Intention to Use and Continuance Usage Intention of mHealth Dialectical Behavior Therapy mobile applications by women with eating disorders

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ABSTRACT

This research aimed to study intention to use and continuance usage intention of mHealth DBT mobile applications by women with eating disorders. Qualitative research employing in-depth interview was conducted with 10 participants (women with eating disorders. aged 18-45, who live in Russia, have practiced DBT (dialectical behavioral therapy), and have used DBT mobile applications or similar self-help applications. Results show that characteristics of women with ED, intention to use and continuance usage intention have a significant connection with mHealth DBT mobile applications. Moreover, the study indicates that there are some factors that might be linked to the use of this applications other than the factors mentioned in previous research such as gamification and supportive feedback from an app.

Keywords: Intention to use, continuance usage intention, Technology Acceptance Model, Information Systems Success Model, Eating disorders.

1. Introduction

Eating disorders (ED) are defined by disturbance in eating habits that may be either excessive or insufficient food intake (Rikani et al., 2013). ED are anorexia nervosa, binge eating disorder (BED), and bulimia nervosa (Rehman, 2022). Worldwide, females with an eating disorder outnumber males by a sizeable margin in every study (Hoek, 2006; Wittchen & Jacobi, 2005). One of the effective ways to help people with ED is Dialectical Behavior Therapy (DBT). DBT is a multimodal cognitive-behavioral treatment that was developed by Marsha M. Linehan in 1987 to treat chronically suicidal people who had a borderline personality disorder. To be more specific, the primary focus of this program is on teaching clients a set of behavioral skills and helping them to use those skills in their daily lives. In DBT skills training, the main objective is to assist people with changing behavioral, emotional, thinking, and interpersonal patterns associated with problems in their daily lives (Linehan, 2017).

Technological advances in mobile technology have made it possible to build applications for comprehension of techniques, self-monitoring, and exercising in new ways. The self-help industry is a multibillion-

dollar business (Valiunas, 2010). Self-help apps for mental and emotional issues have lately been developed in response to increased interest and acceptance (Donker et al., 2013). Nevertheless, the monitoring of patients through mobile phone applications should be further explored and evaluated before they are implemented in clinical practice in a broad sense (Buechi et al., 2017).

Mental and emotional mobile health (mHealth) applications have the potential to play a significant role in the prevention and treatment of mental illness in the future. mHealth apps allow users to access and save all therapeutic materials in one place, use interactive worksheets, work with audio and video files, track their progress, and connect with other people with the same issues. Although mHealth applications for mental and emotional health are widely used, many of them are difficult to navigate and the information structure there is often unclear, especially for someone unfamiliar with DBT principles (Washburn & Parrish, 2013).

Due to the difficulties with user interface and user experience (UI/UX) and other factors in existing mHealth DBT applications, there is a big dropout rate (Vaghefi & Tulu, 2019). This research aimed to study intention to use and continuance usage intention of mHealth DBT mobile applications by women with eating disorders. The findings of this study might have a direct impact on people with ED and other mental health conditions who use mHealth DBT applications in addition to therapy or as a way to relieve their condition on their own. It can also be used by practitioners as a tool to effectively design mHealth DBT applications.

Characteristics of users with ED: Several studies have shown the advantages of apps in ED management; besides convenience, patients have expressed appreciation for the option to customize explored apps to meet their individual needs, as well as the social support offered by other users and therapists within the app (Lindgreen, Clausen, & Lomborg, 2018). Nevertheless, continuous user engagement, which refers to a user's experience with an electronic system over a prolonged period of time (Bickmore, Schulman, & Yin, 2010), declines over time among DBT apps (Taki et al., 2017). Several reasons are identified for low long-term engagement with ED treatment apps, including poor therapist support, navigation problems, and unpleasant feelings when tracking meals or symptoms (Basterfield et al., 2018).

Technology Acceptance Model (TAM): TAM model proposed by Davis (1989) to study users' acceptance of the information system. There are two factors in TAM: perceived usefulness (PU) and perceived ease of use (PEOU). PU represents the extent to which the user is convinced that an application system will increase his or her productivity (Gupta et al., 2020). When it comes to healthcare, PU refers to the extent to which an DBT application can improve a user's quality of life. In the case of the effectiveness of mobile learning, PU influences the intention of a user to use an online platform (Venkatesh and Davis, 2000). By measuring PEOU, we can tell the extent to which our users use our application effectively, because the less effort they have to make, the more efficiently they use it (Cho, 2016). When it comes to DBT apps, those users who satisfy their expectations of mHealth apps by collecting health information in a timely and effective manner, have a better chance of getting the most out of health apps without putting in much effort.

