



UWL REPOSITORY

repository.uwl.ac.uk

A systematic review of usefulness design goals of occupational mobile health apps for healthcare workers

Yingta, Nurha, Abdelnour-Nocera, Jose ORCID logoORCID: <https://orcid.org/0000-0001-7935-7368>, Brew, Obed ORCID logoORCID: <https://orcid.org/0000-0003-1710-6197> and Rehman, Ikram ORCID logoORCID: <https://orcid.org/0000-0003-0115-9024> (2021) A systematic review of usefulness design goals of occupational mobile health apps for healthcare workers. In: Interact 2021: 18th IFIP TC 13 International Conference, 30 Aug–03 Sep 2021, Bari, Italy.

http://dx.doi.org/10.1007/978-3-030-85607-6_37

This is the Accepted Version of the final output.

UWL repository link: <https://repository.uwl.ac.uk/id/eprint/8170/>

Alternative formats: If you require this document in an alternative format, please contact: open.research@uwl.ac.uk

Copyright:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy: If you believe that this document breaches copyright, please contact us at open.research@uwl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

A Systematic Review of Usefulness Design Goals of Occupational Mobile Health Apps for Healthcare Workers.

Nurha Yingta¹, Jose Abdelnour-Nocera^{1,2}, Obed Brew¹ and Ikram Ur Rehman¹

¹ University of West London, St Mary, Ealing UK
21363511@student.uwl.ac.uk, {abdejos, brewobe, rehmiqr}@uwl.ac.uk

² ITI/Larsys, Funchal, Portugal

Abstract. To improve healthcare professionals' health and wellbeing at work, many available effective treatments including meditation, and workplace intervention, have been developed. However, the utilisation of these interventions is still limited. Currently, various mobile health applications (mHealth Apps) exist to help a wide range of users with different occupational health issues, such as stress, anxiety, and burnout. Despite their advantages, post-download uptake of mHealth apps by end-users remains low. Some of the reasons for this are poor usability, irrelevant or missing user-desired features, and poor user experience. This review paper explores the usefulness of mHealth Apps for the early detection of occupational-related ill-health among healthcare workers. Science Direct, ACM Digital Library, IEEE Xplore, and SAGE Journal were searched comprehensively to identify relevant research articles. A total of 9546 reviewed papers were primarily identified through the systematic search on the databases. 2546 articles were removed from them, by duplication check on a RefWorks software. Titles and abstract screening of the remaining 126 led to 50 relevant articles being selected for full text screening. Of these 76 were excluded based on exclusion criteria. Finally, 19 articles were selected for a final inclusion to identify the relevant usefulness design goals, including usability, utility and user experience, deemed as critical for apps' adoption and use. These goals include provide contextually relevant information, which is easy to understand for usability; support self-help guidance and in-depth knowledge for occupational health and wellbeing for utility; reinforced trust and perceived security in m-Health apps for user experience.

Keywords: Occupational Health, Usability, Utility, User Experience, Healthcare Workers

1 Occupational Mobile Health and Usefulness

Occupational-related ill-health (ORIH) is a major health concern for successful economic growth. In UK, the rate of ORIH is 4.8 thousand per 100,000 workers [1], and it is commonly associated with any physical and mental health conditions that result from organisational factors as well as an imbalance of demands, skills and social support at work [2]. Current data suggests most ORIH in UK are mental health related (51% of 1.6 million cases), followed by musculoskeletal (30%) – other types of illness make up 19% [3].

Workers in the medical sector are at increased risk of occupational-related ill-health due to the extraordinary stressors in this environment [4]. Stressors related to the healthcare profession include long work hours, dealing with pain, loss and emotional

suffering, disease outbreak, and providing support to families [5, 6]. These stressors can trigger physical and mental health issues, such as stress, burnout and anxiety.

Despite the advantages of mHealth apps, it remains a huge challenge to find effective ones supporting the prevention and management of occupational ill-health as not much has been done to identify and assess the factors impacting the usefulness and adoption in the contexts of usability, utility and user experience terms. Therefore, the review focuses on the usefulness design goals of mobile mHealth apps to support occupational ill-health in HCWs.

Most of the research on usefulness and mHealth has been focused on perceived usefulness and based on acceptance models such as the Technology Acceptance Model (TAM) and e-Commerce Acceptance Model (EAM) [7, 8]. Several authors in previous studies have addressed the terms “usefulness” in different ways. For example, Nielsen [9] defines a useful interactive system as compounded with the attribution of usability and utility. In addition to usability and utility, usefulness is influenced by the emotional feelings with a system, including enjoyment to provide a richer experience of continued use [10, 11]. Overall, the literature on usefulness reflects that this is a complex construct defined by usability, utility and user experience (UX) factors contingent on users’ contexts and sociocultural backgrounds. Having a consideration of HCW’s real-world experiences is vital to designing integrated and useful mHealth solutions [12].

