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INFORMATION SYSTEMS FOR IMPROVING MENTAL HEALTH: SIX EMERGING THEMES OF RESEARCH

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Abstract
This paper presents qualitative findings from two field studies that focused on supporting people with sleeplessness (Study I) and moderate depression (Study II). Both the studies were designed to examine the potential impact of reminders and rehearsal on the effectiveness of web-based information systems that were developed by implementing selected persuasive software features and incorporated with Acceptance and Commitment Therapy-based exercises. Sleeplessness and moderate depression were chosen because first, they are interrelated and, second they are essential for an individual’s general wellbeing. Good quality of life depends on different factors, and both sleeplessness and depression, if not addressed, can have detrimental consequences. In this paper, qualitative findings are reported with an aim to highlight underlying issues that are at times ignored. Further, the findings are expected to help designers better understand the dynamics of information systems that are developed for mental healthcare. For data collection, we used semi-structured interviews and Likert-scale questionnaires. Although, we used SPSS Version 20 to perform statistical analyses on pre- and post- study psychological measures for both Study I and II, however in this paper only qualitative findings will be reported as in the context of healthcare-related research qualitative methodologies have been advocated as a constructive approach. The results from the two studies portray an interesting contrast. While the participants of the Study I (Sleeplessness) did not generally find reminders to be effective, on the contrary, the participants of study II (Depression) highly appreciated reminders especially in terms of task completion. In terms of rehearsal, participants from both the studies favoured the software feature for learning new behaviors. Based on the qualitative findings, we have identified six emerging themes that are expected to open further research opportunities for mental healthcare researchers.

Keywords: Sleeplessness, Moderate depression, Reminders, Rehearsal, Acceptance and Commitment Therapy, Mental healthcare.
1 INTRODUCTION

Suitable amount and quality of sleep are necessary for a healthy mind and active lifestyles. Sleeplessness or insomnia is among major mental disorders yet they are somewhat understudied (Langrial et al. 2014; Alhola & Polo-Kantola, 2007). Sleeplessness and related disorders including insomnia are prevalent among general population. Available literature indicates that sleeplessness; sleep deprivation and insomnia are negatively correlated with an individual’s cognitive functioning (Water & Bucks, 2011; Durmer & Dinges, 2005; Aloha & Polo-Kantola, 2007). According to van Starten and Cuijpers (2009), physical fatigue, mood disorders, psychosomatic anxiety and psychological stress are among the consequences of sleeplessness. It would be fair to argue that the effects of sleeplessness and related disorders are frightening (Orzel-Gryglewska, 2010). For example, people who suffer from sleep deprivation face a higher risk of cardiovascular diseases, diabetes, depression and obesity (Faubel et al. 2009). Available literature further indicates that there is a decent amount of research that focuses on promoting healthy diet and regular exercise with an aim to improve people’s sleep behaviors (Tang et al. 2010; Purpura et al. 2011; Albanina et al. 2009). However, it is surprising that not much focus has been paid on tackling sleeplessness and related disorders in the research field of information systems. It is essential that mental healthcare researchers identify the stern challenge of designing effective information systems that have the potential to provide state-of-the-art healthcare solutions. The potential effect of information systems when combined with Cognitive Behavioural Therapy (CBT) has been fairly studied and encouraging findings have been reported for people suffering from Insomnia (Ong et al. 2012; Ritterband et al. 2009). Such findings highlight the potential of information systems that support people with sleeplessness and depression.