Continuance usage intention and System Success: Information Systems Success Model is a model for evaluating a technology's success (Delone and McLean, 2003). This model identifies three factors as determinants of successful information system performance, including system quality (SQ), service quality (SEQ), user satisfaction (US), and information quality (IQ). These three different quality factors can both affect the use of the system and the satisfaction of its users independently.

System quality (SQ) is the desired attributes of the information system, and the main purpose of the system is the distribution of information to users and decision makers (DeLone and McLean, 2003). Petter, DeLone, & McLean (2008) indicated SQ as the overall performance of IS in terms of reliability, convenience, ease of use, efficiency, and other system characteristics. In the literature, the following criteria have been used to evaluate SQ: adaptability, stability, trustworthiness, usefulness, ease of use, user-friendly interface, and speed of response (Yusuf, Gunasekaran, & Abthorpe, 2004).

Service quality (SEQ), as a term connected with information systems and technology, has been proven to be crucial to not only users' satisfaction, but also their motivation to continue using the software (Orel and Kara, 2014). SEQ can be described by the existence of online help resources, manuals, helpdesk services, and the existence of online information sources explaining how to use the system (Balaban, Mu, & Divjak, 2003).

User satisfaction (US) has been commonly used as a metric in the field of information systems as one of the main criteria when measuring the success of new systems (DeLone and McLean, 2003). Lin and Wang (2012) defined US as users' satisfaction with the system's response time, functionalities, quality. Additionally, it can be described as the extent to which users are satisfied with the choice to use it and how well it fulfills their expectations.

Information quality (IQ) refers to the extent to which users believe that the content is reliable, relevant, clear, and well-organized (Halonen, Thomander, & Laukkanen, 2010). IQ is one of the most important factors that determine satisfaction and use (Aparicio, Bacao, & Oliveira, 2017), and data show that it has a strong influence on user satisfaction (Jung, Chung, & Leue, 2015).

This study proposes the integration of TAM and IS Success Model. Based on the proposed model, the TAM is used to identify the factors that influence the intention to use mHealth DBT mobile applications from the user's perspective. Meanwhile, the IS Success Model is used to identify the factors that affect the continuance usage of the applications.

2. Objectives of the study

1) To study the characteristics of women with ED on the use of mHealth DBT mobile applications.

2) To study intention to use mHealth DBT mobile applications by women with eating disorders.

3) To study continuance usage intention of mHealth DBT mobile applications by women with eating disorders.

3. Materials and methods

For the purpose of exploring customer intention, this research was designed to be qualitative research. The population of the study was Russian people who has eating disorder symptom during the period of the study. The period of the study was May 1st to May 31st, 2022. The population of the study was 18-45 age female living in Russia who use DBT mobile or similar self-assist application. By this scope, the exact number of populations was unknown. Researcher used purposive sampling technique to comply with research objective of specific prior-experiences and behaviors. The expected interviewee was 10 for data variation purpose.

Research tools was semi-structured in-depth interview based on reviewed literatures. Both question and interview session were separated to four parts consist of respondent's profile, ED perception, ED and DBT behavior, and influence on DBT. Each part consists of 21, 10, 7, and 12 sequentially. Thematic analysis, deductive top-down coding was used for data analysis. Researcher carefully read and assure of collected data both meaning and completeness before interpretation. Key points were listed and categorized.

The interview was conducted in person, one individual at a time. Respondents was informed the objective and brief instruction prior to the session. Before the interview, researcher self-introduced and clearly reexplained both objectives and scope of the study. Respondents were well informed and acknowledged the right to end the session at any time. All collected data topic was present for respondent review before starting the session. Researcher asked respondent for recording permission for academic purpose. Handwritten notetaking was arranged separately for each session. The video recording was done on approbation basis.

