].

Table 5 Hypotheses validation

Hypothesis	Validation
H1: Job relevance is a predictor of the perceived usefulness of telehealth in psychiatric and mental services in Lebanon	Supported
H2: Subjective norm is a predictor of the perceived usefulness of telehealth in psychiatric and mental services in Lebanon	Supported
H3: Perceived risk is a predictor of the intention to use telehealth in psychiatric and mental services in Lebanon	Supported
H4: Quality of interaction is a predictor of the perceived usefulness of telehealth in psychiatric and mental services in Lebanon	Not supported
H5: Perceived ease of use is a predictor of the perceived usefulness of telehealth in psychiatric and mental services in Lebanon	Not supported
H6: Perceived usefulness is a predictor of the intention to use telehealth in psychiatric and mental services in Lebanon	Supported
H7: Perceived ease of use is a predictor of the intention to use telehealth in psychiatric and mental services in Lebanon	Supported
H8: Subjective Norm is a predictor of the intention to use telehealth in psychiatric and mental services in Lebanon	Supported
H9: Users' experience is a predictor of the intention to use telehealth in psychiatric and mental services in Lebanon	Not supported

Furthermore, a notable 19% of individuals who initiated telehealth services during the lockdown have persisted with its usage, indicating their ability to adjust and their favorable reception of this mode of healthcare delivery [59]. Moreover, studies observed analogous trends, emphasizing the persistent incorporation of telehealth as an effective instrument for long-term care provision; and found that the pandemic expedited the adoption of telehealth in Lebanon, with numerous practitioners indicating their intention to persist in its use beyond the crisis [15, 60].

The COVID-19 pandemic has globally expedited the use of telehealth, especially in rural and resource-limited areas with restricted access to healthcare services. Research conducted in the United States and Australia revealed that rural healthcare practitioners rapidly embraced telehealth to surmount geographic and technological obstacles [61]. Research in LMICs, such as Ethiopia, indicated a substantial rise in telehealth adoption during the pandemic, with TAM2 accounting for 56.2% of the variance in individuals' propensity to embrace eHealth systems [62]. Their study found that the modified TAM explained 56.2% of the variation in individuals' willingness to utilize eHealth systems. The results indicate that telehealth has been well accepted and consistently used in mental health services during the pandemic. Furthermore, it has the potential to be integrated into healthcare delivery eventually, yielding outcomes that are equivalent to in-person. These findings align with global trends indicating that telehealth has emerged as an essential instrument for addressing healthcare disparities. Disparities in telehealth access between rural and urban areas highlight the necessity for specific interventions, including enhancements to digital infrastructure and specialized training for healthcare providers in underprivileged communities. By overcoming these obstacles, telemedicine can attain equality in healthcare provision across various regions, promoting equitable access to mental health services.

4.3 Key predictors of telehealth adoption

The results of this study provide valuable insights into the factors that influence healthcare practitioners' willingness and preparedness to adopt telehealth in mental and psychiatric therapies. The findings emphasize key factors that influence the adoption of telemedicine among healthcare professionals, employing the TAM2 framework. Based on research conducted by [29], the path coefficient for job relevance is 0.310, which suggests that it is a highly influential factor in predicting perceived usefulness. This implies that people are more likely to embrace technologies that they perceive as universally applicable to their professional responsibilities. The path coefficient of 0.457 suggests that perceived usefulness has the highest level of influence in predicting the adoption of telehealth. This discovery provides evidence that the belief in advantages plays a vital part in the choice to embrace telehealth, as proposed by [28]. The path coefficient of 0.214 suggests that the implementation of user-friendly technology has a favorable effect on reducing obstacles to adoption, as assessed by the perceived ease of use [63]. The path coefficient of 0.199 suggests that perceived risk has a substantial role in influencing adoption decisions, particularly in connection with concerns about data privacy and security [64]. The concept of subjective norm, as indicated by a path coefficient of 0.177, highlights the influence of social factors, such as the viewpoints of colleagues and superiors, on the decision to use telemedicine [65]. In several LMICs, job relevance and perceived usefulness are equally crucial; but contextual elements including technology infrastructure, policy frameworks, and cultural attitudes can enhance or reduce their influence. In nations such as Ethiopia and Bangladesh, research indicates that inadequate digital literacy and deficient infrastructure frequently impede perceived usefulness, whereas robust official assistance can enhance job relevance [66, 67]. Analyzing these contexts highlights the necessity of customizing tele-mental health solutions to address the specific difficulties and potential of each location, providing critical insights for policymakers and IT developers seeking to improve uptake in various LMIC environments.