Another major mental disorder is that of depressive thoughts or mild-to-moderate depression. It is established that sleeplessness and depression are positively correlated (Benca & Peterson, 2008). It is among the most widespread mental disorders in contemporary world (Johansson & Andersson, 2014; Kessler, 2012). Depression is a serious mental health condition that affects nearly 350 million people around the world (Lappalainen et al. 2015). Just like sleeplessness, it is reported to be a cause of high mortality rate, poor life quality, social isolation and even sleeplessness added by high economic costs (Aromaa et al. 2011; Galatzier-Levy & Bonanno, 2014). Depression has also been correlated with suicide attempts, alcoholism and social stigma (Langrial et al. 2014). Depression and depressive disorders have been projected to increase the disease burden significantly by the year 2030 (Kleine-Budde et al. 2013). Health Information Systems (HIS) and Behavioural Psychology are well-studied research areas and provide ample opportunities for developing novel solutions for mental disorders such as depression especially by incorporating cognitive behavioural techniques (Aromaa et al. 2011). Existing literature highlights that information systems that are developed for mental healthcare could be improved when augmented with Cognitive Behavioural Therapy (CBT) (Meyer et al. 2009; Warmerdam et al. 2008). It is worth noting that various interferences have been identified that stop people from using online or more traditional treatments both for sleeplessness and depression. Some of the deterring reasons include low motivation, difficulty in finding psychological experts, lack or absence of professional services, unwillingness to discuss personal matters, high treatment costs and humiliation (Langrial et al. 2014). It is however encouraging to observe that researchers have been working on developing information systems that might help overcome the said hindrances. Further, there is convincing evidence in the existing literature that indicates the effectiveness of interventions delivered online by employing Cognitive Behavioural Therapy (CBT) (Andrews et al. 2010; Andersson & Cuijpers, 2009). However, information systems that employ Acceptance and Commitment Therapy (ACT) are to date rare (Lappalainen et al. 2015).

This paper highlights findings from two field studies (Study I for Sleeplessness and Study II for moderate Depression). Both the studies were carried out as a part of a nationwide project in Finland, and lasted for six-weeks respectively. The prime focus of the two studies was to evaluate the probable impact of reminders and rehearsal on fundamental challenges in mental healthcare research such as
task completion and learning desirable behaviors. This paper is structured to report qualitative findings through the lens of users’ experiences, observations and comments. It is expected that combining the qualitative findings from the two studies will help reduce ambiguities for researchers of information systems for mental healthcare. In other words, presented work can be seen as a developmental approach that would enhance the overall understanding of the requirements for designing such information systems in future.

2 BACKGROUND

According to Oh et al. (2005) information technology provides a fitting platform to provide healthcare services. This is particularly true because information technology supports cost effective delivery of innovative methods and practices to promote sustainable healthcare solutions (Kuonanoja et al. 2015). Ritterband and Tate (2009) state that healthcare interventions that are delivered over the Internet have shown promise particularly in terms of scalability and cost value. As a result, Internet-based healthcare interventions are receiving growing attention (Kraft & Yardley, 2009). Carefully designed information systems for mental healthcare can offer novel solutions with convenience for people who either cannot reach healthcare professionals or are not motivated enough to discuss psychological problems in person (Kuonanoja et al. 2015, Langrial et al. 2014). Existing studies also endorse the effectiveness of Internet-based health interventions that are incorporated with Cognitive Behavioural Therapy (CBT) (Andersson & Cuijpers, 2009). There is an obvious support for the effectiveness of CBT- based interventions for mental healthcare (Selgman et al. 2011). While Cognitive Behaviour literature underlines evidence about the usefulness of CBT- related techniques, it is fairly interesting to note that a few studies have focused on utilizing Acceptance and Commitment Therapy (ACT), which is the latest wave of CBT (Hayes et al. 2005). What makes Acceptance and Commitment Therapy (ACT) an effective approach is that it is known to improve an individual’s psychological flexibility and is therefore positively correlated with improved mental health (Lappalainen et al. 2015; Hayes et al. 2005). Thoughtful research efforts have been made to understand the details of information systems that are developed to assist people with mental health complaints including sleeplessness, depression and anxiety. It is worth noting that researchers from the fields of Information Systems (IS) and Human Computer Interaction (HCI) have developed and evaluated the effectiveness of selected software features and their probable impact on task completion (Mohr et al. 2014), user satisfaction (Kelders et al. 2011), task adherence and overall psychological outcomes (Langrial et al. 2014).

