Barriers and motivators to electronic and mobile Health (e&mHealth) interventions in mental illness management amongst construction workers

Janet M. Nwaogu
The Hong Kong Polytechnic University, 11 Yuk Choi Rd., Hung Hom, Kowloon, Hong Kong, China.
PhD Candidate, Dept. of Building and Real Estate, E-mail: janet.nwaogu@connect.polyu.hk (corresponding author).

Albert P. C. Chan
The Hong Kong Polytechnic University, 11 Yuk Choi Rd., Hung Hom, Kowloon, Hong Kong, China.
Chair Professor and Head, Dept. of Building and Real Estate, E-mail: albert.chan@polyu.edu.hk

Emmanuel K. Owusu
The Hong Kong Polytechnic University, 11 Yuk Choi Rd., Hung Hom, Kowloon, Hong Kong, China.
PhD Candidate, Dept. of Building and Real Estate, E-mail: emmanuel.k.owusu@polyu.edu.hk

Abstract

The alarming rate of mental illness in the construction industry has led to paralleled suicide rates benched at about 370% increase particularly in England, ranked the top cause of death in America and Australia. Thus, there is a growing interest to combat it by reinforcing researches in occupational health psychology and leveraging on information technology. e&mMental health interventions hold promises for increasing and quality mental illness management, however, there is a concern on increased dropout from such interventions without meeting the desired health goal. The purpose of this study is to identify the barriers and motivators to e&mhealth interventions in mental illness management. The result is intended to inform design implication for such technologies specific to the construction occupation. This study employed the qualitative method to gather data from 34 respondents. Information gathered were relating to likes, dislikes, and barriers to continual use of such interventions. The result was analyzed by systematic content analysis using MAXQDA software. The study showed that though respondents prefer the intervention due to stress reduction abilities, provision of access to quick solution and the monitoring of mental health and efficiency. However, respondents had concerns regarding battery life, synchronization and navigation demands, efficiency and practicability, cost of procurement and data access, boredom and lack of human interface. Therefore, future designs for construction industry should increase on the satisfaction measures and address the dissatisfaction measures which constitute the barriers to continual use. To motivate user engagement, the study recommends that video testimonials, coach and live support are needed for all interventions, they should equally be made affordable and easily comprehensible to the varying class of users.

Keywords: *mental illness, occupational health psychology, e&mMental health, barriers, motivators.*

1. Introduction

Mental health seems deteriorating over time with mental illness such as depression and anxiety being the most common condition globally (Mnookin, 2016). Untreated mental illness poses a risk to suicide and increase of death (Bolton, 2015; Philips et al., 2002). To mitigate such mental illnesses, World Health Organisation (WHO) has placed utmost priority on treatment and prevention through the WHO Mental Health Gap Action Programme (mhGAP) (WHO, 2008). Therefore, mental health promotion has taken several forms such as anti-stigma campaigns, school interventions and workplace interventions (Mnookin, 2016). While these programmes are beneficial, they are highly location based.

Over the past decades, information technology has evolved fast with varying cellphones and internet burst – providing an avenue to information search, connectivity and knowledge on mental illness and self-help (Christenen, 2016; Dorwick, 2015). According to Stewart (2003), mental illness affects the quality of life and occupational performance. Mental ill health causes pain in working populations, with about 50% increased comorbidities (Von Korff et al., 2005; Pincus et al., 2002). Studies have shown that in working populations, construction workers inclusive, mental illness is associated with musculoskeletal pain (Demyttenaere et al., 2008; Kessler et al., 2001) and work-related injuries (Zheng et al., 2010).