4. Results

Second-ordered theme/code	Initial code	Representative quotations
Characteristics of users with ED		
Social support	Find out how other people are dealing with therapy or read about other people's experiences (2/10)	"I don't like sharing m results with others, because I don't want to be judged. But I enjoy seeing how's it going with others, it's interesting to compare."
	Collaborate with other users to have social responsibility (1/10)	"There was an opportunity to gather teams and share social responsibility: if one person missed a day of habit, all members in the team lost points that was interesting."
	None of respondents (0/10) mentioned that they were searching for support offered by therapists within apps	"I have my own therapist to share with."
Emotional support	Conversational style of communication, including notifications and pop-ups that	"I like when the app tells me kind words, like "You haven't been here for a while, but we're so happy that you're here now!"

Second-ordered theme/code	Initial code	Representative quotations
	mention user's name, talk in informal, kind and supportive way. (10/10)	"Not all of us have people that can say something like "Good job, three more steps left!". And the most amazing thing is when I decide to make a pause in app usage, the app says something supportive, comforting, and positive. It says that I did a great job and that tomorrow I will have more energy to do things. It is so effective and pleasant when the app says that I'm amazing because not that many people say that to me."
Emotional barriers	Unpleasant feelings when tracking meals, symptoms or emotions (6/10)	"It is really hard for me because I can't do it on a regular basis, so I always feel guilty."
		"The pressure of dairying caused anxiety."
	6/10 use 25% of the skills on a daily basis	"I am afraid of people on whom I need to practice new skills"
Motivation	Find it very helpful when an app motivates in a tender way (8/10)	"I woke up later and I saw a notification that planned time for my routine had passed, but notification said that it was still not too late."
		"Notifications motivate me a lot by saying something like "You're almost there!"
	Seeing results, data analysis, and statistics motivates to continue use an app (8/10)	"It is very important for me to see the progress and to analyze the connections between my behavior and mood."
		"The diary there was not good enough, because I couldn't analyze the overall results on the main screen"
High dropout rates	9/10 deleted DBT apps after 3-14 days of use	"I didn't like any of them."
		"All of them were awful!"
Perceived Usefulness		
Productivity	Achieving goals makes feeling much better (7/10)	"In the darkest times, I write a list of tasks. When I check them off, I feel constant relief." "I love seeing a pop-up with earned stars when I finish an exercise or a task in the app."
Learning performance	Exercise more effectively (10/10)	"I want to see clear and short instructions."
	Repetitive exercises are the best to remember things (5/10)	"The best way for me to remember something is to repeat it over and over again in different exercises."
	To understand the material better it's good to see examples and short video lessons (5/10)	"I really like that there are short animated videos of five minutes each with instructions and a summary of information. It's so simple and easy to understand."
Improving quality of life	Keep a diary and track emotions (9/10)	"I want a DBT app to help me track my emotional state easily."

Second-ordered theme/code	Initial code	Representative quotations
Perceived Ease of Use		
Engagement	Gamification is a great way to be more engaged and to understand material better (9/10)	"I like it when in the app they say that if I continue using it for 10 days, I'll get a new level." "Learning things during games is the best way to learn."
Customization	Like when there are ready solutions or plans that can be customized, flexibility. (9/10)	"Some apps give the option to try a famous person's routine or to adapt it to my needs."
	Customized diaries (10/10)	"I need an app that has a table for a diary that can be edited and has additional columns."
	Customized features (10/10)	It would be amazing if I could tap several buttons when I open an app for the first time, so that it has only those features that I'm actually going to use."
Service Quality		
Online help resources	Google if can't find needed features (8/10)	"If I can't understand how the app works, I google it."
	Delete an app if can't find a needed feature or can't understand the information (7/10)	"If the information is too complicated, I delete the app."
Manuals	Think that it's important for an app to have a help section (1/10)	"It irritates me, if the app doesn't have a help section with FAQ."
	Read the reviews in app stores in order to understand how the app work, if it's not obvious (5/10)	When I don't understand something about an app, I check the reviews in the Apple store to see if somebody had similar problem."
System Quality		
Stability	Delete the app if there are bugs that spoil experience (7/10)	"If there are system errors or bugs, I just delete it."
User-friendly interface	Interested in beautifully designed apps (8/10)	"It was ugly, I didn't want to use it." "It's like a web page from 1994."
	Feel that usually DBT apps' interfaces are confusing (5/10)	"Overwhelming. I felt that it was too complicated."
	Intuitive navigation is very important (6/10)	"Navigation was really bad, structure was hard to understand. Seems like it was made on purpose so that you have to scroll through many things before you find what you need. It made me really angry."
Feedback	Want to not to only track things, but also receive a feedback from the app, for e.g. advice or suggestion to use a skill that might help (5/10)	"I don't want an app to be like notes, I want it to react on my struggles." "It's really boring, there's no feedback"