HCI researchers have emphasized on designing information systems that facilitate the behaviour change process. For an instance, Consolvo et al. (2009) advocate the use of Theory- driven design for behavior change interventions. On the other hand, Choe et al. (2011) propose that information systems and technological innovations have the potential to advance mental healthcare. They further add that designing such systems is a challenging task therefore there is a need for rich understanding of various factors including cultural sensitivities, privacy issues as well as individual motivations and lifestyles. Although design strategies and generic frameworks for conceptualizing and developing information systems for improved mental healthcare are frequently found in available literature, it is also evident that the potential impact of persuasive software features either in a selected combination or isolation have been largely overlooked (Langrial et al. 2014). Reminders have been among the most frequently studied software features that can be described as periodic prompts or triggers in the form of text messages, email-based messages, nudges or immediate feedback that is delivered to users during an intervention (Lappalainen et al. 2015; Patrick et al. 2009; Fry and Neff, 2009). The overall success of reminders could be further improved if they were to be augmented by tailored content. Further, the timing and content of the reminders can enhance the positive impact of reminders in terms of task completion (Schneider et al. 2013). In contrast to reminders as a software feature, rehearsal has previously been used mostly in the area of Cognitive Behavior studies. Billet (2010) underscores that guided learning practices when frequently exercised could help formation of newly learned
behaviours. Although Billet’s work is focused on workplace learning, however, it can be inferred that appropriate development and implementation of learning techniques, individuals’ willingness to learn and well-designed guidelines could lead to the development of new skills and behaviours. Scholars from the field of Psychology have recognized cognitive improvements through performance-based processes (Thorpe et al. 1987). The basic idea of rehearsal could perhaps be linked with “learning through practice”. According to Billet (2010), practice pertains to routine exercise of a given skill, craft or occupation. It is further proposed that learning through practice is not only limited to developing an individual’s abilities but equally to enable her in dealing with existing or new challenges. Hence, it can be carefully proposed that exercising is related with rehearsal as a technique to learn new skills and behaviours. We have observed that there is little if any research in the area of mental healthcare that investigates the potential impact of rehearsal as a software feature. This research gap was identified and helped us in setting the tone for the two field studies focusing on sleeplessness and moderate depression respectively.

Building upon Fogg’s formative work (2002), several researchers have proposed their own concepts. The Persuasive Systems Design Model (Oinas-Kukkonen & Harjumaa, 2009) is among one of them. They propose that persuasive information systems should prompt users to perform desired behaviors. They further advocate the use of rehearsal as a software feature for facilitating behavior change process. Likewise, Fogg (2002) argues that rehearsal is a mean of providing an environment where people can practice and learn new behaviours. There is yet another important aspect of using rehearsal as a software feature. It would be reasonable to propose that the concept of rehearsal as a technique to learn new behaviours can be grounded in Bandura’s Social Cognitive Theory (SCT) (Bandura, 1986). He proposes that learning process is, “an information processing activity in which information about the structure of behaviour and about environmental events is transformed into symbolic representations that serve as cognitive guides for the construction of complex modes of behavior” (Bandura, 1986, p.51).

An on-going challenge in the area of Health Information Systems (HIS) and e-Health interventions is low task completion and high dropout rates as pointed out by Eysenbach (2005). In the presented work, we shifted away from relatively well-studied areas such as attrition rates and focused more on task completion (by analysing the potential influence of reminders) and learning new behaviors (through the use of virtual rehearsal). We emphasize that task completion is a unique phase that could potentially lead to extended user engagement hence reducing dropout rates. A large body of literature highlights valuable information relating with task completion however, by stressing on the use of material rewards, admiration, and positive feedback (Volpp et al. 2008). We further argue that it is important for healthcare researchers not to confuse adherence with low attrition or high drop out rates. For example, dropouts generally pertain to participants in a given health intervention who do not fulfil a research protocol (Kelders, 2013). Eysenbach (2005) describes adherence as the extent to which participants of a given study experience the content. Adherence has also been reported as the extent to which participants’ behaviours balance with the advice and recommendations as stimulated by the interventions (Aronson, 2007). These clarifications provide rich understanding of a rather overlapping phenomenon. However, it is our argument that task completion could be improved by developing engaging interventions that are augmented with meaningful and rich content. In other words, task completion is more about forming compliance, fulfilling desirable tasks and it could be the first step towards solving the challenging issue of adherence and high drop out rates in the area of information systems that promote general and mental healthcare. Researchers and system developers would also need to pay detailed attention to psychological theories to better understand underlying explanations for high dropouts, which is also maintained by Consolvo et al. (2009). Further, it is our assumption that task completion can not only reduce high dropout rates but could potentially lead to a state of higher self-efficacy where users develop self-confidence to learn new skills and perform desirable behaviors. We have attempted to investigate the said issues especially because low task adherence and difficulties in learning new skills are among the top challenges when it comes tackle mental health problems (Mohr et al. 2010). This paper presents identified themes from the qualitative responses collected from the participants of the two field studies.
Both the studies were primarily conducted using a mixed-method approach, which is sometimes also known as triangulation and is used in various disciplines (Brewer & Hunter, 1989). In addition, Wood et al. (1999) state that a mixed-method approach helps researchers investigate a research problem by employing a combination of qualitative and quantitative research methods. The different methods certainly complement each other by uncovering thorough outcomes. According to Kaplan and Duchon (1988), blending qualitative and quantitative approaches provide a deeper understanding for interpreting and validating research outcomes. As stated above, presented work will highlight the qualitative findings only. This is because reporting outcomes from statistical data analysis is beyond the scope of presented work. Applying qualitative research methods is known to be highly beneficial because they help minimize ambiguity about critical underlying concepts and themes. In other words, it could be taken as a developmental approach that improves the overall understanding of a research problem and help gain meaningful answers (Sofaer, 1999). Qualitative research becomes especially useful for performing research analyses as it describes and explains participants’ experiences, behaviours, interactions and their social interactions (Strauss & Corbin, 1990). In the context of healthcare research, qualitative methodology has been highlighted as a constructive approach.