Several studies aimed at promoting healthcare of construction workers have been undertaken to increase safety on the job and reduce premature exit from the profession (see Ng and Chan, 2018; Boschman et al., 2013). In curbing mental illness following the alarming suicide rates which hit the industry years ago (Burki, 2018; Andersen, 2010), several interventions are sought. For instance, in the UK between 2011-2015, suicide rate was reported at 3.7times above the national average (Burki, 2018). According to Moonkin (2016), Information and Communication Technology (ICT) offers another mode for mental health management with the advantage of addressing physical barriers. The use of such information technology to manage mental health is popularly referred to as e&mMental health. The study opined that electronic and mobile mental health screening, diagnosis and treatment will provide highly specific and contextualized interventions in mental health management.

However, despite the positivity that ICT offers in mental health intervention to all sectors, studies have reported that about 25-50% of users drop out of electronic and mobile health (e&mhealth) intervention in mental illness management within 4 to 6 months of use (Dorwick, 2015; Nahum-Shani et al., 2015). According to the studies, the abrupt exit was not due to improvement in the health status. As a result of this, it was needful to research into the reasons for such behaviour of entry and exit from such e&mhealth interventions. Therefore, this research aims to identify the barriers and motivators to e&mhealth interventions in mental illness management. An understanding of this will provide feedback, informing decisions and features for future intervention development to ensure customer satisfaction and engagement.

2. Literature review

Electronic health (eHealth) and mobile health (mHealth) intervention afford the chance to reach a risk groups just in time and ensure continuous self-help in mental illness management (Naslund et al., 2015a). e&mHealth in mental illness management referred to as "e&mMental health" implies the use of internet related technologies in mental illness detection, management and mental health maintenance (Wozney, 2017). e&mMental health uses mediums such as computers, tablets, smartphones, health monitoring systems such as wearables to improve health care (Naslund et al., 2015a; Dowrick, 2015).

eMental health is a universal set to mMental health (Fiordelli et al., 2013). eMental health has been defined by Christenten et al. (2002) as mental health services, information delivered and enhanced through the Internet and other related technologies. mMental health, on the other hand, refers to emerging mobile communication and technologies for mental health management (Hilty et al., 2017). They can be in the form of health packages developed for mental health and accessed through a mobile technology platform or medium such as smartphone interventions.

According to Hilty et al. (2017), the services which e&mMental affords includes website information, support group/chat, social media, self-assessment tools with feedback, mobile health, psych apps, sensors, and other

technologies. There are several e&mMental health interventions for mental illness such as the online services, activity trackers, heartbeat monitors, mobile apps, smartphone interventions (Naslund et al., 2015a). Smartphone interventions such as FOCUS smartphone intervention for schizophrenia, SitCoach are for serious mental illness (Naslund et al., 2017; Nahum-Shani et al., 2015). For common mental illness such as anxiety and depression, Contact and Connect Smartphone intervention is proposed for the depression management amongst construction workers (Milner et al., 2015). While these interventions are promising, there are reported increased exit from using them (Nahum-Shani et al., 2015; Musiat et al., 2014). A pictorial view of an e&mMental health intervention is shown in Figure 1. According to Stiles-Shields et al. (2017) identifying barriers will inform design changes to be made in mental health interventions which will boost efficacy. This implies that without identifying barriers to continual use of such interventions, they will be built based on intuitions and as such there will be limited consumer or customer (user) satisfaction and engagement. Therefore, the objectives of the study were to (i) identify the reasons for acceptability (likes) for the interventions (ii) identify barriers to continual use of e&mMental health interventions. The knowledge of the barriers will inform decisions for future designs and improvements thereby motivating continuous user engagement on e&mMental health interventions.

Fig. 1. A pictorial view for mMental health intervention

3. Research method and methodology

The study adopted the qualitative method using open-ended questionnaire. The qualitative technique was employed because it affords the opportunity to get a better picture of a question (Cattel et al., 2016); as people can freely express their likes, dislikes and concerns pertaining a situation or product (Millner and Lambert, 2014). The research methodology involved two steps (i) extensive literature review to identify research questions (ii) interviews with industry practitioners. In the first step, 4 major questions were elicited from literature review. The developed questions were reviewed and piloted by a professor with over 15 years of rich experience and a researcher with expertise in e&mMental health. The second stage entailed administration of the survey forms through Google forms database and Mail Merge by Quickluiton software. The survey was administered using a convenience sampling technique.

