Serious Game-gestützte Interventionen zur Behandlung von Kindheitstraumata: Eine Konzeptstudie. Towards serious game-based interventions for the treatment of childhood trauma

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Abstract

Serious games use video game technology to deliver interactive worlds in support of a wide range of application areas. The vivid interest in the use of serious games in military and commercial settings stands in stark contrast to the paucity of empirical studies focused on game-based psychotherapy. We discuss the possibility and prerequisites of a serious game aimed at the support of individualized interventions to children suffering from childhood trauma.

Kurzzusammenfassung

Serious Games nutzen Videospiel-Technologien, um interaktive virtuelle Welten für unterschiedlichste Anwendungsbereiche bereitzustellen. Das große Interesse an der Anwendung von Serious Games im militärischen und kommerziellen Bereich steht dabei in starkem Gegensatz zum Mangel an empirischen Studien im Bereich der Serious Game unterstützten Psychotherapie. In diesem Artikel besprechen wir die Möglichkeit und die Anforderungen eines spezialisierten Werkzeugs zur Unterstützung der psychotherapeutischen Behandlung von Kindheitstraumata.

1. Introduction

1.1. Theoretical background

Serious games 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, serious games can be defined as "(digital) games used for purposes other than mere entertainment". (Susi et al., 2007, p.1) The game concept introduced here is aimed towards applying the serious game paradigm in support of psychotherapeutic interventions for the treatment of childhood trauma. The vivid interest in the use of serious games in military and commercial settings 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.

1.2 Current state of prevention and intervention for child trauma

According to the American Psychiatric Association's Diagnostic and statistical manual of mental disorders (DSM-IV-TR) (2000), "the essential feature of Posttraumatic Stress Disorder (PTSD) is the development of characteristic symptoms following exposure to an extreme traumatic stressor involving direct personal experience of an event that involves actual or threatened death or serious injury, or other threat on one's physical integrity; or witnessing an event that involves death, injury, or a threat to the physical integrity of another person; or learning about unexpected or violent death, serious harm, or threat of death or injury experienced by a family member or close associate" (ibd., p.463). Especially children living in war zones are at high risk of developing PTSD (Thabet et al., 2004, p.533) and rates of comorbidity are extremely high among these children (La Greca & Silverman, 2012, p.327). However, traumatic experiences are not limited to such extreme situations: Following Jamie Marich's axiom that "if an experience was traumatic for the client, then it is worthy addressing it clinically [...] regardless of how we as therapists perceive it" (Marich, 2011, p.68), we concur there are many forms of trauma for which treatment should be offered. Likewise, Francine Shapiro distinguishes between large "T" traumas as defined in the DSM-IV-TR and small "t" traumas, which she defines as "the upsetting experiences that life sends our way that we are not able to integrate into our system of understanding" (Shapiro & Forrest, 1997). La Greca and Silverman (2012, pp.327f) identified the following comorbid diagnosis for trauma: "anxiety disorders, depression, safety and security concerns, increased fears, sleep problems, somatic complaints and substance abuse." With this in mind, it becomes evident that developing appropriate interventions for children and adolescents to deal with exposure to traumatizing events is both a most challenging and important mental health concern.

1.3 State of the art in serious games

Business Wire (http://www.businesswire.com (last visited: May 2013)) reports that, according to research studies by Ambient Insight Research and Interpret presented at the Serious Play Conference in 2012 the serious games market is already a multi-billion dollar industry, growing at a slow but steady pace as games and simulations designed for education and training purposes gain acceptance. According to Sue Bohle, executive director of the Serious Games Association, industry estimates range from $2 - $10 billion in annual revenue

for the serious games area, depending on how much of the market for games, simulations, and virtual worlds is included in the calculation. In their overview paper, Susi et.al (2007, p.11) categorized serious games into five main areas. *Military games*, i.e., games designed to train soldiers in military conflict, still form the dominant area, followed by *government games*, which concern a range of tasks and situations, including different types of crisis management related e.g. to terrorist attacks, epidemics, outbreaks, biohazard, health care policy issues, city planning, traffic control, fire fighting, budget balancing, ethics training, and defensive driving. *Corporate Games* comprise serious games developed to train employees in, e.g., teamwork, organisation skills, or communication skills. *Educational games* and *healthcare games* likewise cover a wide range of application areas, such as teaching history at school (Anderson, 2009), triage training for doctors (Knight, et al., 2010), and---as in our case---supporting psychotherapeutic interventions. We will now briefly introduce two working examples to provide a glimpse at the current state of the art in serious-game based therapy:

