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The Trauma Treatment Game: Design Constraints for Serious Games in Psychotherapy

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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 address scientific and methodological challenges and their implications for the design of serious games for this domain. We do so in the context of a comprehensive multistage design process that preceded the final game concept of the "Trauma Treatment Game", a serious game to support individualised interventions to children of age eight to twelve suffering from trauma.**

I. Introduction

Serious games draw from both computer games and educational simulations [1] to create immersive learning environments 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" [2] (p.1). The vivid interest in the use of serious games in military and commercial settings [3] currently stands in stark contrast to the paucity of empirical studies focused on educational games and 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. A key reason is that introducing new media in psychotherapy poses considerable scientific, methodological and ethical challenges. In this paper, we address these challenges in the light of knowledge gathered throughout a rigorous multistage design process and detail the implications for the design of serious games for psychotherapy. Before addressing the design process itself and discussing how the strict design constraints common to all serious games in psychotherapy apply for the particular user domain of children suffering from severe childhood trauma, we first provide basic background in a short introduction to trauma-focused psychotherapy.

II. Trauma-Focused Therapy

According to the APA DSM-5 [4], 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 by either: directly experiencing the traumatic event(s); witnessing occurrence to others; learning of occurrence 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 [5] (p.533) with extremely high rates of comorbidity [6] (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" [7] (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" [8]. 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. Tinker and Wilson categorise traumas as simple or complex, acute or chronic, and singular or multiple [9] (p.11). For the Trauma Treatment Game, we will focus specifically on so-called *type II childhood traumas*, which result from long-standing or repeated ordeals, such as sexual abuse (in contrast to *type I childhood traumas*, which result from one sudden blow, such as a car accident). In the case of type II childhood trauma, the traumatising events are disclaimed, whereas in type I childhood trauma the cause is vividly remembered. Type II childhood trauma is further characterised by a more complex and severe pathology that usually results in a total inability to feel or show emotions; depersonalisation and dissociation; alienation; permanent aggression and rage; and alternating episodes of total passivity with self-harming actions, including mutilation and even suicide [10].

III. Related work

In this section, we touch upon a sample of significant research on the use of technology for children psychotherapy—see e.g. [11] or [12] for recent broader reviews.

Personal Investigator [13] [14] is an online 3D detective game to support Brief Solution Focused Therapy (BSFT), which has a distinguishing feature of lacking specificity for any

particular class of problems. The main function of the game is to support strengthening of the therapeutic relationship as the user plays the role of a detective solving various tasks in a Detective Academy. Dialogues with game characters provide contexts for more detailed conversations between the therapist and their client—a central aspect shared across serious games in psychotherapy. There is clear empirical evidence that such games can serve as useful icebreaker, assist with the client–therapist relationship, the structuring of sessions, and in engaging adolescent clients [14] [15].

Treasure Hunt [16] [17] follows a different approach, employing theoretical background derived from treatment programmes used in cognitive behavioural therapy (CBT) for children. Through the integration of therapeutic concepts into the video game, children are offered attractive electronic homework assignments that enable them to rehearse and repeat basic psycho-educational concepts learned during therapy sessions. The authors duly emphasise that the game is not meant to substitute the therapist, but is rather meant to serve as a complement to traditional approaches. Ongoing evaluation indicates achieved satisfaction among both, the client and therapist populations [18].

The PlayMancer [19] 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 in order to support acquisition and improvement of relaxation skills, strategies of self-control and emotional regulation. First evaluation results reveal the short-term development of improved coping and self-control strategies (see [20] for a critical appreciation).

These three examples are representative for the status quo of applying serious games in psychotherapy. Although the therapeutic efficacy of these tools has been shown empirically, no general guidelines for the development of serious games with a psychotherapeutic purpose exist. This may be due to the research prototype status of the systems and the significant differences in therapeutic background and purpose of these incipient endeavours. For this reason, we hope that detailing the rigorous design process underlying our game development activities addresses an extant need.