4. Results and Discussion

A total of 207 surveys were sent out while 34 response were retrieved from Google forms. The response rate was therefore 16.4% of total surveys. The low percentage response rate is not unusual for survey conducted using online web-based medium (Fricker, 2008). The respondents were construction professionals occupying positions such as Project manager (Construction Manager), Quantity Surveyor, and Architects. The data collected was analyzed using MAXQDA software for mixed methods analysis. The survey questions solicited information on likes, dislikes about e&mMental health intervention, type of intervention and reasons for possible discontinuing to use the intervention. Information on demographic characteristics particularly age and gender were also sought. Out of the 34 respondents, 82.4% (28) were male, 17.6% (6) female and the mean age was 40 years (SD = 8.97); most of the participants (44.1%; 15/34) were between ages 35-44, and 11.8% (4/34) were above 54 years (Table 1).

Table 1: Demographic characteristics

Demographics		Frequency	Percentage
Gender	Male	28	82.35
	Female	6	17.65
	Total	34	100.00
Age	25-34	10	29.41
	35-44	15	44.12
	45-54	5	14.71
	54-64	4	11.76
	Total	34	100.00

4.1 e&mMental health use

Out of the 34 respondents, only 18 (52.9%) uses e&mMental health intervention. Therefore, the reporting is based on the 18 responses as they form feedback on actual use of such intervention. A similar study evaluating mental health smartphone app using qualitative sampling got 8 final responses (see Goodwin et al., 2016). In qualitative research, enough depth of response is most important, and a small sample size or response can give that provided data saturation is achieved (Parahoo, 2014; Bryman, 2012).

When asked what kind of intervention the respondents use (see Fig. 2), 55.6% used the mobile-based apps, 38.9% use the wearable technology and 38.9% used the online based interventions. Online interventions were used to get more information about mental health, coping mechanisms, motivations and to interact with other people in mental health group as a social support. This aligns with Wetterlin et al. (2014) and Naslund et al. (2015a, 2016a), persons with mental ill health turn to the internet and social media (e.g., Facebook, Twitter) to get help or information about feelings with mental health problems.

The study revealed that the mobile based apps (particularly smartphone mental health apps) were used for periodic assessment, Cognitive Behavioural Therapy (CBT) psychosocial intervention and meditations. This is consistent with Hilty et al. (2017), who posited that smartphone apps are used for several purposes such as to augment psychotherapy, symptom tracking, and psychoeducation. Finally, wearable technology was used for monitoring individual activities and calculating heart rate. This reason can be seen in Naslund et al. (2016b), wearable technologies are important in mental health to ensure a person is active physically, as it helps to benchmark steps taken per day, giving people a push to be physically active, preventing obesity and at same time guarding against depressive state of mind.

