Interaction Design Study for Movement-based Meditation Applications

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Mindfulness and meditation practices have been studied for their benefits to mental and physical well-being. The aim of this PhD is to explore interactive meditation applications that utilized real-time and non-disruptive feedback to support alternative mindfulness practices. We used frameworks in the Attention Regulation Framework to design the applications. In the first study, we explored kinetic meditation as it might give more opportunities for more novel research in mindfulness practice and interaction between the users and the interactive kinetic meditation applications. The preliminary result showed positive responses and we will use the feedback to inform the next studies. The findings of this PhD will provide more information about designing interactive mindfulness applications.

1. INTRODUCTION

The covid-19 pandemic has caused mortality and morbidity in those affected. Research by Priyanka (2021) showed there was an increase in stress and anxiety in the general population. It has also triggered irreversible changes in the way we do things such as changing face-to-face activities to online work or study, among other things (Radanliev & De Roure, 2021). Radanliev & De Roure (2021) reviewed alternative such as home-based therapies for healthcare and mental health to adapt to the changes and improve well-being.

1.1 Research Aims

This PhD aims to explore interactive meditation as one of the online alternative therapy to improve the well-being of the general population. We also explore the best practices to design interactive applications, especially for digital mindfulness technology. We do not intend to completely replace the guided meditation teachers, as their role is important in learning mindfulness. Rather, we would like to give support for self-study in between their practice.

1.2 Research Questions

(i) How to design interactive meditation applications for users at home to support mindfulness practice?

(a) How to design interactive real-time feedback that is suitable with the requirements of mindfulness practice?

(ii) How do different forms of feedback affect users' performance in movement accuracy during interactive mindfulness practice?

(iii) What are the user experience qualities of different forms of feedbacks in meditation applications?

2. BACKGROUND

The majority of previous research related to mindfulness in HCI examines how technology can support mindfulness (Terzimehic, et.al., 2019). Researchers have been developing different kinds of technology for mindfulness. Some of the examples are mobile applications such as Headspace (Headspace, 2022); web-based applications; self-guided resources provided by organizations; augmented reality or real-time interactive Tai Chi in virtual reality (Liu et al., 2020). For beginners, learning to practice mindfulness requires a lot of effort (Yildiran & Holt, 2015). Feedback would be beneficial for them to help them understand how to do mindfulness practice better.

The Attention-Regulation Framework that we use in this study is based on Niksirat et al., (2019) about the suggestion on designing mindfulness
applications. The important keys of the framework were real-time detection to monitor user's states, feedback to inform users about their current state, and the regulation technique to help users reach meditative state (Niksirat et. al., 2019). According to Niksirat (2021), embodied cognition theory could be used to approach the challenge detecting users' state detection without bio-signals as it refers to how human mind and body are intertwined and influenced each other.

Pose estimation is used for detection and to inform feedback for users in this study. It is the process to detect the position and orientation of an object (Sigal, 2020). PoseNet is a machine-learning network from Tensorflow used to identify human poses from images or videos by identifying the body joints resulting in 17 keypoints of human joints in JSON (Papandreou et. al., 2018). Data collections from target images were calculated using PoseNet which later would be compared to users' live data.

The interactive web applications was developed using HTML, CSS, and Javascript. After the system detects user's real-time poses through their camera using PoseNet from Tensorflow. Cosine similarity was used to measure the similarity between the user's pose and the target pose (Li, 2013). The result of the calculation using similarity cosine package (Liu, 2021) was shown to the participants in the user interface.

4. PHD PROGRESS

The first study has been conducted. The study was titled "Exploratory study on kinetic meditation". The main goal of the first study was to test the interactive kinetic meditation applications and feedback from the users and test the functionality. We found that participant that was practicing mindfulness standing meditation found that the applications was very useful and was able to practice mindfulness breathing. We would continue in this direction by designing an interactive standing meditation with real-time non-disruptive feedback.

Study 2 will start with a participatory design with experts to gain an understanding of the current practice, challenges, and user requirements. Audio feedback will be incorporated in the study to subtly inform the accuracy of the position measurement from the pose estimation. The study will continue with user study to understand the interaction between users and the feedback. We would like to understand the effects of using these feedbacks, especially for beginner practitioners. In study 3 and study 4, we will explore other feedbacks that are non-disruptive which suit the requirements of meditation to attain a meditative state as previous research mentioned (Niksirat et. al.,2019)

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