4.4 Implications for practice

4.4.1 Incorporating in clinical and medical education curriculum

Integrating telehealth into clinical practice is crucial for maximizing its potential benefits. Comprehensive training and support services, including online tutorials and continuous education, can enhance user experience and satisfaction [63]. Partnerships with academic institutions and ongoing research and development can stimulate innovation and guarantee that telehealth technologies evolve in alignment with user requirements and the latest scientific advancements [68].Training by implementing telehealth delivery, residents can effortlessly integrate telehealth into their clinical processes. Studies stress the significance of modifying clinical processes to incorporate telehealth [69]. They underline that effectively incorporating telehealth requires both technology expertise and a change in traditional care delivery models. Training programs for residents should prioritize the development of these abilities to guarantee their ability

to establish and maintain a positive relationship with patients and provide excellent healthcare services via digital platforms. Research emphasizes the significance of communication in telehealth, highlighting that effective telehealth interactions require compassionate communication and adequate training to guarantee patient satisfaction and adherence to treatment protocol [70].

4.4.2 Information technology companies

The findings of this study have considerable ramifications for information technology (IT) firms engaged in the development and execution of telehealth solutions. A thorough understanding of the factors influencing healthcare practitioners' acceptance of telehealth can aid IT companies in creating technologically advanced, user-focused, and widely adopted products. This research highlights that the perceived usefulness and ease of use of telehealth technologies markedly affect the intention to adopt them. This underscores the importance of design that prioritizes user demands and preferences. Creating insightful technologies that correspond with healthcare procedures helps expedite their acceptance [29]. The incorporation of ongoing elements such as AI-driven diagnostics and electronic health record integration can augment functionality, resulting in enhanced clinical efficiency and quality of patient care [28]. Robust security protocols and transparent communication about data protection are essential to foster confidence and mitigate perceived risk [64]. Furthermore, leveraging social influence (subjective norm) via endorsements from prominent individuals might facilitate the acceptability and utilization of a product [65]. Tailoring products and marketing strategies to align with regional conditions, as demonstrated by the study's focus on Lebanon, can effectively address cultural and infrastructural challenges [71]. IT companies can create telehealth systems that adequately address the needs of healthcare professionals and patients by emphasizing user-centered design, instituting robust security protocols, utilizing targeted marketing strategies, offering comprehensive training, and promoting ongoing innovation. These advances can enhance therapeutic efficiency and mitigate perceived hazards. Providing specialized training modules, including interactive tutorials and practical workshops, can facilitate the rapid adoption of innovative technology by healthcare workers. Furthermore, IT firms may collaborate with esteemed healthcare professionals to promote their platforms, utilizing subjective norms to establish confidence and enhance utilization. Employing these strategies enhances the adoption and use of telehealth solutions while positioning IT businesses as leaders in the swiftly evolving healthcare technology landscape.

4.4.3 Telehealth certification and accreditation

Policymakers can promote wider use by offering financial incentives, like subsidies for telehealth equipment and lower licensing fees for recognized platforms. Certification and accreditation of telehealth are crucial for ensuring the quality, reliability, and validity of telehealth services offered by an institution. This will influence healthcare practitioners' adoption and acceptance of these technologies. Obtaining telehealth certification sets IT organizations apart in the market, improving their brand recognition and gaining more trust and favor from healthcare providers [71].Accreditation requirements set by entities such as the American Telemedicine Association (ATA), the National Committee for Quality Assurance (NCQA), and the Joint Commission encompass rigorous criteria that ensure the efficacy and advantages of telehealth services in clinical practice. This can guarantee healthcare providers the dependability and safety of the system. It signifies to healthcare practitioners that telehealth technology adheres to established standards of excellence and guarantees patients its safety, quality, and compliance with industry standards. This assurance cultivates trust, hence enhancing the probability that patients will pursue and utilize telehealth services. This subsequently augments the perceived usefulness of telehealth by demonstrating enhanced clinical results and efficiency [28].Usefulness testing, commonly employed in certification processes, assists in identifying and addressing potential difficulties, ensuring that telehealth technologies adhere to rigorous user-friendliness criteria and minimizing obstacles to their implementation. Moreover, certification guarantees full compliance with stringent security and privacy regulations, including adherence to the Health Insurance Portability and Accountability Act (HIPAA), thereby mitigating perceived risks, and enhancing trust among healthcare providers [64]. These specific solutions correspond with the study's findings, providing practical measures to improve the incorporation of tele-mental health into clinical practice.

