Developing a Framework for Interactions in CBT-Based Serious Games on Smartphones

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ABSTRACT

While there are numerous serious games that explore cognitive behavioral therapy (CBT) techniques through gamification on smartphones, the framework for developing interactions is not often thoroughly discussed. The objective of this study is to outline the process of combining CBT techniques, narrative setup, and game mechanics to create two types of interactions (verbal- and physical-based) using the player interaction framework (PIF). The PIF consists of three key sections: setup, aim, and execution. In the setup section, it utilizes the ABCDE (activating events, beliefs, consequences, disputation of beliefs, and effective new approaches) model to combine narrative and CBT techniques such as gratitude and self-monitoring. The aim section is used to break down the intended experience of both the player and their main character, at the same time clarifying the CBT goal of the interaction. Finally, the execution section includes the representation of how players will interact in the game through input and feedback. The efficacy of the framework in visual narrative serious games remains to be investigated through a randomized controlled trial after the completion of our serious game, BlueLine.

KEYWORDS

cognitive behavioral therapy, framework, interactions, serious games, smartphone

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DEVELOPING A FRAMEWORK FOR INTERACTIONS IN COGNITIVE BEHAVIORAL THERAPY BASED SERIOUS GAMES ON SMARTPHONES

Millennials' lives are inextricably linked to their phones, which they use for work, travel, and entertainment. Social media apps have become a hangout during traffic and a temporary respite from work (S. Kim, 2018). Smartphones may no longer be things we use regularly but rather a hub of where we live. In Thailand, social media users spend approximately three hours daily, mainly on YouTube and Facebook (Kemp, 2021). However, long-term use of social media may result in adverse effects such as social comparison (Wang et al., 2020). In most cases, negative effects come in the form of upward social comparison, self-evaluation of someone superior (Verduyn et al., 2020). According to the Department of Mental Health's survey in 2023, 48.54% of Bangkok's millennials are at risk of depression (Department of Mental Health, 2024). At the same time, this population has to confront the substantial financial cost to access effective mental healthcare (Prukkanone et al., 2012).

In recent years, numerous projects and papers have focused on the gamification of cognitive behavioral therapy (CBT) and therapeutic techniques in serious games and mHealth applications (Cechetti et al., 2019; Seaborn & Fels, 2015). CBT involves the patient identifying the triggering event and correcting dysfunctional beliefs through the therapist's guidance (Beck, 2020). Components of CBT can be gamified, for example, in Quest - Te Whitianga, a mHealth app for Māori (indigenous New Zealand people) youth with emotional difficulties (Christie et al., 2019). The player plays as "Tata," who goes on an adventure to meet with the guardians to gain ancient wisdom about well-being. The efficiency of these applications has not been fully established, but the field does show potential for further exploration (Erten Uyumaz et al., 2021; Torous et al., 2017).

From a game developer's perspective, existing serious games have explored many gamification elements such as points, badges, and leaderboard (Richter et al., 2015). However, only few studies have examined the nuance of these reward systems (Nicholson, 2015) and the input system (Smith & Chaparro, 2015), especially in mHealth-related apps. The nuance of the player's experience and their input can amplify the effectiveness of CBT and its therapeutic components further. The input range on smartphones is not limited to the mouse and keyboard; the user's finger can make the interaction of elements in applications more tangible (Djajadiningrat et al., 2007). While the framework of each serious game is distinct, the potential of a structured universal framework for interactions in visual narrative serious games could increase the consistency of immersive experiences for players. Immersion leads to more robust player engagement and improves the gaming experience (Jennett et al., 2008).

This paper proposes and outlines the player interaction framework (PIF) used in designing mobile interaction for our CBT-based serious game, BlueLine. We aim to provide a detailed description of how we reach and finalize the two types of interactions: verbal- and physical-based.

LITERATURE REVIEW

Among many definitions of the term serious game, it is widely accepted that they are games with purpose on value creation and not primarily focused on entertainment (Laamarti et al., 2014). Over the years, serious games have been integrated into multiple fields such as education and psychology (Ávila-Pesántez et al., 2017; Alvarez & Djaouti, 2011). In order to accommodate the development process of this magnitude, there are many proposed frameworks to create structure for serious games (Mitgutsch & Alvarado, 2012; Yusoff et al., 2009). This research allows serious game developers to understand structure at the macro level, the big picture of their game projects.

In addition, there are records of design process in existing serious games such as Triangle of Life (Assigana et al., 2014), a side-scroller platformer game that conveys the cognitive triangle concept of feelings, thoughts, and behaviors, and Merlynne (Chan et al., 2021), a role-playing game that motivates participation in peer-to-peer CBT. These serious games showed positive results in creating values to the user through CBT techniques through small-scaled prototypes. Despite that,

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