3 PROCEDURES

3.1 Recruitment

Study II was conducted between September 2012 and January 2013. Participants were recruited through newspaper advertisements that explained that we were seeking individuals who felt depressed. The inclusion criteria included: 1) Self-reported depressive symptoms, 2) Depressed mood, 3) No parallel therapy for depression, 4) Access to Internet, 5) Having an email account and 6) Age 18 years of over. In response, a total of 42 individuals contacted the university clinic (Department of Psychology, University of Jyväskylä, Finland) for initial screening. After initial screening, measurement packages and informed consent forms were sent out to the selected participants. One participant dropped out before the screening process and another two did not meet the inclusion criteria therefore the final number of the participants was Thirty-nine (N=39).

Study I was conducted between October 2013 and November 2013. Participants were recruited through newspaper advertisements. The advertisements explained that we were seeking people were suffering from sleep problems. The eligibility criteria included: 1) Access to Internet, 2) Having an email account, 3) Access to telephone, 4) Not being part of a therapy for sleep disorders in parallel, 5) and aged 18 years or over. In response, 122 individuals contacted the university clinic (Depart of Psychology, University of Jyväskylä, Finland) for initial screening process. From the 122 individuals, 14 were dropped out, as they did not meet the inclusion criteria. Another 22 were excluded from the study because of limited research resources. Consequently, the final number of participants for Study I was eighty-six (N=86).

3.2 Ethical Approval

Because both the studies included real people with sleeplessness issues and depressive symptoms respectively, the studies followed the Declaration of Helsinki and the research. Further, Ethical Approval was formally obtained from the Ethical Committee at the University of Jyväskylä, Finland and the Central Finland Healthcare District (Diary no: 15U/2012).
3.3 Randomization

Randomization for Study II was performed on the 13th of September 2012. The participants were divided into two groups: (1) Intervention group 1 (n=19) that received the measurements, automated reminders and complete access to the weekly rehearsal modules, and (2) Intervention group 2 that first served as a waiting list control group and had to wait for a period of six-weeks before they could access the complete intervention. Although the Intervention group 2 had access to the weekly rehearsal modules, however, they did not receive automated weekly reminders. A total of 28 (71.8%) females and 11 (28.2%) males with an average age of 51 years comprised the total sample. Upon completion of the six weeks from Intervention group 1, login credentials for the intervention were sent to the participants of the Intervention group 2. For Study I, randomization was performed using a randomization tool (https://www.random.org/lists) on the 9th of October 2013. Again the participants were divided into two groups: (1) Intervention group (n=43) that received the measurements, and had complete access to the intervention supplemented with two automated weekly reminders, and (2) Wait-list control group (n=43). For ethical reasons, the Wait-list group received access to the complete intervention but no reminder were sent out. A total of 31 (72.1%) females and 12 (27.9%) males comprised the Intervention sample aged between 24 to 73 years.