Clinically verified telehealth solutions assure healthcare providers of their efficacy and potentially guarantee decrease perceived risk which depicts better intention to use. This corresponds with the study's findings, which demonstrate that a job's relevance affects the perceived value of telehealth solutions. The inclusion of defined training programs and user guidelines associated with accreditation improves the perceived ease of use of telehealth systems by rendering them more intuitive and user-friendly [63]. Furthermore, qualifications that result in endorsements from professional groups

and prominent individuals may influence subjective norms. Subjective norm significantly influences telemedicine adoption, as evidenced by the theory of planned behavior [65]. Peer endorsements of reputable telehealth services enhance subjective norms by showcasing trust and usage by respected specialists. This facilitates adoption by mitigating uncertainty and perceived risk. Certification acts as a catalyst for fostering patient confidence by ensuring the safeguarding of their personal health information and the delivery of superior care. Certification and accreditation significantly enhance the acceptability and integration of telehealth technology in healthcare practice by augmenting perceived usefulness, ease of use, mitigating perceived risks, and shaping subjective norms. This can facilitate the broader acceptance and utilization of telehealth solutions.

4.5 Bottom of form

4.5.1 Limitations of the study

This study, although it has a strong research design and methodology, recognizes several limitations. Challenges encountered during the process of data collection encompassed unanswered questions, a scarcity of psychiatrists, and challenges in contacting nurses due to the lack of database to identify their service location. To address this issue, we institute follow-up reminders to increase participation. Nevertheless, the limited number of mental health professionals in Lebanon, along with a low level of nurses' involvement did not affect sample verification. Despite repeated reminders, the low rate of response, the potential bias caused by nonresponse (differences in the views of non-participants compared to participants), and the phenomenon of survey fatigue, are all limitations that should be acknowledged. Non-responses in the survey may introduce bias, reflecting systematic differences between respondents and non-respondents. Healthcare professionals who are less familiar with or skeptical of telehealth may have been less likely to participate, potentially biasing the results toward a more favorable perspective on tele-mental health adoption. Furthermore, the urban skew of the sample suggests that the results may not be entirely applicable to rural or neglected areas, where infrastructural and technical obstacles may vary considerably.

Future research may investigate strategies such as weighting adjustments to address potential non-response bias and enhance the representativeness of the participants' sample and the findings. Future mixed-methods research has the potential to reduce sampling biases through the integration of qualitative insights and quantitative data. Such mixed methods facilitate the triangulation of findings, thereby enhancing the robustness and comprehensiveness of data interpretation. Conducting in-depth interviews or focus groups with non-respondents may uncover their distinct perspectives and obstacles to participation. This method offers a comprehensive understanding of telehealth adoption, revealing potential disparities between respondents and non-respondents. Furthermore, utilizing various sampling methods, including purposive or snowball sampling for qualitative aspects, can effectively include underrepresented populations, enhancing both the generalizability and depth of the research [39, 72–78].Nevertheless, comprehending patient viewpoints is essential for the effective implementation of mental health technologies. In conclusion, integrating patient viewpoints is essential for the successful implementation and use of mental health technologies. Addressing patient concerns, preferences, and identified obstacles can result in more customized and accepted technological interventions in mental health care [79, 80].

5 Conclusion

This study makes a significant contribution to telehealth literature by providing empirical evidence specific to mental and psychiatric care. Using the TAM2, it explores key factors influencing telehealth adoption, including job relevance, perceived usefulness, ease of use, risk, and subjective norms. The results directly respond to the research question by pinpointing the factors influencing TMH uptake among mental health practitioners in Lebanon, a demographic facing socio-cultural and infrastructural challenges. These findings inform the creation of customized telemedicine programs, highlighting the necessity of improving work relevance, optimizing technology, addressing security concerns, and utilizing social influence for effective implementation [29]. Previous research often overlooks the specific needs of mental health care [81], rendering this study particularly significant. It underscores that enhancing work relevance, streamlining technology, mitigating security issues, and utilizing social influence are essential for the adoption of telehealth. The findings are beneficial for policymakers, healthcare providers, and technology developers in creating culturally suitable telehealth solutions [63, 64].In rural or digitally deprived regions, targeted solutions are crucial to guarantee access. These