IV. The Trauma Treatment Game Design Process

Developing a serious game for psychotherapy in general and for the treatment of childhood trauma in particular imposes rigorous constraints on the design process. Numerous factors influence the basic game concept game, quite often in conflicting ways. Designers of such games are obliged to comply with strict guidelines and restrictions dictated by an ethics commission; they have to face and overcome strong scepticism and resistance by both psychotherapists and caretakers biased against video games by media and hearsay; and—last but not least—they have to consider the experiences and expectancies

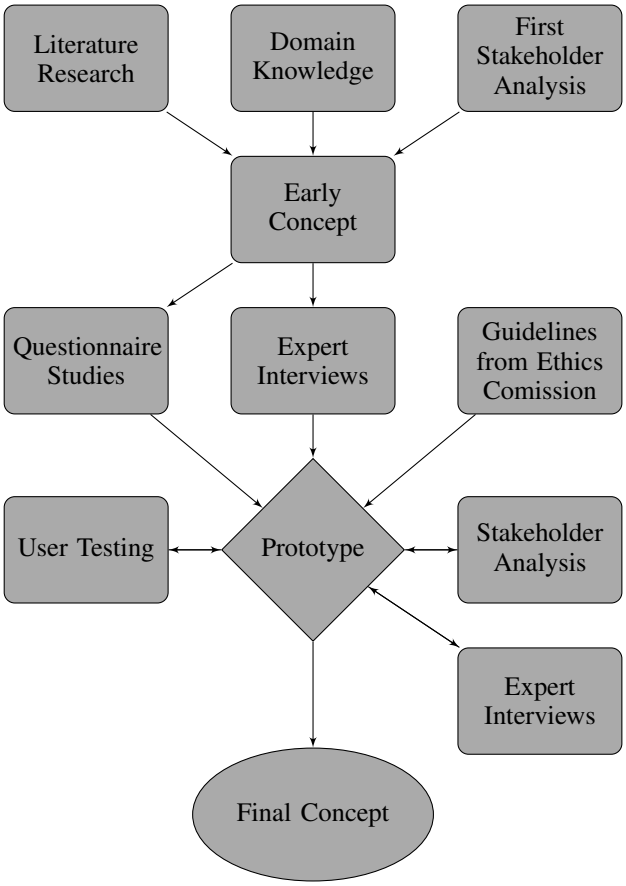

Fig. 1. The Concept Design Process for the Trauma Treatment Game

of children, who may—but need not be—accustomed to top-notch gaming experiences offered on the latest equipment. Figure 1 provides an overview of the process that led to the final concept underlying the Trauma Treatment Game.

Based also on an extensive literature research, we developed a concept which to the best of our knowledge was scientifically sound. Well aware that this was but the beginning of the actual concept design phase, we started to plan the sampling procedures for two complementary qualitative studies: a questionnaire study with 47 psychotherapists on the one hand and an extended series of over 60 unstructured expert interviews with three psychotherapists over the course of almost a full year on the other. The questionnaire study was aimed to provide us with a snapshot of current familiarity with serious games among domain experts in psychotherapy, the interview series provided us with invaluable input from experts who witnessed the moulding of our concept over an extended time period. An important pitfall when conducting questionnaire studies with domain experts in psychotherapy on a topic such as serious games is failing to consider they may well be entirely unfamiliar with it (to be precise, only 15% of all participants were familiar with serious games): For this reason, we required participants to read an introductory article on serious games along with one one of our earlier publications on the Trauma Treatment Game before answering the questionnaire. We followed two different strategies for the sampling procedure for the respective studies. For the questionnaire studies, the inclusion criteria were a specialisation on children and

on trauma, independent of the therapeutic approach, whereas for the expert interviews we selected therapists from three main psychotherapeutic approaches (see e.g. [21]), namely: the psychoanalytic, the behavioural and cognitive, and the experiential and humanistic[1]. This strategy is essential for us since we want to step out of the psychotherapeutic discipline debate (see e.g. [22]) and ensure our game suits as large an audience as possible. Important further input was obtained from identifying and considering the perspectives of an extended range of stakeholders (not addressed further in the present paper). The results from our studies and the regulations imposed on us by the Sigmund Freud University ethics commission allowed us to elaborate our initial concept and start building early game prototypes, to be subject to further user testing, stakeholder presentation and follow up interviews with domain experts, thereby iteratively approaching the final concept of the Trauma Treatment Game.