Second-ordered theme/code	Initial code	Representative quotations
Information Quality		
Reliable content	Believe in the content in apps without checking (5/10)	"I trust it easily, if it was made with a help of experts."
Easy-to-understand content	Complicated information is an obstacle (9/10)	"Too many pages of complicated information to understand, by the third page it's already hard to focus. That's why I mostly learned from therapy sessions."
	Lack of Russian language is a barrier (7/10)	"I had to delete it because I couldn't understand much, I don't know English."
User Satisfaction		
Expectation fulfillment	Unsatisfied with all DBT apps they had used (10/10)	"All of the DBT app I've tried were too complicated and didn't have features I needed."

5. Discussion

Research objective 1: To study the characteristics of women with ED on the use of mHealth DBT mobile applications. The research findings align with prior literatures in many aspects. Firstly, all respondent (10/10) identified emotional support from apps as one of the most significant factors to use mHealth and m-Learning apps. To be precise, the answer refers to conversational style of messages, personalized notifications, soft and friendly tone of voice, kind, and supportive communication. Secondly, participants generally preferred caring in-app notifications as a source of motivation (8/10). Thirdly, most participants (8/10) were strongly motivated by either weekly or monthly data analysis that gave them not only the satisfaction of results, but also the ability to identify their problematic moments.

In consistent with literature review, a major concern when it comes to standard ED treatments is the dropout rate, the percentage of patients who leave treatment altogether after a certain period of time. Dropout rates for outpatient ED treatments can reach 73 percent (Fassino et al, 2009). And most of the female participants (9/10) deleted DBT apps after 3-14 days of use due to many reasons including lack of engagement and unpleasant feelings when tracking meals, symptoms or emotions (6/10).

In contrary, social support offered by other users and therapists within the app appeared to be not as important as previous research claimed. In a few studies, it has been found that in addition to convenience, patients greatly appreciate the social support received within the app from other users and therapists (Lindgreen, Clausen, & Lomborg, 2018). But only one woman collaborated with other users to have social responsibility: if one person missed a day of habit, all members of the team lost points. It is noteworthy that a few women (2/10) showed interest in seeing the results of others or reading their stories about therapy experiences. And none of respondents (0/10) mentioned that they were searching for support offered by therapists within an app.

Research objective 2: To study intention to use mHealth DBT mobile applications by women with eating disorders. It was found that many of the findings of the research were align with literature review. PU is the degree to which an individual is convinced that an application system is likely to increase their productivity (Gupta et al., 2020), improve their quality of life (Venkatesh and Davis, 2000), or improve their learning performance. Furthermore, PU influences the intention of a user to use an online platform (Venkatesh and Davis, 2000). PEOU can be used to determine the amount of effort users have to make in order to use an application, as the more effort they must make, the less efficiently they will use it (Cho, 2016). The result indicates more than half respondent (7/10) feel better after accomplishing their goals using a DBT or self-help app. This feeling motivates them to keep using the app. Checking off boxes in a to-do list, receiving levels and accomplishments, or checking statistics are the most popular ways to achieve a sense of accomplishment among respondents.

Moreover, result strongly explicit that enhancing learning performance was one of the most important factors that led respondents to perceive an app as useful: all women wanted to exercise more and learn DBT skills in a more effective way (10/10). Almost all respondents (9/10) also found it important to be able to track their emotions in a DBT app, as well as keep a diary. Another uncovered trend from the analysis was that half of the respondents (5/10) believed that repetitive exercises and short video lessons are the best way to comprehend and learn new material. Interestingly, only 25% of the skills are used on a daily basis some respondent (6/10). It can be attributed to numerous reasons including the fact that none of the DBT apps that are currently available are considered useful by interviewees.