3.4 The Interventions

The interventions were designed and developed in collaboration between research groups from the Department of Information Processing Science, University of Oulu and Department of Psychology, University of Jyväskylä, Finland. A research team from the University of Oulu was responsible for developing and implementing the software features while the research group from the University of Jyväskylä was responsible for developing ACT-based rehearsal modules for both the studies. Rehearsal as a software feature was employed to enhance mindfulness, acceptance skills, value-based actions, and psychological flexibility with the help of carefully constructed metaphors, experiential exercises and behavioural activation (Hayes et al. 2006). Table 1 and 2 exhibit a brief overview of the modules that were used for the rehearsal content for Study II and I respectively.

<table>
<thead>
<tr>
<th>Week</th>
<th>Acceptance and Commitment Therapy Modules used for Rehearsal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Creative hopelessness and values</td>
</tr>
<tr>
<td>2</td>
<td>Value-based actions</td>
</tr>
<tr>
<td>3</td>
<td>Contact with the present</td>
</tr>
<tr>
<td>4</td>
<td>Cognitive defusion</td>
</tr>
<tr>
<td>5</td>
<td>Self as context</td>
</tr>
<tr>
<td>6</td>
<td>Acceptance</td>
</tr>
</tbody>
</table>

*Table 1. Acceptance and Commitment Therapy Modules for Rehearsing to overcome moderate depression.*
<table>
<thead>
<tr>
<th>Week</th>
<th>Theme</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Values and value-based actions</td>
<td>Knowing what matters the most for an individual in her life and acting in accordance</td>
</tr>
<tr>
<td>2</td>
<td>The present moment</td>
<td>Living in the present moment (mindfulness)</td>
</tr>
<tr>
<td>3</td>
<td>Cognitive defusion</td>
<td>Understanding that an individual’s thoughts could be different</td>
</tr>
<tr>
<td>4</td>
<td>The observer stance</td>
<td>Learning to view one’s thoughts and feelings from an observer’s stance</td>
</tr>
<tr>
<td>5</td>
<td>Acceptance</td>
<td>Accepting one’s feelings, and thoughts and admitting that one cannot change things</td>
</tr>
<tr>
<td>6</td>
<td>Summary</td>
<td>Rehearsing ACT exercises from the past five weeks</td>
</tr>
</tbody>
</table>

Table 2. Acceptance and Commitment Therapy Modules for Rehearsing to improve sleeplessness.

3.5 Qualitative Data Collection

Upon completion of the Study II, the participants were asked questions about system usefulness, impact of reminders on task completion, impact of rehearsal on learning new behaviors, impact of rehearsal on self-confidence and their intention to practice newly learnt (if any) skills in future. The questionnaire used Five-point Likert-type scale ranging from 1 = Strongly agree to 5 = Strongly disagree. In addition, the participants were interviewed in a post-intervention session where their experiences and general comments were recorded, coded and analyzed.

In Study I, users’ experiences with the intervention and its overall usefulness was evaluated using Likert-scale (Likert, 1932) questionnaires at the beginning and the end of the study. The questions focused on participants’ expectations and perceived usefulness of the system (pre-study) while their actual experiences, system usefulness, ease of use, impact of reminders on task completion, impact of rehearsal on self-confidence and impact of rehearsal module to improve sleep behaviors (post-study). Finally, the participants were interviewed (exit interview) in a post study satisfaction survey where their experiences and remarks were recorded, coded and analyzed.

4 RESULTS

In Study II (Moderate Depression), automated reminders were sent to Intervention Group I only, in order to evaluate how the participants perceived the effect of reminders on task completion. A high majority of the participants (83.3%) approved the reminders and gave positive remarks that; for example, it is easy to forget important tasks in a hectic lifestyle. Some of the representative remarks are listed below:
Participants from the intervention group that did not receive reminders stated that reminders would have been helpful and a desirable feature. Some of the representative quotes are as below:

P6. “...If one has a tendency towards forgetting things that need to be done (reminders would have helped a great deal)”.  

P7. “Yes (reminders would have been useful), because I forgot since there were no reminders, the due dates were hard to remember”.

Some mixed remarks were also noted. Below are a few representative quotes:

P8. “I did not need to be reminded. I was already committed to the program (intervention)”.  

P9. “I would try to make the reminders and rehearsal (exercise modules) less demanding”.