V. What really matters to psychotherapists

Today, computer games play a significant role in the lifeworlds of children. Digital media have become omnipresent and highly familiar to them, with computer games are being often even preferred over traditional ones. For the most part, psychotherapists are well aware that these games correspond to the interests and the mindsets of children and adolescents, picking them up from where they are. Nowadays, the affinity of children for digital media in general and computer games in particular is beyond question, "the virtual" has become a constitutive part of reality. Thus, some psychotherapists assume that computer games could facilitate establishing relationships with patients who are otherwise difficult to access and increase their willingness and motivation to actively participate in therapy. Since ultimately it is the psychotherapist's principal task to be responsive to the child's lifeworld/worldview—e.g., through games, traditional or digital—, many are highly motivated to remain up-to-date.

For children, gameplay is an important activity to explore social settings; to train social interaction; to develop strategic thinking and other cognitive capacities; and to express themselves. Psychotherapists assert that playful exposure to difficult content enables clients, young and old, to *cope* with it, mainly because this takes place in a relaxed and enjoyable manner. Psychotherapists note it is a significant advantage of digital games that achieved results can be *saved*, making it possible to resume at the same level in the following session. The employment of digital games in psychotherapy is recognised as a possibility to *make progress*, which strengthens the clients' self-confidence and is easy to document. In general, most psychotherapists offer their clients freedom to choose the medium to engage with in sessions. It is a logical step to incorporate digital games into the psychotherapeutic repertory, covering yet another "blank spot". Furthermore, some therapists consider serious games to be widely applicable, well beyond the particular case of trauma treatment. It is conceivable to develop a game adequate for a variety of mental disorders, depending on client needs and capabilities. Since children exhibit a high degree of competence in the playful development of different worlds, virtual environments may offer a great opportunity to engage in creative activities to express their "inner states" and thereby gain in self-confidence. Therapists recognise the diagnostic potential of serious games. Closely related to today's forms of children's everyday life and play, they are likely to elicit natural behaviours. Additionally, digital systems can support detailed documentation of player activity. Finally, psychotherapists do not rule out the possibility of serious games potentially supporting awareness and cognitive processes.

All this being said, our questionnaire study shows that serious games are met with interest as well as scepticism. It is thus our task to quiet concerns, by providing a sound conceptual design based on a strong scientific foundation and by including psychotherapists into the design process. Already technical aspects, such as required equipment and infrastructure (hardware, online-access, etc.) do give rise to concerns; some therapists e.g. stated the necessity to place a computer in the therapy room to feel uncomfortable and unspiritual. The overall quality of serious games also forms an important success factor: they may have to keep up with popular games in terms of design and playability to prevent children from quickly losing interest. The primary scepticism of most psychotherapists however concerns the therapist–patient relationship, in particular: their interaction during therapy sessions. Therapists are concerned clients might mainly attend to the game and thus interact less or not at all with the therapist. Serious games are often evaluated as an external intervention with respect to the actual therapy, hindering significantly psychotherapeutic communication and interaction. For example, serious games may lack eye-contact and other important interpersonal qualities. Psychotherapists further bring forward the argument that immediate human interaction involves a sub-conscious dimension, whereas digital games do not. A related point of criticism is that digital games merely address two senses (vision and audition), losing many constitutive qualities of our lifeworld. It is argued that in order to grasp an idea children often require something real to grasp. Since the children's interaction with virtual realities seems not to comprise all qualities of real-world engagement, it is seen as a fundamentally impoverished setting. Psychotherapists also highlight negative social and emotional aspects of digital media and computer games: Children spending much time online or playing computer games become increasingly isolated and unaware of their own emotional and bodily needs, leading to negative emotions and frustration. To back up their assertions, some psychotherapists explicitly refer to books and papers by Manfred Spitzer, such as [23]. Spitzer is taken to have clearly shown that science has disproved all hoped-for positive effects of new media, or rather proved the opposite. Many psychotherapists have also experienced the negative influence of digital media on children's and adolescent's mental conditions in the course of therapeutic cases: They refer to problems like social isolation; addictive behaviour; or the low transfer rate of positive experiences from virtual worlds to reality. The last problem in particular goes hand in hand with the argument of virtual experiences not being comparable to experiences arising from embodied, real life situations. Since children already spend a considerable amount of time in front of screens in their everyday lives, some psychotherapists consider it important to offer alternative means of engagement, which is why they do not want to employ serious games. Finally, therapists raise concerns over the pre-established and linear

[1]For completeness, we aim to also interview an advocate of systems-oriented approaches.

development in computer games, a key obstacle for frank and unbiased expression of children during therapy: computer games putatively suppress coming to the fore of individual aspects and constrain the children's creativity.