approaches may improve accessibility to mental health services by addressing Lebanon's fragmented healthcare system [82].Thorough training and explicit protocols are crucial for equipping practitioners to incorporate telehealth into their practice [59], while addressing technological obstacles and enhancing user-friendly interfaces will broaden telehealth's accessibility [28]. Enhancing care continuity for patients with chronic conditions by adaptive care management and constant communication highlights the promise of TMH [83]. Mitigating perceived risks and augmenting user-ease of use will render telehealth a more feasible alternative, hence strengthening mental health results. Clinical programs must integrate training to reduce adoption obstacles, while healthcare providers, insurers, and IT businesses should work to create safe, user-friendly systems that enhance trust and increase adoption, improving mental health outcomes. The Ministry of Public Health (MOPH) can operationalize the study's findings by formulating telehealth policies that delineate explicit guidelines for virtual consultations and data protection to mitigate perceived risks. Training programs can improve digital literacy among healthcare practitioners by emphasizing practical use and intuitive interfaces. Public awareness initiatives can mitigate stigma and underscore the advantages of tele mental health. Enhancing digital infrastructure in underprivileged regions, in collaboration with telecommunications firms, will guarantee equitable access. Partnering with technology developers to design culturally customized telehealth platforms will enhance the acceptance of tele-mental health services and improve mental health outcomes across the nation.

Author contributions L.M. developed the study protocol and the tools. N.B,M.A, I.B.O, F.M and P.E. reviewed the protocol and made substantial contributions to the design of the study. L.M. conducted the data collection and analysis under the supervision of N.B, MA, I.B.O, F.M and P.E. All authors contributed to the interpretation of data. L.M prepared the first draft, and all authors contributed to critical revisions and approved the final version of the article.

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Data availability The datasets produced and/or examined during the present investigation can be obtained from the relevant author upon a reasonable request. Interested researchers will be given supplementary materials or additional data to ensure the transparency and reproducibility of the findings.

Declarations

Ethics approval and consent for participation Ethics Approval The study protocol was approved by the Ethics Committee of the Saint-Joseph University of Beirut [reference number 2095]. Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Participation in the survey was anonymous and voluntary.

Consent for publication All authors have thoroughly examined and given their explicit approval to the final iteration of the work, thereby granting their consent for its publication. Participants explicitly consented to the inclusion of their anonymized data in any publications arising from this study.

Competing interests The authors affirm that they do not possess any conflicting interests pertaining to this study. There are no conflicts of interest, whether financial, personal, or professional, that could have had an impact on the results of this research. This manuscript is an original piece of work that has not been published elsewhere and is not currently being considered for publication in any other journal. All authors have thoroughly reviewed and given their approval to the final version of the paper. Additionally, each author has made substantial contributions to the work, guaranteeing the study's integrity and accuracy. The authors affirm that there are no conflicts of interest pertaining to the research, authorship, and/or publication of this paper.

Appendix

See Table 6

Table 6 Definition of each construct with respective indicators in the research model

Latent Variable or Construct	Definition	Pertinent Questions or Indicators in the developed questionnaire
Job Relevance [JR]	An individual's perception regarding the degree to which the tele -health is applicable to the individual's job	Q1: I believe that TH is relevant to the delivery of care
		Q2: I believe that TH is important to the delivery of care
Subjective Norm [SN]	Users perceived pressure or push factors when using tele-health	Q3: I would use TH if my peers think that I should use TH
		Q4: I would use TH if my superiors think that I should use TH
		Q5: I would use TH if most of the people who are important to my organization think that using TH is a wise idea
		Q6: I would use TH if it if my patients request it of me
		Q7: Practitioners who use TH would have more prestige than those who do not
		Q8: I would use TH if my patients accept using it
Perceived Usefulness [PU]	The degree to which a person believes that using a tele-health would enhance his or her job performance	Q9: I believe that using TH would facilitate accomplishing tasks more quickly [TH could increase my productivity]
		Q10:I believe that using TH would improve the quality of care that I deliver
		Q11: I believe that using TH would enhance my Ability to provide better care [Effectiveness on the job and make it easier to do my job]
Perceived Ease of Use [PEOU]	The users perceived easiness to use tele- health	Q12:I believe that Learning to operate TH would be easy for me
		Q13: I believe that My interaction with TH would be clear and understandable
		Q14: I believe that it would be easy for me to become skillful at using TH
		Q15: I believe that my patient will find TH easy to use
Perceived Risk [PR]	Perceived risk is an antecedent and a moderator of user acceptance to tele health which can either increase the strength of the correlation or decrease it	Q16: I use TH if it saves me time
		Q17: I use TH if I receive adequate training
		Q18: I use TH if it was easy to learn to use
		Q19: I use TH if I could get back easily and quickly whenever I made a mistake
Intention to Use [ITU]	User subjective Intention to Use the tele health and the likelihood to engage in this service	Q20: I intend to use TH in the future
		Q21: I am more likely to attend my future appointments on phone or video rather than in person
		Q22: I would use TH in my practice
Quality of Interaction [QI]	Perceived quality of tasks fulfilled by means of tele -health and how well it performs the tasks that match their job relevance	Q23: I would use TH, if I could interact with the patient [hear, see and understand] as well as if we met in person
		Q24: I would use TH if the quality of interpersonal communication/rapport between me and the patient is not different than in person visit
Experience [Exp]	Users personal experience with tele—health use	How many years have you been in practice? 0–5 years, 6–10 years, 11–15 years,16–20 years and 21 + years