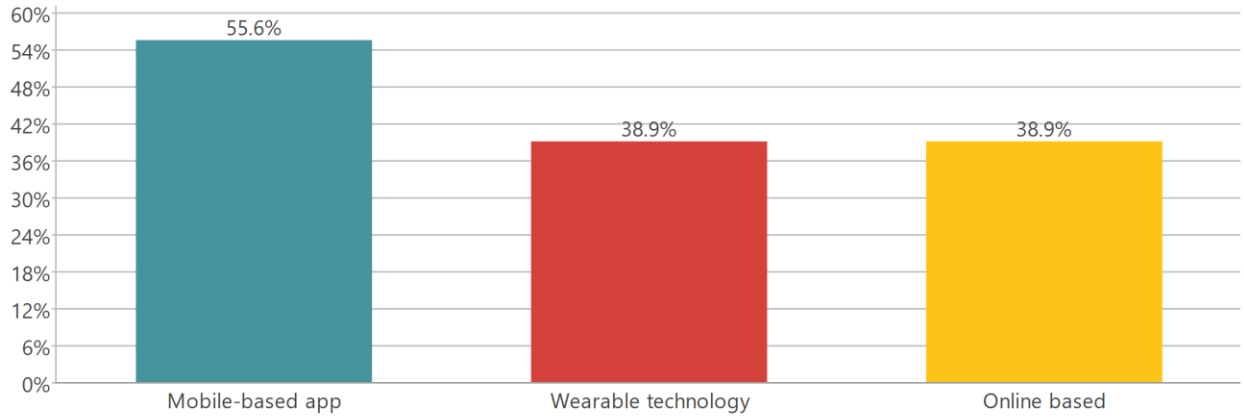

Fig. 2. Interventions used

Respondents were asked what their likes were regarding e&mMental health interventions. The total response in this category was more than 100% because some respondents gave multiple reasons for liking the intervention (see Fig. 3). Respondents likes for e&mMental health intervention include they provide quick access to solution (22.2%), provide update on their health (22.2%), easy to use (22.2%), help to reduce stress (22.2%) and are efficient (11.1%),. The findings are consistent with Wetterlin et al. (2014), that people turn to such interventions as quick source of information on their health and for tracking or assessing progress. Naslund et al. (2016c) who posited mental health interventions are efficient and easy to use. Luxton et al. (2014) some e&mMental health interventions are great at stress reduction through meditation and muscle relaxation activities.

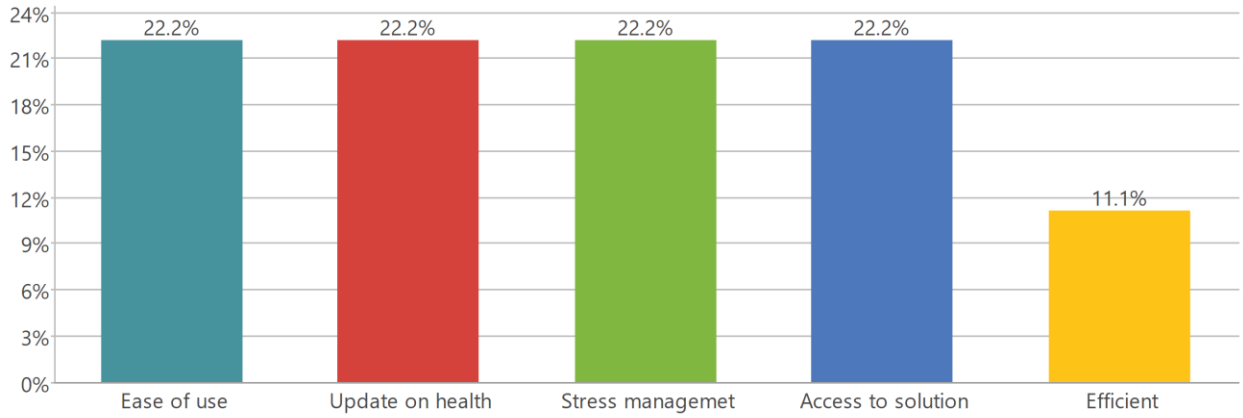

Fig. 3. Likes about e&mMental health interventions

Information was sought on what the respondents disliked about e&mMental health intervention and reported below (see Fig. 4). The dislikes are they are ineffective and unpracticable (14.3%), synchronization and navigation demands (14.3%) and battery issues (7.1%). The study also revealed that apart from the dislikes, there were concerns which form barriers to continual use of e&mMental health interventions (see Fig 5.). Such barriers were concerns about efficiency (14.3%), being expensive (14.3%), and boring (7.1%).