To dispel such concerns, a serious game must be of psychotherapeutic value, should be fascinating and amusing, and above all has to improve the direct interaction between therapist and client. Some kind of *magic open door* has to be always available, allowing the psychotherapist to intervene at all times. Ideally, therapist and client would play the game together, with the psychotherapist having leeway for creative changes, the integration of traditional games, and the power to manipulate the game trajectory: As explained, the game has to improve and not to hinder communication. The serious game should provide a variety of applications and be easy to use and play. Usability, for client and therapist alike, is an essential requirement. Likewise, pleasure and therapeutic value are core aspects. To appear as natural as possible, it should include appealing graphics and sound, also to facilitate learning transfer. On the other hand, it is important that the symbolic character, which helps clients confront problems in a secure and playful manner, remain evident. It should trigger fantasy and creativity, to enable spontaneous and genuine experimentation and coming up with copying strategies, for the sake of gaining self-confidence through a sense of achievement within a secure framework. The game should address all of the cognitive, emotional, and physical dimensions. It should require the client to reach decisions by clarifying motives and results. It is important that it take place in interaction with both the world and the therapist, which is crucial for the therapeutic relationship and learning transfer. Since subsequent reflection of the gameplay is an essential part of the therapy, the gameplay should not be overly time consuming. Easy access and exit are important features for successful integration in therapy sessions, since it remains one tool among many others: it should not require difficult explanations or time-consuming introductions. Finally, the game should support adaptation to the individual needs and possibilities of each client.

In spite of a growing body of literature on the positive potential of gaming and serious games for numerous skills [24], [25], [26], [27], [28], [29], it remains a key scientific and methodological challenge to provide empirical evidence of the efficacy of serious games in psychotherapy. Recent studies have shown serious games to engage young and older learners by targeting specific groups, demonstrating the efficacy of the game format for behavioural and attitudinal changes in experienced gamers and non-gamers [30]. But the capability to achieve similar results in psychotherapeutic settings remains to be validated, as does whether a positive effect on the therapeutic relationship can be achieved, as an essential factor for therapy success shared by all psychotherapeutic schools.

VI. The Trauma Treatment Game

The Trauma Treatment Game being developed by IS-Ginnovations in cooperation with OFAI, the Sigmund Freud University Vienna and the University of Applied Sciences Upper Austria, is to undergo rigorous screening through an ethical commission and clinical evaluation by psychotherapeutic experts. The aim of this effort is a well-designed serious game as a tool to support individualised interventions to children age eight to twelve suffering from complex trauma, while taking sufficient precautions not to re-traumatise the client. Safety concerns are of highest priority: we aim to avoid any exposure to traumatic memories in-game, while facilitating a comforting relationship to the therapist (see e.g. [9] (p.25)).

The game is *not* meant to replace a human psychotherapist; on the contrary, we believe that using computer games during therapy sessions may strengthen the therapeutic relationship between the psychotherapist and client. We believe in the central importance of adopting a user-oriented perspective involving both patients and psychotherapists, as well as a larger range of stakeholders in the design process. We therefore employ an iterative agile process, where design and refinement alternate with test and evaluation phases throughout development of the game. This includes substantial work on usability, improvement of technical aspects, consolidation of comprehensive documentation, and development of a related certification programme. We strive to deliver a positively motivating experience that facilitates the establishing of a good therapeutic relationship with children who may be difficult to reach with other methods.

