Towards a Serious Game for Trauma Treatment

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Abstract. Serious games deliver interactive worlds in support of a wide range of application areas. Addressing the current paucity of scientific empirical studies in game-based psychotherapy, we present a principled concept for the design and deployment of a Trauma Treatment Game aimed at the support of individualised interventions to children suffering from childhood trauma. Focusing on the particular methodological challenges of IT-based psycho-therapeutic support, we detail a domain-general staged process that is fully embedded in a scaffolding of validation and evaluation assessments. We motivate the structural decomposition, explain the nature and requirements of quality insurance measures, identify suitable instruments for their implementation, and specify success criteria and contingency measures.

Keywords: cognitive psychotherapy, trauma treatment, Mexican protocol, serious game concept design, evaluation and validation, ethics.

1   Introduction

Serious games (SGs) use video game technology to deliver affordable, accessible, and usable interactive worlds in support of application areas including training, education, marketing, and design. At their core, SGs can be defined as "(digital) games used for purposes other than mere entertainment" [23] (p.1). The vivid interest in the use of SGs in military and commercial settings (cf. e.g. [2]) currently stands in stark contrast to the paucity of empirical studies focused on game-based psychotherapy—all the more given that the popularity of video games especially among younger people makes them a medium to consider for educational and therapeutic purposes. In this paper, we present a principled concept of the design and deployment of a Trauma Treatment Game to support individualised interventions to young childhood trauma clients as contribution to the growing momentum in technological adjuncts for psychotherapy practices.

2   Trauma Focused Therapy

According to the APA DSM-5 [1], the diagnostic features for Post-Traumatic Stress Disorder (PTSD) are the development of characteristic symptoms following exposure to actual or threatened death, serious injury, or sexual violence,

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by either directly experiencing the traumatic event(s), witnessing occurrence to others, learning that it occurred to close family members or friends, or experiencing repeated or extreme exposure to aversive details of the traumatic event(s). Children living in war zones are at a particularly high risk of developing PTSD [24] (p.533) with extremely high rates of comorbidity [16] (p.327). Traumatic experiences are however not limited to such extreme situations, cf. Jamie Marich's axiom that "if an experience was traumatic for the client, then it is worthy of addressing it clinically [...] regardless of how we as therapists perceive it" [17] (p.68). Likewise, Francine Shapiro distinguishes between "T"raumas as defined in the DSM and "t"raumas, which she defines as "the upsetting experiences that life sends our way that we are not able to integrate into our system of understanding" [22]. La Greca and Silverman's comorbid diagnosis for trauma—"anxiety disorders, depression, safety and security concerns, increased fears, sleep problems, somatic complaints and substance abuse." (ibd.)—further corroborates how developing interventions for children and adolescents with exposure to traumatising events is a most challenging and important mental health concern. We concur that treatment should be offered for many forms of trauma. Victims of child sexual abuse (CSA) often exhibit symptoms of psychopathology and impairment in many areas of functioning; the majority of children who have suffered sexual abuse meet criteria for PTSD [10]: According to Deblinger et al.'s recent review of the CSA treatment outcome literature, trauma-focused cognitive-behavioural therapy (TF-CBT) has the strongest empirical support for effectiveness in treating PTSD and related difficulties in the children population. In our SG, out of the typical components of TF-CBT (ibd., p.352) we explicitly cover psychoeducation; relaxation techniques; trauma narrative and processing; and enhancing future safety and development.

3 Related Work

Here, we touch upon a sample of significant research in the domain of use of technology for children psychotherapy—see e.g. [6] for a recent broader review.

Personal Investigator [8,9] is an online 3D detective game to support Brief Solution Focused Therapy (BSFT). A distinguishing feature of this approach is its lack of specificity for any particular class of problems. The main function of the game is to support the strengthening of the therapist-patient alliance as the user plays the role of a detective solving various tasks in a Detective Academy. The dialogues with game characters provide contexts for more detailed conversations between the therapist and their client—a central aspect shared across SGs in psychotherapy: there is clear empirical evidence that such games can serve as useful icebreaker, and assist with the client–therapist relationship, the structuring sessions, and in engaging adolescent clients [9,11].

Treasure Hunt [5,3] follows a different approach, employing a theoretical background derived from treatment programmes used in CBT for children: Through the integration of therapeutic concepts into the video game, children are to be offered attractive electronic homework assignments that enable them to rehearse

and repeat basic psychoeducational concepts learned in therapy sessions. Even so, the authors duly emphasise that the game is not meant to substitute the therapist. Ongoing evaluation indicates achieved satisfaction with both the client and therapist populations [4].

The *PlayMancer* [12] multicentre project developed a video game prototype for the treatment of shared dysfunctional emotional regulation and disinhibited personality traits—core symptoms of severe impulse-related disorders lacking effective therapeutic strategies and adequate psychotherapy tools. The "Islands" adventure game uses an archipelago to structure the challenges and situations related to problem solving, impulse control, frustration, and emotion management. The game employs novel interaction modes using biosensors and multimodal emotion recognition technologies to provide biofeedback to support acquisition and improvement of relaxation skills and strategies of self-control and emotional regulation. First evaluation results reveal the short-term development of improved coping and self-control strategies (see [26] for a critical appreciation).

Radkowski et al. [19] argue that exposure therapy commonly applied to adult PTSD patients is ill suited to children and adolescents, given their differing comprehension of the PTSD and lack of insight into the difficulties caused by it. They propose key principles for the design and management of SGs for the therapy of PTSD in children and adolescents, and report on first positive validation results with a healthy test population of children and adults.