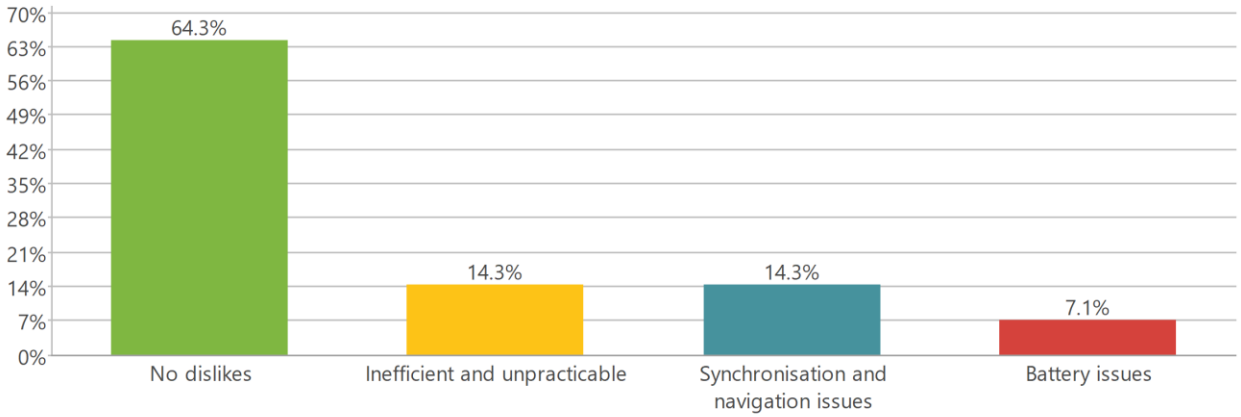

Fig. 4. Dislikes about e&mMental health

The dislikes and barriers are consistent to previous studies Naslund et al. (2016c), though wearables such as activity trackers are effective, the calories monitoring of the gadget is ineffective as the results were unrealistic and not feasible. Dislike and barriers such as boring were centred around lack of human interface, the interventions being robotic. This aligns with Stiles-Shield et al. (2017) who recommended the integration of human interface in future designs. Concerns about the interventions being expensive relating to cost were consistent in both queries and were associated with cost of app and internet access. This is also consistent with Naslund et al. (2015b), some mobile mental health interventions are expensive and unaffordable to low-income earners. The cost of internet access (data package) is also a major barrier to using mMental health intervention (Stiles-Shield et al., 2017).

Battery life, synchronization, and navigation demands are associated with usability. This aligns with Simblett et al. (2018), the applications consume too much battery of smartphones. Naslund et al. (2016c) posited challenges relating to use of wearables with smartphones and companion mobile application especially amongst persons with limited mobile technology use. Another significant barrier was poor awareness or knowledge about such interventions as was revealed by the number of persons (16/34; 47.1%) who do not use any of the intervention. These findings point out the concerns and needs of users. As such, to promote improved mental health through continuous intervention engagement, the concerns should be met in future designs. The construction industry also need to leverage on such interventions to reduce stress, amongst numerous advantages of the interventions, while providing mental health promotions and management for it at-risk personnel.