References

1. Benudis A, Re'em Y, Kanellopoulos D, Moreno A, Zonana J. Patient and provider experiences of telemental health during the COVID-19 pandemic in a New York City academic medical center. Psychiatry Res. 2022. https://doi.org/10.1016/j.psychres.2022.114496.311:114496.
2. Whaibeh E, Mahmoud H, Naal H. Telemental health in the context of a pandemic: the COVID-19 experience. Curr Treat Options Psychiatr. 2020. https://doi.org/10.1007/s40501-020-00210-2.
3. American Medical Association. After COVID-19, $250 billion in care could shift to telehealth [Internet]. Chicago (IL): AMA https://www.ama-assn.org/practice-management/digital/after-covid-19-250-billion-care-coul, 2020 [cited 2025 Jan 11]. Available from:.
4. Yu J, Bekerian DA. Telemental health and diverse populations amid COVID-19. Encyclopedia. 2023;3(1):267–78.
5. Rudd BN, Beidas RS. Digital mental health: the answer to the global mental health crisis? JMIR Ment Health. 2020. https://doi.org/10.2196/18472.
6. Naslund JA, et al. Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. Lancet Psychiatry. 2017. https://doi.org/10.1016/s2215-0366(17)30096-2.
7. Farran N. Mental health in Lebanon: tomorrow's silent epidemic. Ment Health Prev. 2021;24:200218. https://doi.org/10.1016/j.mhp.2021.200218.
8. El Othman R, Touma E, El Othman R, Haddad C, Hallit R, Obeid S, et al. COVID-19 pandemic and mental health in Lebanon: a cross-sectional study. Int J Psychiatry Clin Pract. 2021;25(2):152–63.
9. Al Hariri M, Zgheib H, Abi Chebl K, Azar M, Hitti E, Bizri M, et al. Assessing the psychological impact of Beirut port blast: a cross-sectional study. Medicine. 2022;101(41):e31117.
10. Bizri M, Zeinoun L, Mihailescu AM, Daher M, Atoui M, Chammay R, et al. A closer look at patterns and characteristics of suicide in Lebanon: a first nationwide report of cases from 2008 to 2018. Asian J Psychiatr. 2021;59: 102635.
11. Naal H, Whaibeh E, Mahmoud H. Guidelines for primary health care-based telemental health in a low-to middle-income country: the case of Lebanon. Int Rev Psychiatr. 2020. https://doi.org/10.1080/09540261.2020.1766867.
12. Jefee-Bahloul H. Telemental health in the Middle East: overcoming the barriers. Front Public Health. 2014. https://doi.org/10.3389/fpubh.2014.00086.
13. Connolly SL, Miller CJ, Lindsay JA, Bauer MS. A systematic review of providers' attitudes toward telemental health via videoconferencing. Clin Psychol Sci Pract. 2020. https://doi.org/10.1111/cpsp.12311.
14. Ackerman M, Greenwald E, Noulas P, Ahn C. Patient satisfaction with and use of telemental health services in the perinatal period: a survey study. Psychiatr Q. 2021. https://doi.org/10.1007/s11126-020-09874-8.
15. Shaarani I, Ghanem A, Jounblat M, Jounblat H, Mansour R, Taleb R. Utilization of telemedicine by the Lebanese physicians during time of pandemic. Telemed E-Health. 2022. https://doi.org/10.1089/tmj.2021.0090.
16. Helou S, El Helou E, Abou-Khalil V, et al. The effect of the COVID-19 pandemic on physicians' use and perception of telehealth: the case of Lebanon. Int J Environ Res Public Health. 2020. https://doi.org/10.3390/ijerph17134866.
17. Patel, K. B., Turner, K., Tabriz, A. A., Gonzalez, B. D., Oswald, L. B., Nguyen, O. T., & Spiess, P. E. (2023). Estimated indirect cost savings of using telehealth among.
18. Wosik J, Fudim M, Cameron B, Gellad ZF, Cho A, Phinney D, et al. Telehealth transformation: COVID-19 and the rise of virtual care. J Am Med Inform Assoc. 2020;27(6):957–62.
19. Badr N, Aroutine N, Yeretzian J. Factors influencing tele-dermatology adoption among the Lebanese youth: A pilot study at Saint Joseph University. Proceedings of the 15th International Joint Conference on Biomedical Engineering Systems and Technologies. 2.
20. Safdari R, Ahmadi M, Bahaadinbeigy K, Farzi J, Noori T, Mehraeen E. Identifying and validating requirements of telemental health services for Iranian veterans. J Family Med Prim Care. 2019;8(3):1216–21.
21. Shapiro B, Baker CR. Information technology and the social construction of information privacy. J Account Public Policy. 2001;20(4–5):295–322.
22. Reed ME, Huang J, Graetz I, Lee C, Muelly E, Kennedy C, Kim E. Patient characteristics associated with choosing a telemedicine visit vs office visit with the same primary care clinicians. JAMA Netw Open. 2020;3(6):e205873.
23. Smith K, Ostinelli E, Macdonald O, Cipriani A. COVID-19 and telepsychiatry: development of evidence-based guidance for clinicians. JMIR Ment Health. 2020;7(8):e21108.
24. Figueroa CA, Aguilera A. The need for a mental health technology revolution in the COVID-19 pandemic. Front Psychiatr. 2020. https://doi.org/10.3389/fpsyt.2020.00523.
25. (2023)https://www.moph.gov.lb/en/DynamicPages/index/6#/en/Pages/6/553/nmhp, moph.
26. Acharibasam JW, Wynn R. Telemental health in low- and middle-income Countries: a systematic review. Int J Telemed Appl. 2018. https://doi.org/10.1155/2018/9602821.
27. Abraham A, Jithesh A, Doraiswamy S, Al-Khawaga N, Mamtani R, Cheema S. Telemental health use in the COVID-19 pandemic: a scoping review and evidence gap mapping. Front Psychiatry. 2021;12: 748069.
28. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989. https://doi.org/10.2307/249008.
29. Venkatesh V, Davis FD. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. Manag Sci. 2000;46(2):186–204. https://doi.org/10.1287/mnsc.46.2.186.11926.
30. Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: four longitudinal field studies. Manage Sci. 2000;46(2):186–204.
31. Alwreikat A, Shehata AMK, Abu Zaid MK. Arab scholars' acceptance of informal scholarly communication tools: applying the technology acceptance model 2 (TAM2). Glob Knowl Mem Commun. 2023;72(1/2):160–78.
32. Zhang X, Yu P, Yan J, Spil T. Using diffusion of innovation theory to understand the factors impacting patient acceptance and use of consumer e-health innovations: a case study in a primary care clinic. BMC Health Serv Res. 2010;10:251.

