A Scoping Review of Interactive Mindfulness Technologies for Mental Wellbeing: Considerations from HCI and Psychology

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Abstract. There has been a growing interest in the fields of Psychology and Human-Computer Interaction (HCI) to develop interactive technologies to facilitate the practice of mindfulness, which has shown significant benefits for physical and mental wellbeing. However, there has been limited academic work evaluating the distinct approaches taken from both fields, and in what way they could benefit each other. In this paper, we present a scoping review of interactive biofeedback mindfulness technologies for enhancing mental wellbeing. We performed a literature search using the main academic databases in Psychology and HCI, retrieving all papers written in English and published since the beginning of the literature until January 2020. This abstract presents preliminary findings from the analysis of 131 articles (the initial search elicited 236 articles, from which 105 duplicates were identified and removed). We aim to contribute in three ways: (1) by providing a scoping review of interactive mindfulness technologies for mental wellbeing, (2) by presenting a comparative analysis of the design considerations taken to highlight the gaps and opportunities between the approaches in psychology and HCI, and (3) providing implications for designing such technologies to enhance mental wellbeing.

Keywords. Mindfulness, biofeedback, interactive technology, mental wellbeing, scoping review, psychology, HCI

1. Introduction

The practice of mindfulness, commonly defined as the awareness that arises through paying attention, on purpose, in the present moment, and non-judgmentally [6], has shown significant benefits for physical and mental wellbeing [2,5]. In recent years, there has been a growing interest in the fields of Human Computer Interaction (HCI) [7,12,15] and Psychology [3,14] for developing interactive mindfulness technologies to enhance mental wellbeing. We refer to *interactive* as systems that provide real-time feedback based on one's performance during the mindfulness practice, commonly accomplished through biofeedback [10,11,13,16]. Despite the growing body of work evaluating interactive mindfulness technologies in general [4,7,12,14,15], there has been limited research exploring the different approaches taken in Psychology and HCI over the design and development of interactive mindfulness technologies.

In this paper, we aim to identify the distinct design elements and intervention strategies followed in interactive mindfulness technologies for mental wellbeing in the fields of Psychology and HCI using a scoping review methodology.

2. Method

This study follows a scoping review methodology [1,8], which consists of a process of mapping the existing literature to a specific field, in order to identify research gaps and summarize research findings through qualitative synthesis [9].

In order to identify relevant research studies to be included in the review, a systematic search of the literature was performed during January 2020 in the relevant academic databases for HCI and Psychology: ACM Digital Library, IEEE Xplore, Springer, Web of Science, Scopus, and PubMed. Google Scholar was also used for backward reference searching, to run general searches of specific references, and to identify relevant articles. The search was focused on interactive mindfulness technologies for mental wellbeing that used biofeedback to provide personalized feedback, with the following search terms: *("technology" OR "digital")* ***AND*** *"mindfulness"* ***AND*** *"interactive"* ***AND*** *("biofeedback" OR "neurofeedback" OR "EEG" OR "HRV" OR "GSR")* ***AND*** *("wellbeing" OR "well-being" OR "mental health")*. This search string was applied to the title, abstract, full-text, and author keywords.

The inclusion criteria for the studies to be part of the scoping review was that they had to be published until January 2020, written in English, and describe at least one interactive mindfulness technology with biofeedback with the aim of enhancing mental wellbeing. The initial search elicited 236 articles from the different databases, from which 105 duplicates were identified and removed leaving 131 articles to be screened.

The next step will be to screen the studies to exclude irrelevant studies based on the inclusion criteria describe above. The resulting articles will be analyzed under themes such as: mindfulness approach, the way in which mental wellbeing is supported, type of technology used for the interactive system, physiological signal used as input, modality of feedback used as output.

3. Preliminary Results

Although this study is still a work in progress as the data has not been analyzed yet, preliminary findings from screening the papers suggest that there is a growing interest in the fields of HCI and Psychology to develop interactive mindfulness technologies for mental wellbeing. Nevertheless, it appears that there is a gap between both areas of research that if addressed would benefit the resulting systems. That is, work in psychology focuses on the theoretical underpinnings of mindfulness to enhance mental wellbeing and relies on technology to make such interventions more accessible to the general public; whereas HCI work seems to focus on the designing more natural and engaging interactive technologies based on mindfulness principles while assuming the associated benefits for mental wellbeing.

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