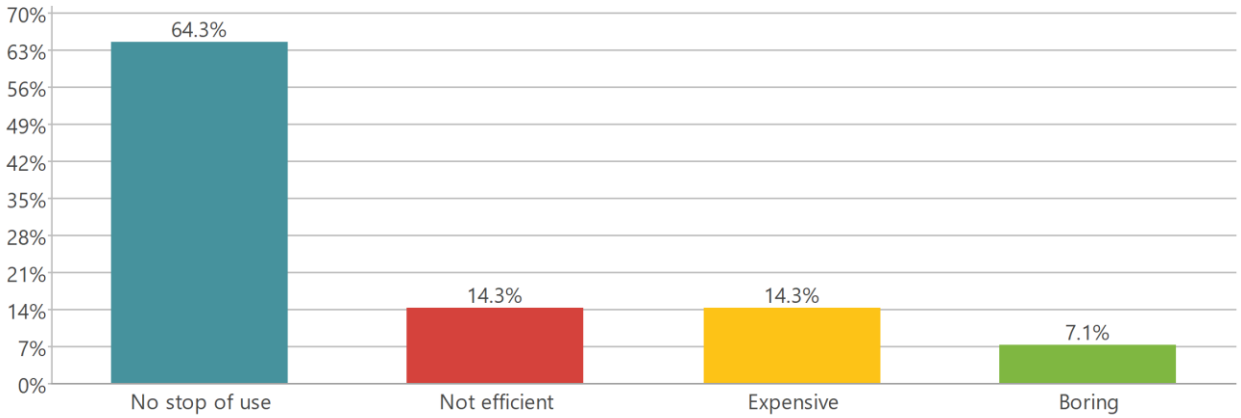

Fig. 5. Reasons to stop use

5. Conclusion

e&mMental health is promising and beneficial to mental health in any field and can be custom fit to meet specific psychosocial demand of construction workers. The study deduced that major likes about the interventions and reasons for use are those related to quick access to solution, efficiency, providing update on health, ease of use and stress reduction. Therefore, future designs should ensure e&mMental health interventions provide for satisfaction measures more effectively. Despite the likes for the interventions, reasons for dislikes and concerns about premature exit from the interventions were related to being expensive (cost of procurement and data access), short battery life, burden of navigation demands and synchronizing interventions to gadgets, concerns about effectiveness and practicability, boredom from same features and lack of human interface. Future designs should address these concerns appropriately to ensure customer satisfaction and engagement.

As regards cost of procurement and data access, designs of affordable interventions are important. With respective to smartphone apps, trial packages could be allowed for users after which they can upgrade to the payment options based on initial satisfaction. This will help ensure that mental health apps to be developed are efficient since continual subscription and use is dependent on initial satisfaction. To improve effectiveness and practicability, video testimonials of people of same demographics should be included. Such video testimonials using demographic features are essential user requirements in other health interventions (see Schnall et al., 2015).

Boredom from same features and lack of human interface centred around same features, lack of feedback and robotic nature of the interventions could be addressed by using coaches and live support in all interventions. Coaching and live support in interventions will help increase motivation, engagement and meet health need. The burden of navigation demands, synchronization and other usability concerns could be eliminated by making the technologies simple and easy to use by people who are not vastly inclined with the pace of information technology. Incorporating a help button in all e&mMental health intervention is also recommended.

While this study adopted a qualitative approach, future studies can use quantitative techniques to determine barriers to using e&mMental health interventions, this could allow for comparative study. The study revealed that a lot of construction workers had no knowledge of e&mMental health interventions. There is need for the industry to leverage on information technology for mental health promotions amongst its workers. Also, further studies can be carried out using populations with clinically diagnosed mental illnesses and who use e&mMental health interventions for continuous health management.

Acknowledgement

The authors would like to acknowledge the support of Department of Building and Real Estate, Hong Kong Polytechnic University for her financial support. This paper is part of a PhD study where articles with identical background and methodology but varying objectives and scopes may be published.

References

Andersen, K., Hawgood, J., Klieve, H., Kõlves, K., & De Leo, D. 2010. Suicide in selected occupations in Queensland: evidence from the State suicide register. *Australian and New Zealand Journal of Psychiatry*, *44*(3), 243-249.

Bolton, J. M., Gunnell, D. & Turecki, G. 2015. Suicide risk assessment and intervention in people with mental illness. *BMJ,* 351**,** h4978.

Boschman, J. S., Van Der Molen, H. F., Sluiter, J. K. & Frings-Dresen, M. H. 2013. Improving occupational health care for construction workers: a process evaluation. *BMC Public Health,* 13**,** 218.

Bryman A. 2012. How many qualitative interviews is enough? In: Baker SE, Edwards R, eds. How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research. Southampton: National Centre for Research Methods, 18–20.

Burki, T. 2018. Mental health in the construction industry. The Lancet Psychiatry, 5(4), 303.

Cattell, K., Bowen, P. and Edwards, P., 2016. Stress among South African construction professionals: a job demand-control-support survey. *Construction Management and Economics*, *34*(10), 700-723.