33. Mudaly S, Singh P, Olugbara OO. Improved technology acceptance model applied to study enterprise resource planning usage. In: 2013 Science and Information Conference, et al.
34. Damerau M, Teufel M, Musche V, Dinse H, Schweda A, Beckord J, et al. Determining acceptance of e-mental health interventions in digital psychodiabetology using a quantitative web-based survey: cross-sectional study. JMIR Form Res. 2021;5(7):e27436.
35. Braun P, Schwientek AK, Loerbroks A, Apolinário-Hagen J. How to design information strategies on e-mental health services for prospective healthcare providers. Eur J Public Health. 2022. https://doi.org/10.1093/eurpub/ckac131.177.
36. Sagnier C, Loup-Escande E, Lourdeaux D, Thouvenin I, Valléry G. Acceptance of virtual reality devices: a multi-study approach. Int J Hum Comput Interact. 2020;36(3):271–90.
37. Mburu G, Lichtenstein RL, Ketende SC. Mobile health applications for care support in sub-Saharan Africa: a case study of Kenya. BMC Public Health. 2021;21(1):14.
38. Pal D, Vanijja V. Perceived usefulness, perceived ease of use, and user acceptance of telemedicine in India: A TAM2 study. Health Informatics J. 2020;26(3):1654–67.
39. Dillman DA, Smyth JD, Christian LM. Internet, phone, mail, and mixed-mode surveys: the tailored design method. 4th ed. Hoboken: Wiley; 2014.
40. Hair JF, Hult GTM, Ringle CM, Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM). 2nd ed. Thousand Oaks (CA): Sage; 2017.
41. Sarstedt M, Ringle CM, Henseler J, Hair JF. On the emancipation of PLS-SEM: a commentary on rigdon (2012). Long Range Plan. 2014. https://doi.org/10.1016/j.lrp.2014.02.007.
42. Hair JF, Black WC, Babin BJ, Anderson RE. Multivariate Data Analysis. 8th ed. Cengage Learning 2019.
43. Chin WW, Newsted PR. Structural equation modeling analysis with small samples using partial least squares. In: Hoyle RH, editor. Statistical Strategies for Small Sample Research. Thousand Oaks, CA: Sage; 1999. p. 307–41.
44. Rigdon EE. Rethinking partial least squares path modeling: in praise of simple methods. Long Range Plan. 2012;45(5–6):341–58. https://doi.org/10.1016/j.lrp.2012.09.010.
45. Hair JF, Hult GTM, Ringle CM, Sarstedt M. PLS-SEM: Indeed a silver bullet. J Mark Theory Pract. 2011;19(2):139–52.
46. Kock N, Hadaya P. Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. Inf Syst J. 2018;28(1):227–61.
47. Associates, Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale (NJ): Lawrence Erlbaum; 1988.
48. Hair JF, Black WC, Babin BJ, Anderson RE. 2019 Multivariate Data Analysis. 8th ed
49. Tao D, Wang T, Wang T, Zhang T, Zhang X, Qu X. A systematic review and meta-analysis of user acceptance of consumer-oriented health information technologies. Comput Hum Behav. 2020;104: 106147.
50. Zhang, X., Zhou, X., & Yoruk, E. (2019, September). Re-examining the Technology Acceptance Model from stakeholders' management perspective in health sector. In British Academy of Management Conference 2019. British Academy of Management.
51. Gu X, Sun Y, Wang S, Li X. Investigating factors influencing nurses' behavioral intention to use mobile nursing applications: an empirical study. BMC Health Serv Res. 2019;19(1):408. https://doi.org/10.1186/s12913-019-4287-8.