1.3.1 Working Example 1: Carmen's bright IDEAS

In their seminal work, Marsella et al. (2000) describe an agent-based approach to realising what they term interactive pedagogical drama: According to this concept, the player does not directly control a character's actions, but a character's emotional state. The system Carmen's Bright IDEAS is intended to help mothers of paediatric cancer patients to deal with the strong emotional, physical, and financial strains they have to face. In the Bright IDEAS problem solving approach, "[e]ach letter of IDEAS refers to a separate step in the problem solving method: Identify a solvable problem,

Develop possible solutions, Evaluate your options, Act on your plan and See if it worked." (ibd., p.301). The story is that of Carmen, mother of a nine-year-old son suffering from leukaemia and a six-year-old daughter. The first act provides a back story through narrative devices such as showing Carmen interacting with her boss, who complains about her neglecting her work, or with her daughter, who behaves defiantly because of lack of attention received from her mother. Such scenes are meant to help the user to empathise with Carmen. The second act plays mostly inside the office of the hospital counsellor Gina, who proposes the IDEAS method to Carmen. Gina supports Carmen with the initial three steps. During this scene, the user can take choices regarding Carmen's presumed private thoughts. These choices influence the emotional states of the story character and have direct impact on her thinking and behaviour and thus the overall development of the drama. In the final third act, Carmen implements the actions she has decided on with the counsellor. This is presented as a linear sequence of scenes that depends on the decisions taken previously.

In the presentational approach adopted by Carmen's Bright IDEAS, the user *influences* the course of action without direct participation as a story character. Marsella et al. explain that besides technical limitations there are important clinical reasons for this choice (ibd., p.302): The goal of the system is not for the user to deal with severe emotional dilemmas in a virtual world *in addition to* all the problems they already face in real life; rather, the user should empathise with the character and learn problem solving skills from her, without having to make demanding decisions on their own.

1.3.2 Working Example 2: FearNot!

FearNot! (Enz et al., p.1) adopts a virtual role-playing approach employing autonomous agents as social partners in scenarios related to exploring coping strategies for bullying by school children. The single player takes on the role of an external observer, watching a scene where a child character is bullied at school. The player is then allowed to give advice and suggest different coping strategies. By doing so, they are expected to empathise with the victim and transfer this attitude to real life situations, thereby becoming motivated to stand up against real-life bullying. The main objective of FearNot! is to exploit the system's immersive power to fight bullying in schools and thereby prevent long term negative effects, such as academic regression, social anxiety, and somatic and psychiatric symptoms. The authors describe FearNot!'s working mechanism as follows:

"By interacting with the victimised virtual character, we hope to prompt empathic reactions within the child user. [...] Apart from [that], FearNot! prompts reflection on a variety of coping strategies that the learner can suggest to the character in order to help him or her. If the learner runs out of ideas, the system will provide further coping strategies through the interaction with the characters." (ibd., p.2)

The intent thus is to motivate users to take action against real world bullying and additionally to confer knowledge about the range of possible coping strategies and their consequences. The authors of FearNot! believe that *immersion* is an essential precondition for any system with the goal of changing the user's attitudes and behaviour: character design — including the modelling of the agents' minds as well as the narrative structure of the learning experience—is the necessary groundwork for an immersive user experience. The experienced believability of FearNot! is on the one hand the result of engaging storylines and drama, and on the other hand due to the way the virtual characters are presented: here, the authors prefer a cartoon style look over naturalistic character presentation so as to avoid the uncanny valley paradox, according to which at a certain point character believability starts to *decrease* with increasing realism.