In addition, two elements, customization, and gamification, were identified as vital in terms of PEOU. According to most response (9/10), gamification is a great tool that can help them to be more engaged, navigate easier and better understand the material being taught. Interestingly, all participants (10/10) favor flexible features interfaces where it is possible to use both readymade and customized solutions at the same time. Also, it has been mentioned numerous times that they would like to be able to customize not just the tables (diaries) but also the overall features of the app, to be able to hide those they don't use.

Research objective 3: To study continuance usage intention of mHealth DBT mobile applications by women with eating disorders. Respondents have varied opinion on connection between usage intention and learning effectiveness. A measure of SEQ is the presence of online help resources, manuals, and helpdesk services that provide information about the use of the system, as well as the existence of online information sources explaining how to use it. As term associated with information technologies and systems, it has been a crucial part of both users' satisfaction and their motivation to continue using the software (Orel and Kara, 2014). However, half of the respondents (5/10) claimed that if they are unable to understand how to use a particular app, or if they are unable to locate a particular feature, the first thing they do is read app store reviews in order to find the answer. Only one respondent opens the help section of an app when searching for an answer, while most others (810) do Googling for the answer. Moreover,

it is also important to mention that if an app is not perceived as useful, most respondents (7/10) will delete it instead of searching for manuals when encounter difficulties.

As for SQ, it is affected by system errors, user interfaces, and ease of use (Seddon, 1997). Furthermore, SQ is also defined as the overall effectiveness of an app in terms of reliability, (Petter, DeLone, & McLean, 2008). According to this study, more than half of the respondents (7/10) thought an app must be stable and that it shouldn't contain any system errors in order to be useful for most of them. Additionally, half of them (5/10) believe that DBT apps come with confusing interfaces. Over half of the respondents said it was important for them to be able to navigate intuitively through their DBT apps (6/10). Surprisingly, most respondents (8/10) emphasized the importance of beautiful design, which includes pleasing colors, types, and icons. Furthermore, half of the respondents (5/10) expressed their desire not only to add information into the app for the sake of tracking emotional state, but to also receive feedback from the app in the form of advice or suggestion on how to use a skill that might be helpful.

For IQ, it can be defined as the extent to which the content is perceived to be relevant, clear, and well-organized by users (Halonen, Thomander, & Laukkanen, 2010). According to Aparicio, Bacao, & Oliveira (2017), it is one of the most important factors that determine satisfaction and use. In terms of content perception in existing DBT apps, almost all respondents (9/10) believe that content is overwhelming, complicated, and hard to comprehend. The fact that some interviewees (7/10) find it difficult is mainly due to the large amount of text contained in the DBT apps as well as the fact that they are primarily available only in English. In terms of the trustworthiness or reliability of app content, all women (10/10) replied that they believe it is very important for content in apps to be relevant. However, half of them (5/10) held the opinion that it is relevant because it was stated that the app was developed with the assistance of experts.

It is important to mention that all of the respondents said that none of the DBT apps that they had tried had met their expectations and that none of them satisfied them, and only one of the respondents still had a DBT app installed. This is a compelling argument in support of the idea that it is very important to develop a DBT app that will satisfy users with ED so that they could keep using the app and learn emotion regulation skills with greater ease.

6. Conclusion

Although mHealth applications for mental and emotional health are widely used, many factors may increase dropout rates and make it more difficult for people with ED to learn and understand DBT skills, including emotional regulation skills. That is why it is important to identify, research, and understand factors that are connected to more efficient app development which might lead to users' satisfaction that increases continuance usage to improve learning effectiveness of emotional regulation skills through a mobile app. The study tries to investigate the connection of the factors on leaning behavior.

The study empirically found that characteristics of women with ED, intention to use and continuance usage intention have a significant connection with learning effectiveness of mHealth and DBT apps. Moreover, the study

indicated that there are some factors that might be linked to the learning effectiveness of apps other than the factors mentioned in previous research. Two highlighted factors are gamification elements and the responsive modification on emotional feedback. Nonetheless, some of the findings are not aligned with prior research. Of which, a need in social support both from other users and therapist in the app are important. Lastly, the less important feature of the apps in respondent opinion is help sections, manuals, and FAQs. This is because most of interviewees is either searching for answers in the reviews session in app store or deleted the app without looking for manual at all.

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