52. Lemay V, Horsch C, Lancee J, Griffioen-Both F. Mobile phone-delivered cognitive behavioral therapy for insomnia: a randomized waitlist controlled trial. J Med Internet Res. 2017;19(4):e70.
53. Yellowlees P, Shore J, Roberts L. Provider attitudes towards the use of telepsychiatry: survey results. J Telemed Telecare. 2010;16(5):305–9.
54. Shore P, Goranson A, Ward MF, Lu MW. Meeting veterans where they're@: a VA home-based telemental health (HBTMH) pilot program. Int J Psychiatry Med. 2014;48(1):5–17.
55. Myers K, Nelson EL, Rabinowitz T, Hilty D, Baker D, Barnwell SS, et al. American telemedicine association practice guidelines for telemental health with children and adolescents. Telemed J E Health. 2017;23(10):779–804.
56. Gagnon MP, Desmartis M, Labrecque M, Car J, Pagliari C, Pluye P, et al. Systematic review of factors influencing the adoption of information and communication technologies by healthcare professionals. J Med Syst. 2012;36:241–77.
57. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. Can J Psychiatr. 2008;53(11):769–78. https://doi.org/10.1177/070674370805301109.
58. Wade VA, Eliott JA, Hiller JE. Clinician acceptance is the key factor for sustainable telehealth services. Qual Prim Care. 2016;18(4):213–9.
59. Kruse CS, Karem P, Shifflett K, Vegi L, Ravi K, Brooks M. Evaluating barriers to adopting telemedicine worldwide: a systematic review. J Telemed Telecare. 2018;24(1):4–12.
60. Shaarani I, Mehio N, Naamani M, et al. Telemedicine adoption in Lebanon during the COVID-19 pandemic. BMC Health Services Res. 2022;22:1–10. https://doi.org/10.1186/s12913-022-07641-9.
61. Wilczewski H, Paige SR, Ong T, Barrera JF, Soni H, Welch BM, et al. Perceptions of telemental health care delivery during COVID-19: a cross-sectional study with providers, February-March 2021. Front Psychiatr. 2022;13: 855138.
62. Kalayou MH, Endehabtu BF, Tilahun B. The applicability of the modified technology acceptance model (TAM) on the sustainable adoption of eHealth systems in resource-limited settings. J Multidiscip Healthc. 2020;13:1827–37.
63. Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: toward a unified view. MIS Q. 2003;27(3):425–78.
64. Featherman MS, Pavlou PA. Predicting e-services adoption: a perceived risk facets perspective. Int J Hum Comput Stud. 2003;59(4):451–74.
65. Ajzen I. The theory of planned behavior. Organ Behav Hum Decis Process. 1991;50(2):179–211.
66. Worku EB, Abebe SM, Wassie AY. Technology acceptance and its influencing factors in ehealth services: a systematic review. BMC Med Inform Decis Mak. 2020. https://doi.org/10.1186/s12911-020-01257-3.
67. Rahman MS, Ko MM, Warren J. Adoption of telemedicine in rural areas of Bangladesh: challenges and opportunities. J Health Inform Dev Ctries. 2019;13(1):1–12.
68. Etzkowitz H, Leydesdorff L. The dynamics of innovation: From National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. Res Policy. 2000;29(2):109–23.
69. Greenhalgh T, A'Court C, Shaw S. Understanding heart failure, explaining telehealth—a hermeneutic systematic review. BMC Cardiovasc Disord. 2016. https://doi.org/10.1186/s12872-016-0333-2.
70. Shigekawa E, Fix M, Corbett G, Roby DH, Coffman J. The current state of telehealth evidence: a rapid review. Health Aff. 2018;37(12):1975–82.