FearNot! employs a multi-agent system where each agent is equipped with an eclectic "emotion-driven" architecture named FAtiMA that tries to integrate findings from research on cognitive appraisal theories of emotion with results from research on coping. In this system, the narrative emerges dynamically from the interaction between the autonomously controlled characters. The system has been evaluated in the UK and in Germany with over one thousand learners, and preliminary results show that pupils indeed do engage empathically with the characters---it remains to be verified whether this experience is also actually transferred to real-life situations.

2. Key scientific challenges

A main scientific and methodological challenge that has to be faced is to provide empirical evidence of the efficacy of serious games in psychotherapy. Two recent studies have shown serious games to engage young and older learners by targeting specific groups: for both, experienced gamers and non-gamers, the efficacy of the game format for behavioural and attitudinal change could be demonstrated (de Freitas & Liarokapis, 2011, p.11). However, the capability of serious games to achieve similar results in psychotherapeutic settings remains to be validated. Furthermore, it has to be assessed whether the use of seri-

ous game play in psychotherapy does have a positive effect on working alliance. If there was a positive effect, it would still be necessary to consider the possibility of not the serious game itself being the cause, but gameplay as such: i.e., would a standard, non-therapeutic game have the same effect? This is a question that is not only relevant for working alliance in particular, but for any positive effect. Another well-known issue regards transfer of acquired knowledge and skills: Repeated exposure to problem solving in a virtual world increases the effectiveness of the problem-solving strategies... in that virtual world. Whether such strategies are then also be applied to real world settings also needs empirical evaluation.

Last but not least, tied to the introduction of novel forms of digital media to psychotherapy are a multitude of new ethical considerations, from technical challenges such as the protection of confidential information from malicious code to questions regarding the concept of "immediacy" in psychotherapy and counselling. To validly demonstrate the effectiveness of psychotherapeutic interventions supported by serious game technology, the standard control group needs to be complemented by an additional one, where traditional therapy is deployed along with standard computer games as reward. For ethical reasons, the establishing of a group relying on automatic serious-game based intervention (i.e., without a therapist) is explicitly excluded.

The goal of evaluating the efficacy of a manualized intervention – such as via a serious game – would suggest the idea of using a randomized controlled trial (RCT) design. However, current scientific discourse in psychotherapy research critically highlights RCT-studies as inappropriate to meet psychotherapeutic reality (Tschuschke, et al., 2009). Efficacy studies

have to face the substantial current research results suggesting that therapeutic relationship is of higher relevance for reaching therapy goals than the therapeutic method itself: Establishing an appropriate so-called naturalistic approach to evaluate process-outcome relationships will also be a challenge in evaluating the effect of the use of a supportive serious game in psychotherapy.

The development of knowledge about serious game 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 (2011, p.15) for a participatory design methodology centred on learner profiling and modelling and stakeholder involvement throughout all design phases could be applied. As pointed out there, "two elements are in particular need of more research in advance of better deployment of serious games 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).

These considerations leave us with the following quintessential research questions:

1. Does the use of digital game play in psychotherapy have a positive effect on the ther-

apeutic relationship? A good therapeutic relationship is essential for positive therapy outcomes. As suggested above, some authors even argue that the therapeutic relationship be of higher relevance for reaching therapy goals than the therapeutic method itself. We assume that introducing gameplay into therapy has also a positive impact on the therapeutic relationship, simply because it is entertaining.

2. Does the use of serious games have a positive effect on therapy efficacy? The main goal of any serious game project in psychotherapy has to be to evaluate its efficacy in supporting the treatment. We believe that serious game technologies offer the potential to enhance the effectiveness and efficacy of psychotherapeutic treatment of childhood trauma. Moreover, we propose that serious games, if utilized alongside, or combined with conventional psychotherapy, could provide a more powerful means of "knowledge transfer" for a broad range of psychological disorders.

3. Is there empirical evidence for successful transfer of experiences in the virtual world to real-life? As Bossard et al. (2008, p.158) argue, it must be demonstrated that skills practised in virtual environments can transfer successfully to the real world before these environments can be widely used as an educational medium. While there are studies that show promising results, much more research is still required. As these authors point out, in our technological society people must adapt to frequent change and upheavals. Research education must aim to facilitate the adequate use of knowledge in developing autonomy and adapting in daily life. The question of knowledge transfer in this context is fundamental. In the coming years, educational and professional fields will have to find answers to this pressing issue.