Christensen, H., Griffiths, K., & Evans, K. 2002. *e-Mental health in Australia: Implications of the Internet and related technologies for policy*. Canberra: Commonwealth Department of Health and Ageing. Google Scholar.

Christensen, H., Batterham, P. J., Gosling, J. A., Ritterband, L. M., Griffiths, K. M., Thorndike, F. P., Glozier, N., O'dea, B., Hickie, I. B. & Mackinnon, A. J. 2016. Effectiveness of an online insomnia program (SHUTi) for prevention of depressive episodes (the GoodNight Study): a randomised controlled trial. *The Lancet Psychiatry*, 3**,** 333-341.

Demyttenaere, K., Bonnewyn, A., Bruffaerts, R., De Graaf, R., Haro, J. M., & Alonso, J. 2008. Comorbid painful physical symptoms and anxiety: prevalence, work loss, and help- seeking. *Journal of affective disorders*, *109*(3), 264-272.

Dowrick, C. 2015. Computerised self-help for depression in primary care. *BMJ*, 351**,** h5942.

Fiordelli, M., Diviani, N. and Schulz, P.J., 2013. Mapping mHealth research: a decade of evolution. *Journal of medical Internet research*, *15*(5).

Fricker, R.D., 2008. Sampling methods for web and e-mail surveys. *The SAGE handbook of online research methods*, 195-216.

Goodwin, J., Cummins, J., Behan, L., & O'Brien, S. M. 2016. Development of a mental health smartphone app: perspectives of mental health service users. *Journal of Mental Health*, *25*(5), 434-440.

Hilty, D.M., Chan, S., Hwang, T., Wong, A. and Bauer, A.M., 2017. Advances in mobile mental health: opportunities and implications for the spectrum of e-mental health services. *Mhealth*, *3*. doi: 10.21037/mhealth.2017.06.02

Kessler, R. C., Greenberg, P. E., Mickelson, K. D., Meneades, L. M., & Wang, P. S. 2001. The effects of chronic medical conditions on work loss and work cutback. *Journal of Occupational and Environmental Medicine*, *43*(3), 218-225.

Luxton, D. D., Hansen, R. N., & Stanfill, K. 2014. Mobile app self-care versus in-office care for stress reduction: a cost minimization analysis. *Journal of telemedicine and telecare*, *20*(8), 431-435.

Miller, A.L. and Lambert, A.D., 2014. Open-ended survey questions: Item nonresponse nightmare or qualitative data dream. *Survey Practice*, *7*(5), 1-18.

Milner, A., Witt, K., Burnside, L., Wilson, C., and LaMontagne, A.D., 2015. Contact & connect—an intervention to reduce depression stigma and symptoms in construction workers: protocol for a randomised controlled trial. *BMC public health*, *15*(1), 1062.

Mnookin, S., 2016. Out of the Shadows: Making Mental Health a Global Development Priority. *World Bank Group and World Health Organization: Washington, DC. (http://documents. worldbank. org/curated/en/270131468187759113/Out-of-theshadows-making-mental-health-a-global-developmentpriority)*.

Musiat, P., Goldstone, P. and Tarrier, N., 2014. Understanding the acceptability of e-mental health-attitudes and expectations towards computerised self-help treatments for mental health problems. *BMC psychiatry*, *14*(1), 109.

Nahum-Shani, I., Hekler, E. B. & Spruijt-Metz, D. 2015. Building health behavior models to guide the development of just-in-time adaptive interventions: A pragmatic framework. *Health Psychol*, 34S**,** 1209-19.

Naslund, J.A., Marsch, L.A., McHugo, G.J. and Bartels, S.J., 2015a. Emerging mHealth and eHealth interventions for serious mental illness: a review of the literature. *Journal of mental health*, *24*(5), 321-332.

Naslund, J. A., Aschbrenner, K. A., Barre, L. K., & Bartels, S. J. 2015b. Feasibility of popular m-health technologies for activity tracking among individuals with serious mental illness. *Telemedicine and e-Health*, *21*(3), 213-216.