71. Alaa M, Alsaffar H. Regional challenges and strategies in telehealth adoption: Insights from a study on Lebanon. J Telemed Telecare. 2020;26(4):201–8.
72. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Adm Policy Ment Health. 2015. https://doi.org/10.1007/s10488-013-0528-y.
73. Taherdoost H. Sampling methods in research, methodology, how to choose a sampling technique for research. Int J Acad Res Manag. 2016;5:1–9.
74. Etikan I, Musa SA, Alkassim RS. Comparison of convenience sampling and purposive sampling. Am J Theor Appl Stat. 2016;5(1):1–4.
75. Creswell JW, Creswell JD. Research design: qualitative, quantitative, and mixed methods approaches. 5th ed. Thousand Oaks: Sage Publications; 2017.
76. Groves RM, Peytcheva E. The impact of nonresponse rates on nonresponse bias: a meta-analysis. Public Opin Q. 2008;72(2):167–89.
77. Lindner JR, Murphy TH, Briers GE. Handling nonresponse in social research. J Agric Educ. 2001;42(4):43–53.
78. Burgess RG, editor. Field research: a sourcebook and field manual. 4th ed. London: Routledge; 2003.
79. Andersson G, Carlbring P, Ljótsson B, Hedman E. Guided internet-based CBT for common mental disorders. J Contemp Psychother. 2013. https://doi.org/10.1007/s10879-013-9243-0.
80. Mohr DC, Weingardt KR, Reddy M, Schueller SM. Three problems with current digital mental health research and three things we can do about them. Psychiatr Serv. 2017;68(5):427–9. https://doi.org/10.1176/appi.ps.201600541.
81. Mohr DC, Burns MN, Schueller SM, Clarke G, Klinkman M. Behavioral intervention technologies: evidence review and recommendations for future research in mental health. Gen Hosp Psychiatry. 2013;35(4):332–8.
82. Yehya N, El Chammay R, Ammar W, Khoury B, Haddad R, Ammar L, et al. Mental health services in Lebanon: availability and barriers. Int J Ment Health Syst. 2020. https://doi.org/10.1186/s13033-020-00355-4.
83. Kruse CS, Krowski N, Rodriguez B, Tran L, Vela J, Brooks M. Telehealth and patient satisfaction: a systematic review and narrative analysis. BMJ Open. 2017;7(8): e016242.