4   Scientific and Methodological Challenges

In spite of a growing body of literature on computer games and SGs regarding the positive potential of gaming [7], a key scientific and methodological challenge remains to provide empirical evidence of the efficacy of SGs in psychotherapy. Recent studies have shown SGs to engage young and older learners by targeting specific groups, demonstrating the efficacy of the game format for behavioural and attitudinal change for experienced gamers and non-gamers [13]. But the capability of SGs to achieve similar results in psychotherapeutic settings remains to be validated, as does whether the use of SG play in psychotherapy does has a positive effect on working alliance. Even then, whether gameplay itself rather than the SG be the cause would still need to be clarified—an issue of relevance for any positive effect registered. Another well-known issue regards transfer of acquired knowledge and skills: While repeated exposure to problem solving in a virtual world increases the effectiveness of the problem-solving strategies in that setting, empirical evaluation is required of whether such strategies are also be applied in the real world. Finally, the introduction of novel digital media to psychotherapy begs a multitude of new ethical considerations, from technical challenges of security, confidentiality, and data protection to questions regarding the concept of *immediacy* in psychotherapy and counselling.

To demonstrate the effectiveness of psychotherapeutic interventions supported by SG technology, the standard control group needs to be complemented by an additional one, where traditional therapy is combined with standard computer games as reward. For ethical reasons we explicitly exclude the establishing of

a group relying on serious-game based intervention alone (i.e., without a therapist). Our project seeks to research the requirements, design, implementation, and evaluation of a SG to support psychotherapists in the task of providing efficient help to youth suffering from childhood trauma. The development of knowledge about SG challenges, educational design, and assessment, with the aim of facilitating innovative therapy methods should provide useful supplemental tools in psychotherapy. For example, the guidelines proposed by de Freitas and Liarokapis [13] for a participatory design methodology will be applied. As pointed out there, "two elements are in particular need of more research in advance of better deployment of SGs towards the end of greater immersion: a more detailed and dynamically updated learner model [...] and [...] game responsiveness, and this will be through different and varied data captured of the learner [...]" (ibd., p.17). Game design according to this new paradigm "will need to reflect better the learner and their requirements through engagement with their changing user model, but will also need to respond on-the-fly to changes with respect to missions, narrative, flow and feedback levels in a multimodal way, adapting to the position, context and previous behaviour, as well as to their physiological state and mental attention and affect." (ibd., p.18).

5 Structure of Trauma Treatment Game Deployment

Deployment of our Trauma Treatment Game is structured in five parts, embedded in a scaffolding of validation assessments: 1) Psychoeducation; 2) Relaxation training; 3) EMDR[1]-based trauma exposure tasks; 4) CBT procedures for coping with trauma; and 5) Building resilience against anxiety and depression. The game first introduces the core concepts of the therapy. A likeable avatar character makes the user's acquaintance and explains various aspects of the therapy, enquires after the user's emotional state, and offers to answer a range of questions. This phase is followed by a child-friendly relaxation training as introduced in [18], where a Captain Nemo narrative is used to actively engage children into relaxation exercises: The aim is to ensure the child feels comfortable, to minimise the risk of further traumatisation through the very exposure techniques. The third and main part is based on the *Mexican Protocol*, originated and developed by Lucina Artigas during work performed with the survivors of Hurricane Pauline in Mexico in 1998[2]. While other EMDR protocols are available, the Mexican Protocol is particularly suitable for implementation in a SG: The method employs painting techniques on a drawing board in combination with the *butterfly hug* (a Dual Attention Stimulation theorised to promote deeper re-processing of stored memories) to help children deal with traumatic experiences and build resilience against PTSD. The final parts of the game rely on CBT techniques to build resilience against comorbid disorders of anxiety and depression [21].

While it is important to research innovative user interfaces and concepts of usability for SGs (cf. [14]) we agree with Visch et al. on the central importance

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[1] Eye movement desensitisation and reprocessing [22].
[2] http://www.amamecrisis.com.mx/; last visited: June 2013.

of adopting a user-oriented perspective involving both patients and therapists in the design process [25]. To address the significant validation and evaluation challenges, multiple assessments are foreseen at different project phases. A questionnaire study combined with face-to-face interviews will be used to gather relevant up-to-date theoretical and practical knowhow and expectations from psychotherapists. It then is key to start with iterative development of tangible concepts and playable prototypes (e.g. Wizard-of-Oz techniques [20]) very early on, and include child users throughout the design process (always with due care for ethical considerations); the knowledge gathered will be used to complete the Trauma Treatment Game. A pre-treatment assessment will be conducted with the children focus groups, followed by a twelve-week (the standard duration for EMDR-based therapy) integrated therapy with the pilot system, including the two control groups discussed earlier. Differences between pre- and post-treatment assessments will be critically evaluated: In case of a positive outcome, a nine-months re-assessment will be aimed at verifying lasting therapy success. In case of negative or inconclusive outcomes of the post-treatment assessment, the system design and its premises would need to be revisited before deciding whether to conduct and evaluate another twelve-week integrated therapy.

6   Conclusion

In case of overall success, the Trauma Treatment Game would stand as an early SG specifically designed to provide individualised interventions to children suffering from childhood trauma and comorbid disorders such as anxiety and depression to have undergone rigorous clinical evaluation. We will consider the project a success if positive outcomes can be shown in the twelve-weeks assessment as well as in the nine-months re-assessment. The availability of a first validated prototype would be the premise for further substantial work on usability, improvement of technical aspects (in particular of non-functional features such as dependability and management facilities), consolidation of comprehensive documentation (including practical hints and guidelines), and development of a related certification programme.

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