Naslund, J.A., Aschbrenner, K.A. and Bartels, S.J., 2016a. How people with serious mental illness use smartphones, mobile apps, and social media. *Psychiatric rehabilitation journal*, *39*(4), 364.

Naslund, J. A., Aschbrenner, K. A., Scherer, E. A., McHugo, G. J., Marsch, L. A., & Bartels, S. J. 2016b. Wearable devices and mobile technologies for supporting behavioral weight loss among people with serious mental illness. *Psychiatry research*, *244*, 139-144.

Naslund, J.A., Aschbrenner, K.A. and Bartels, S.J., 2016c. Wearable devices and smartphones for activity tracking among people with serious mental illness. *Mental health and physical activity*, *10*, 10- 17.

Naslund, J. A., Aschbrenner, K. A., Araya, R., Marsch, L. A., Unützer, J., Patel, V. & Bartels, S. J. 2017. Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. *The Lancet Psychiatry,* 4**,** 486-500.

Ng, J. Y. K. & Chan, A. H. S. 2018. The Work Ability of Hong Kong Construction Workers in Relation to Individual and Work-Related Factors. *Int J Environ Res Public Health,* 15.

Parahoo K. 2014. *Nursing research: Principles, process and issues*. 3rd edn. New York: Palgrave, Macmillan.

Phillips, M.R., Yang, G., Zhang, Y., Wang, L., Ji, H. and Zhou, M., 2002. Risk factors for suicide in China: a national case-control psychological autopsy study. *The Lancet*, *360*(9347), 1728-1736.

Pincus, T., Burton, A. K., Vogel, S., & Field, A. P. 2002. A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. *Spine*, *27*(5), E109- E120.

Schnall, R., Mosley, J.P., Iribarren, S.J., Bakken, S., Carballo-Diéguez, A. and Brown III, W., 2015. Comparison of a user-centered design, self-management app to existing mHealth apps for persons living with HIV. *JMIR mHealth and uHealth*, *3*(3).

Simblett, S., Greer, B., Matcham, F., Curtis, H., Polhemus, A., Ferrão, J., Gamble, P. and Wykes, T., 2018. Barriers to and facilitators of engagement with remote measurement technology for managing health: systematic review and content analysis of findings. *Journal of medical Internet research*, *20*(7).

Stewart, W. F., Ricci, J. A., Chee, E., Hahn, S. R. & Morganstein, D. 2003. Cost of lost productive work time among US workers with depression. *Jama,* 289**,** 3135-3144.

Stiles-Shields, C., Montague, E., Lattie, E. G., Kwasny, M. J. & Mohr, D. C. 2017. What might get in the way: Barriers to the use of apps for depression. *Digit Health,* 3**,** 2055207617713827.

Von Korff, M., Crane, P., Lane, M., Miglioretti, D. L., Simon, G., Saunders, K., ... & Kessler, R. 2005. Chronic spinal pain and physical–mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain*, *113*(3), 331-339.

Wetterlin, F.M., Mar, M.Y., Neilson, E.K., Werker, G.R. and Krausz, M., 2014. eMental health experiences and expectations: a survey of youths' Web-based resource preferences in Canada. *Journal of medical Internet research*, *16*(12).

World Health Organization, 2008. mhGAP: Mental Health Gap Action Programme: scaling up care for mental, neurological and substance use disorders.

Wozney, L., Newton, A.S., Gehring, N.D., Bennett, K., Huguet, A., Hartling, L., Dyson, M.P. and McGrath, P., 2017. Implementation of eMental Health care: viewpoints from key informants from organizations and agencies with eHealth mandates. *BMC medical informatics and decision making*, *17*(1), 78.

Zheng, L., Xiang, H., Song, X., & Wang, Z. 2010. Nonfatal unintentional injuries and related factors among male construction workers in central China. *American journal of industrial medicine*, *53*(6), 588-595.