2 Review Methodology and Findings

Four resources including ACM digital Library, IEEE Xplore, SAGE journal, and Science Direct were searched in December 2020, and repeated in February 2021, to identify relevant studies. The search terms relating to occupational “mHealth apps”, “well-being health apps”, “usefulness”, “usability”, “utility”, “user experience”, and “healthcare workers” in different Boolean operator (“AND” and “OR”) were used to identify relevant literature. Screening for inclusion was then carried out to extract relevant studies identifying the key design goals that enhance the adoption and continued use of such mHealth apps. A PRISMA Flowchart was created to identify the following points; (1) studies that use occupational health apps or wellbeing health apps; (2) studies that relevant to usability, utility and user experience; (3) studies that were conducted with healthcare workers or workers. We excluded studies that reported on health apps used only by patient (s), abstract, posters, and studies with no full text available.

A total of 9546 reviewed papers were primarily identified through the systematic search on the databases. 2546 articles were removed from them, by duplication check on a RefWorks software. Titles and abstract screening of the remaining 126 led to 50 relevant articles being selected for full text screening. Of these 76 were excluded based on exclusion criteria. Finally, 19 articles were selected for a final inclusion to identify the relevant usefulness of mHealth apps. We cannot list all reviewed papers here due to space limitations of the poster paper, but we have provided at least the most important reference for each goal in table 1.

Table 1. Identified usefulness design goals of occupational m-Health apps proven to be relevant or often lacking.

Concept	Goals (position statement)	Goal Definition	Reference
Usability Goals	Provide contextually relevant information, which is easy to understand	Healthcare workers have mentioned apps should reflect their own work domain context and roles	[13]
	Match user expectations about the type of app: prevention or management	Help the user access the information they need whether the app helps them prevent or manage work-related ill-health.	[14]
Utility Goals	Support self-help guidance and in-depth knowledge for occupational health and well-being	The reviewed literature reveals this is a feature that is lacking or not sufficiently developed	[15]
	Promote social connectedness	The app should include some communication and information sharing features such as a group collaboration among app users and with clinicians.	[16]
User Experience Goals	Reinforced trust and perceived security in m-Health apps	It is necessary for users to feel confident that the system will behave as intended. This has resulted in increased collaboration with the system securely and willingly.	[17]
	Manage the performance expectancy of m-Health apps	The app design should be consistent with its intended goal, e.g. if it is presented as a prevention app then its features should be consistent with this aim.	[18]

3 Discussion and Conclusions

The findings presented here provide an enhanced understanding of usefulness design goals that should be considered in designing an mHealth app to support healthcare workers health and wellbeing in healthcare work setting. The identified design goals highlight not only the key dimensions of usefulness, but also the key insights needed to

inform design to improve adoption and continued use of such occupational mHealth apps. For instance, in relation to usability and user experience goals, given the fast-paced nature of healthcare work, workers' everyday usage and associated experiences should be considered in the design of such health apps. This is in line with previous study by [20], which suggests that understanding ordinary users' experience, cognitive challenges and demands from the workplace context will ensure the design of relevant and useful mHealth solution. Moreover, in relation to utility goals, mHealth apps will have the potential to provide healthcare workers with a better health and wellbeing if the crucial features are effectively incorporated in such apps. This suggests that having a consideration of user desired features could lead to the increased adoption and continued used of the system [21].

The review presented in this paper provides insightful knowledge for the design of occupational mHealth apps to enhance the usefulness of such health apps. Due to the nature of healthcare professionals work contexts and environments, future occupational mHealth apps should be designed differently following domain-relevant and distinct design goals such as those identified in this review. The proposed goals address these aspects and are contributions to the literature on mHealth by advancing knowledge on the user-centred design of this genre of apps, focusing on healthcare workers [16, 22].