The Trauma Treatment Game employs the Unity game engine [31]; it is targeted at mobile platforms to meet the desire of psychotherapists of being able to share the game experience with their clients without having to clutter the therapy room with bulky monitors and expensive gaming equipment. In traditional video game terms, it is a 2D side-scrolling jump-and-run game, extended by role playing game elements and a strong child-friendly narrative. All game elements are well motivated, as we are bound by strict ethical directives and also evaluate and iterate each element with both children and experts from the domain of psychotherapy. The most central ethical directive is that the game must not trigger any trauma related memories or mental images, as it is to be applied during the *stabilisation phase*, where the patient's personal resources and self esteem are fostered in order to become capable of facing the traumatising events during the subsequent confrontation phase. This implies that the game not include any violent or aggressive actions like fights, nor any evil or frightening narrative elements like villainous characters. The game concept should not involve competitive situations, to prevent players from experiencing failure and resulting frustration. To meet the latter, we are implementing an intelligent closure system that supports players in reaching the goal state of each level. Additionally, major goals are divided into several subgoals, whereof only a certain percentage has to be accomplished to achieve the overall goal. This implies that overly difficult subgoals can be skipped without affecting neither progress in game play nor narrative progress. A closely related aspect of this flexible game structure is its individuality: The possibility to progress in the game by solving just an individually picked subset of all tasks available engenders a variety of ways to complete the game: Therapists and players gain freedom in influencing the character's as well as the game world's destiny, improving the match to particular psychotherapeutic developments and the engaging revisiting of levels by picking different (unfinished) subgoals. Since most type II childhood traumas are directly caused by or related to other human beings, human or humanoid characters besides the player character are excluded: the Trauma Treatment Game concept posits a fantasy world

inhabited only by animals as non-player characters. The game concept does not include interactions with human characters, which could remind players of unpleasant social events in their real lives. It aims to minimise the risk of triggering the emergence of re-traumatising memories while offering encounters that may serve as anchors for metaphors in therapeutic reflection following gameplay. Further ethical directives are for the game not to reflect any gender preferences, and not to have addictive potential. To ensure that both boys and girls enjoy the game's narrative content and elements; audiovisual design; and gameplay tasks, individual elements and prototype versions are evaluated by healthy school children of the targeted age range. Additionally, the whole game concept is grounded in a strong psychotherapeutic framework heavily inspired by elements taken from play therapy; metaphor therapy; and psychodynamic imaginative trauma therapy, as proposed by Luise Reddemann [32]. This exhaustive design approach has led to the current conceptual model:

The game starts with allowing the player to choose race and gender of the player character. In addition to its visual appearance, they can also pick one out of a range of background stories. The Trauma Treatment Game adopts the narrative structure of *imaginative journeys*, which begin in the real world, transfer to the fantasy world where the main story takes place, and return to the real world for a closing sequence. The game starts with a tutorial level situated in a supermarket, allowing to familiarise with the controls and various ways of interacting with the game environment before the discovery of a secret door leading to the fantasy world. Upon crossing the door, the player discovers a location constituting their "safe place" (see e.g. [9] (p.25)) in the virtual world. This oasis serves as home base to which the player can return at any time during their adventures, ensuring that they can always escape unpleasant situations or just take a break from action. With game progress, the "safe place" gets populated with friendly animal NPCs playing a main role for the narrative structure. It also serves as store location for various collectables with potential therapeutic meaning, which can be used in therapeutic exercises or referenced in subsequent therapeutic conversation. At the start of the game this oasis is only populated by a wise owl representing the psychotherapist in the virtual world. The owl introduces the player character to the fantasy world and provides them with them with their quests.

Each quest forms a self-contained story that addresses a specific psychological problem common among trauma patients; the psychotherapist can select upfront quests suitable for the individual client. An example of a quest setting is given by the story of the majestic elephant captured and chained to a large tree a long time ago. For a long time the elephant tried to escape, but eventually quit the futile effort. Today, the elephant is tied to a small tree with but a thin rope: he lost all hope and never resumed efforts to escape. It is the player's task to help the elephant remember who he once was and make him regain believe in his own strength in order to finally break free. The player can do so by retrieving parts of a fractured stone tablet carrying the elephant's name across multiple game episodes. This story exemplifies metaphors presented throughout the game that therapists can use to address very specific problems of traumatised clients in follow-up therapeutic conversations.

Another central therapeutic feature providing metaphors for therapeutic conversations is the reward system: items representing important events during gameplay can be collected and preserved. They can be stored at the "safe place" and referenced by the psychotherapist to recall the related events. The accomplishment of each quest results in the opportunity to improve the character's skills and features. In contrast to traditional games, the character's skills do not represent physical abilities such as speed or strength, but personality traits like courage or persuasiveness. In addition to providing metaphors for various topics essential in psychotherapeutic treatment, the reward system should also feed the player's motivation and entertainment.