4. What ethical considerations are specific to the use of serious games technology in psychotherapy? As Pope and Vasquez (2011, p.41) explain, new technologies can change not only the ways we interact with our patients but also the treatments we provide. There are numerous considerations to be made in regard to the therapeutic use of digital media as such which is regulated through professional guidelines and also in regards to common topics in computer use like handling of confidential data.

3. Towards structured deployment of a serious game for trauma treatment support

The following is a proposed structure for deployment of a serious game designed to support treatment of childhood trauma, where each part is embedded in a scaffolding of validation assessments (addressed in more detail the next section):

1. Psychoeducation

2. Relaxation training

3. EMDR-based trauma exposure tasks

4. Cognitive and behavioural procedures for coping with trauma

5. Building resilience against anxiety and depression

The first part of the game has to introduce the core concepts of the therapy to the user. A likeable avatar character could be used to make the user's acquaintance and then explain various aspects of the therapy, ask a number of questions regarding the user's emotional state, and provide answers to a range of questions offered to the user.

This phase should be followed by a child-friendly relaxation training, as for example introduced by Ulrike Petermann (2012), who uses narrative (in their case: a Captain Nemo Story) to actively engage children into relaxation exercises. This should ensure that the child feel comfortable, and thereby minimize the risk of further traumatization through the very exposure techniques.

The third and main part of the game could for example be based on the so-called *Mexican Protocol*, originated and developed by Lucina Artigas (Founder of the NGO AMAMECRISIS - http://www.amamecrisis.com.mx/) during work performed with the survivors of Hurricane Pauline in Acapulco, Mexico, in 1998. While there are other EMDR protocols available, the Mexican Protocol is particularly suitable for implementation in a serious game: The method employs painting techniques on a virtual drawing board in combination with the so-called *butterfly hug* (BH) to help children to deal with traumatic experiences and build resilience against PTSD: The BH is a Dual Attention Stimulation (DAS), which is theorized to promote deeper re-processing of stored memories. It consists of crossing your arms over your chest, so that the middle finger of each hand is placed below the collarbone and the other fingers and palms cover the area located under the connection between collarbone and shoulder and collarbone and sternum or breastbone.

The fourth and fifth parts of the game could for example rely on cognitive-behavioural or other techniques suited to deal with childhood trauma and help build resilience against comorbid disorders of anxiety and depression (Seligman, 2007).

4. Validation and evaluation of serious game projects

To address the significant validation and evaluation challenges, serious game projects should conduct multiple assessments at different project stages. First, it appears to be necessary to ask psychotherapists about their expert opinion. Questionnaires and/or face-to-face interviews could be used to gather relevant up-to-date theoretical and practical know-how. Second, it should prove useful also for this particular class of serious games to start iterative development of tangible concepts and playable prototypes (also employing simulations, such as Wizard-of-Oz techniques) very early on, which also facilitates active involvement of child users throughout the design process (always with due care for ethical considerations). Third, a pre-treatment assessment should be conducted with the children focus groups. Fourth, a twelve-week (= the standard duration for EMDR-based therapy) integrated therapy with the pilot system---including the two control groups discussed earlier---should be followed by a post-treatment assessment to determine the program's outcome. The differences between the pre- and post-treatment assessments have to be critically evaluated. In case of a positive outcome, a nine-months re-assessment should to be conducted as fifth assessment, aimed at verifying lasting therapy success. In case of a negative or inconclusive outcome 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.

5. Conclusion

Applying the theoretical considerations discussed in this article to the real implementation of a serious game designed to support

therapy of childhood trauma is currently on-going as a project conducted jointly by the Sigmund Freud Private University and the Austrian Research Institute for Artificial Intelligence. In case of overall success, this game would stand as a first serious game specifically designed to provide individualized interventions to children suffering from childhood trauma and comorbid disorders such as anxiety and depression to have undergone rigorous clinical evaluation. The availability of a first validated prototype would be the premise for further (substantial) work on usability; improvement of technical aspects (in particular 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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