A high majority of the participants approved the impact of rehearsal in helping them to learn new skills and behaviors. Some of the representative comments are listed below:

P10. “Exercises (weekly rehearsal modules) were good. All in all, the interaction (experience) was excellent”.  

P11. “Weekly themes (modules) were very good. They brought me in touch with my (core) values and I learned to be consciously present in the moment”.  

P12. “I found the rehearsal (content) to be supportive. It kept me on track”.  

P13. “I think the weekly rehearsal (modules) improved my understanding about life”.

In Study I (Sleeplessness), 41 out of the 43 participants gave their feedback and remarks about reminders. Some of the representative remarks are listed below:

P1. “Reminders worked fine. Adding SMS–based reminders would have been better”.  

P2. “The system was good. I found the reminders and rehearsal to be beneficial”.  

P3. “I expected a little more from the system. The rehearsals were good and so were the reminders (they were much needed)”.

Participants generally appreciated the rehearsal feature as well as its content. Some of the representative quotes are listed below:

P4. “I go to know myself (better) and now I have new (better) viewpoints (about my life)”.
P5. “I had no problems with the systems. It was (indeed) a positive experience. The entire program was well built (designed) both technically and content wise”.

P6. “There was a lot of new information. The program provided broad (comprehensive) approaches towards (tackling) sleep problems, it was engaging. Although my sleep problems are still the same, I will continue to rehearse”.

P7. “Rehearsals were easy to use and reasonable (logical). It was (indeed) an interesting experience. Now I can sleep and breathe better”.

P8. “It was a positive experience. Working the exercises (rehearsals) has improved my situation”.

P9. “It was a surprising and exciting experience. I committed myself to the program (intervention) and I learnt new skills”.

P10. The system (rehearsal modules) taught me to listen, breathe and mediate well. It helped me accept that there are bad times. Thank you”.

Some mixed remarks were also noted. Some of the representative quotes are stated below:

P11. “A little more interaction (prolonged study period) would have been better (desirable)”.

P12. “The program (intervention) did not help me. The study period should have been longer”.

P13. I expected more from the system (intervention). However, my own laziness influenced my learning process”.

Based on the qualitative feedback and comments from the participants of the two studies, the following six themes have been identified that could be used by researchers and system designers for mental healthcare.

- **Provision of positive feedback:** Users of a given intervention appreciate receiving positive feedback. This could lead to better interaction between the users and the systems (interventions). It is generally accepted that positive feedback improves the learning process (Mitrić et al. 2013). It has also been observed that positive feedback improves the overall interactivity and engagement (Schubart et al. 2011). Therefore, it is important that the intervention provides carefully crafted feedback (content) to the users.

- **Provision of constructive criticism:** People with mental illnesses are generally sensitive towards criticism however, some might benefit from it by focusing on the constructive content of the feedback. However, such a strategy would perhaps best suit those individuals who are open to receive criticism and have the motivation to benefit from it for personal improvement (Bergner, 1995). This could be an interesting area for further research in the area of mental healthcare using information systems.

- **Use of SMS to supplement Email-based reminders:** Email-based reminders could be supplemented with SMS. The use of SMS-based reminders has been proposed for e-Health interventions (Pop-Eleches et al. 2011). The role of SMS-based reminders has also been supported by researchers in the area of behavior change (Neff & Fry, 2009). They argue that mobile phones are like constant partners therefore making it easier for the prompts to be sent. This could be particularly useful for people who do not check their emails frequently.
• **Adding supportive content to the reminders:** It is critical that people suffering from mental conditions such as depressive thoughts are not left in a situation where they feel isolated or unattended to. One of the key themes identified from the interviews is that participants emphasized on the need for adding supportive content to the reminders. It is therefore proposed that when developing the content of reminders, subtle elements of empathy should be given consideration. By adding the element of support, we can reshape the entire intervention as supporting mental health interventions leading to better outcomes including higher adherence or lower dropout rates (Mohr et al. 2011).

• **Reminding people of their core values:** The intervention should be designed in such a way that it reminds people of their core values and that it facilitates the users to reflect upon their values (Ploderer et al. 2014). Further, the content of the interventions should be designed in a way that it helps people to identify what is really important for them, what are their goals and values. Once people identify their core values, they are more likely to take actions to overcome difficult and unpredictable situations hence making life easier for them (Kuonanoja et al. 2015).