References

1. Hse.gov.uk.: Health and safety statistics. (2021).
2. Rajgopal, T.: Mental well-being at the workplace. *Indian journal of occupational and environmental medicine*. 14, 63–65 (2010). <https://doi.org/10.4103/0019-5278.75691>.
3. New, long-standing cases of work-related ill health by type, 2019/20: The Labour Force Survey (LFS).
4. Ravalier, J.M., McVicar, A., Boichat, C.: Work Stress in NHS Employees: A Mixed-Methods Study. *International journal of environmental research and public health*. 17, 6464 (2020). <https://doi.org/10.3390/ijerph17186464>.
5. Solano Lopez, A.L.: Effectiveness of the Mindfulness-Based Stress Reduction Program on Blood Pressure: A Systematic Review of Literature. *Worldviews on evidence-based nursing*. 15, 344–352 (2018). <https://doi.org/10.1111/wvn.12319>.
6. Alameddine, P., Mohamad, MPH, Dainty, P. (c), Katie N., MSc, CRPC, PhD, R.D., Sibbald, M., William J. (Bill), MD: The intensive care unit work environment: Current challenges and recommendations for the future. *Journal of critical care*. 24, 243–248 (2009). <https://doi.org/10.1016/j.jcrc.2008.03.038>.
7. Schnall, R., Higgins, T., Brown, W., Carballo-Dieiguez, A., Bakken, S.: Trust, Perceived Risk, Perceived Ease of Use and Perceived Usefulness as Factors Related to mHealth Technology Use. *Studies in health technology and informatics*. 216, 467–471 (2015).
8. Alsswey, A., Al-Samarraie, H.: Elderly users' acceptance of mHealth user interface (UI) design-based culture: the moderator role of age. *Journal on multimodal user interfaces*. 14, 49–59 (2020). <https://doi.org/10.1007/s12193-019-00307-w>.

9. Nielsen, J.: Usability inspection methods. In: Conference companion on Human factors in computing systems. pp. 413–414 (1994).
10. Koufaris, M.: Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior. *Information systems research*. 13, 205–223 (2002). <https://doi.org/10.1287/isre.13.2.205.83>.
11. MacDonald, C., Atwood, M.: What does it mean for a system to be useful?: an exploratory study of usefulness. Presented at the (2014). <https://doi.org/10.1145/2598510.2598600>.
12. Aryana, B., Brewster, L., Abdelnour-Nocera, J.: Design for mobile mental health: an exploratory review. (2018).
13. Yassaee, M., Mettler, T., Winter, R.: Principles for the design of digital occupational health systems. *Information and Organization*. 29, 77–90 (2019). <https://doi.org/10.1016/j.infoandorg.2019.04.005>.
14. Torquati, L., Kolbe-Alexander, T., Pavey, T., Leveritt, M.: Changing Diet and Physical Activity in Nurses: A Pilot Study and Process Evaluation Highlighting Challenges in Workplace Health Promotion. *Journal of Nutrition Education and Behavior*. 50, 1015–1025 (2018). <https://doi.org/10.1016/j.jneb.2017.12.001>.
15. Richert, J., Lippke, S., Ziegelmann, J.P.: Intervention-engagement and its role in the effectiveness of stage-matched interventions promoting physical exercise. *Res.Sports Med.* 19, 145–161 (2011). <https://doi.org/10.1080/15438627.2011.583164>.
16. Torous, J., Nicholas, J., Larsen, M.E., Firth, J., Christensen, H.: Clinical review of user engagement with mental health smartphone apps: evidence, theory and improvements. *Evidence-based mental health*. 21, 116–119 (2018).
17. Rajan, J.V., Moura, J., Gourley, G., Kiso, K., Sizilio, A., Cortez, A.M., Riley, L.W., Veras, M.A., Sarkar, U.: Understanding the barriers to successful adoption and use of a mobile health information system in a community health center in São Paulo, Brazil: a cohort study. *BMC medical informatics and decision making*. 16, 146 (2016). <https://doi.org/10.1186/s12911-016-0385-1>.
18. Liew, M.S., Zhang, J., See, J., Ong, Y.L.: Usability Challenges for Health and Wellness Mobile Apps: Mixed-Methods Study Among mHealth Experts and Consumers. *JMIR mHealth and uHealth*. 7, e12160 (2019). <https://doi.org/10.2196/12160>.
19. Bakker, D., Rickard, N.: Engagement in mobile phone app for self-monitoring of emotional wellbeing predicts changes in mental health: MoodPrism. *Journal of affective disorders*. 227, 432–442 (2018). <https://doi.org/10.1016/j.jad.2017.11.016>.
20. Clemmensen, T., Hertzum, M., Abdelnour-Nocera, J.: Ordinary User Experiences at Work: A Study of Greenhouse Growers. *ACM transactions on computer-human interaction*. 27, 1–31 (2020). <https://doi.org/10.1145/3386089>.
21. Chandrashekar, P.: Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps. *mHealth*. 4, 6–6 (2018). <https://doi.org/10.21037/mhealth.2018.03.02>.
22. Yen, P.-Y., Bakken, S.: Review of health information technology usability study methodologies. *Journal of the American Medical Informatics Association : JAMIA*. 19, 413–422 (2012). <https://doi.org/10.1136/amiajnl-2010-0000>