• **Engage users by developing logical content:** Mental healthcare interventions should be designed with an aim to provide users with a rich and engaging experience. In other words, the content of the interventions should be meaningful and affective. By adding logical content, it would be easy to involve users emotionally because user engagement depends on elements that include but are not limited to behavioral actions, cognition and threads of logical arguments (O’Brien, 2010).

5 **DISCUSSION**

The main objective of the presented work is to highlight qualitative findings from two field studies that specifically focused on two prevalent mental disorders namely moderate depression and sleeplessness. In this paper, participants’ personal reflections about system usefulness, impact of reminders on task completion, impact of rehearsal on learning new skills and behaviors, and participants’ overall experiences with the systems (interventions) have been highlighted with an aim to identify emerging themes that could help the researchers and system designers to develop effective information systems for mental healthcare. It is noted that the reminders were generally well received by the participants of both the studies. However, an interesting finding was the there was no significant added effect of the reminders on the overall psychological outcomes.

Nevertheless, reminders did support the participants in completing their weekly tasks (rehearsal modules). Rehearsal on the other hand, markedly improved participants’ self-efficacy while decreasing cognitive burden and disorientation. The relatively lower effect of reminders could be contributed to the rich, engaging and meaningful content of the ACT-based rehearsal modules because the participants reported them as highly useful and effective. Yet another reason could be the intrinsic motivation of the participants. This is because despite suffering from serious mental conditions (moderate depression and sleeplessness), they volunteered to be a part of the studies without any monetary incentive. This indicates that people have a natural tendency to look for and try out all the available means that can help them tackle mental healthcare issues.

Although the lack of significant effect for reminders was observed, it is worth noting that some of the participants felt that whilst receiving the reminders, they were being dealt on an individual level. This is an interesting observation and opens up further research opportunities to develop and evaluate personalized reminders. In terms of rehearsal, it was noted that almost all of the participants from both the studies not only approved but also found it as a successful technique to learn new skills leading to enhanced state of self-confidence. This observation is not only supported by the post study questionnaires and interviews but also by evident decrease in the severity of depression and
sleeplessness. It is therefore cautiously proposed that although mental healthcare is predominantly dealt in face-to-face sessions, however, carefully designed technology-based solutions with no or minimal face-to-face contact can be as effective in treating such disorders. In both the studies, we observed significant improvements in post-study psychological measurements where participants experienced enhanced mental state (both in terms of moderate depression and sleeplessness) and improved self-confidence to tackle such disorders. However, reporting the psychological measurements and their outcomes is beyond the objective and scope this paper.

6 LIMITATIONS

Like any other research project, presented work has its limitations. First, an effort has been made to combine the qualitative findings from two field studies with slightly different research settings. The number of participants for the studies are not the same, however, it should be considered that the primary base of the interventions for both the studies was Acceptance and Commitment Therapy that provides a solid ground to combine the qualitative findings. Second, the entire focus has been laid on qualitative comments and remarks because reporting the quantitative and psychological measurements was outside of the objective and beyond the scope of this paper. Further, even though presented work combines two field studies with real patients of moderate depression and sleeplessness, yet the overall sample size is rather small hence making it hard to generalize the results.

7 CONCLUSIONS AND RESEARCH IMPLICATIONS

Presented paper highlights qualitative findings from two field studies about the effectiveness of reminders and rehearsal in web-based information systems for sleeplessness and moderate depression. The systems were incorporated with Acceptance and Commitment Therapy (ACT), which is the latest wave of Cognitive Behavioural Therapy (CBT). Reminders were studied to examine their potential impact on task completion that is proposed to be a way forward to solve the prevalent problem of high dropout rates in healthcare interventions while rehearsal was evaluated to find out whether it can enhance participants’ self-efficacy and self-belief to tackle serious mental conditions. The reported representative quotes highlight participants’ experiences with the interventions and provide noteworthy insights that can have significant implications for researchers in the area of mental healthcare. Presented work contributes to the exiting literature relating with task completion and improved self-confidence (self-efficacy) and by highlighting the potential effectiveness of information systems as a medium to deliver novel solutions for mental healthcare. The identified themes provide a solid ground for researchers in the area of Health Information Systems to develop potentially effective interventions that focus on people with mental disorders especially depression and sleeplessness.

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