A detailed discussion of the full concept of the Trauma Treatment Game along with design decisions, key realisation aspects and the results of validation case studies with trauma clients are scheduled to covered in follow-up publications.

VII. Conclusion

In case of overall success, the Trauma Treatment Game would stand as one of the first serious games specifically designed to provide individualised interventions to children suffering from complex trauma and comorbid disorders such as anxiety and depression to have undergone rigorous clinical evaluation. In this paper, we have highlighted the importance of a thorough design process involving all stakeholders from the very beginning. Introducing new media like serious games to psychotherapy begs addressing and solving a multitude of scientific, methodological, and ethical challenges. Only by listening very carefully, and currently primarily to what the domain experts, the psychotherapists, have to say, can we hope to deliver serious games that meet the high expectancies in this field.

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References

[1] C. Aldrich, *The complete guide to simulations and serious games: how the most valuable content will be created in the age beyond Gutenberg to Google*. San Francisco, USA: John Wiley & Sons, Inc., 2009.

[2] T. Susi *et al.*, "Serious Games: An Overview," Web at GamesLearningSociety, Univ. Skövde, Sweden, Tech. Rep. HS-IKI-TR-07-001, Feb. 2007.

[3] A. Andrews, "Serious games for psychological health education," in *Virtual and Mixed Reality*, ser. LNCS, R. Shumaker, Ed., vol. 6774. Springer, 2011, pp. 3–10.

[4] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Arlington, USA: American Psychiatric Publ., 2013.

[5] A. Thabet *et al.*, "Comorbidity of PTSD and depression among refugee children during war conflict," *J. Child Psychol. Psych. and Allied Disc.*, vol. 45, no. 3, pp. 533–542, 2004.

[6] A. M. La Greca and W. K. Silverman, "Interventions for youth following disasters and acts of terrorism," in *Child and Adolescent Therapy*, 4th ed., P. Kendall, Ed. New York, NY: The Guilford Press, 2012, pp. 324–344.

[7] J. Marich, *EMDR Made Simple*. Eau Clair, USA: Premier Publ. & Media, 2011.

[8] F. Shapiro and M. Forrest, *EMDR: The breakthrough "eye movement" therapy for overcoming stress, anxiety, and trauma*. New York, USA: Basic Books, 1997.

[9] R. Tinker and S. Wilson, *Through the eyes of a child*. New York, USA: W. W. Norton & Company, Inc., 1999.

[10] L. C. Terr, "Childhood traumas: An outline and overview," *American journal of psychiatry*, vol. 148, no. 1, pp. 10–20, 1991.

[11] B. A. Clough and L. M. Casey, "Technological adjuncts to enhance current psychotherapy practices: A review," *Clin. Psychol. Review*, vol. 31, no. 3, pp. 279–292, 2011.

[12] C. Gaudet-Blavignac and A. Geissbuhler, "Serious games in health care: a survey." *Yearbook of medical informatics*, vol. 7, no. 1, pp. 30–33, 2012. [Online]. Available: http://view.ncbi.nlm.nih.gov/pubmed/22890338

[13] D. Coyle *et al.*, "Personal investigator: A therapeutic 3d game for adolecscent psychotherapy," *Interactive Technology and Smart Education*, vol. 2, no. 2, pp. 73–88, 2005.

[14] ——, "An evaluation of a solution focused computer game in adolescent interventions," *Clin. Child Psychol. and Psych.*, vol. 14, no. 3, pp. 345–360, 2009.

[15] G. Doherty *et al.*, "Engagement with online mental health interventions: an exploratory clinical study of a treatment for depression," in *CHI '12*. New York, NY, USA: ACM, 2012, pp. 1421–1430.

[16] V. Brezinka and L. Hovestadt, "Serious games can support psychotherapy of children and adolescents," in *HCI and Usability for Medicine and Health Care*, ser. LNCS, A. Holzinger, Ed. Springer, 2007, vol. 4799, pp. 357–364.

[17] V. Brezinka, "Treasure hunt—a serious game to support psychotherapeutic treatment of children," in *eHealth beyond the horizon—Get IT There*, ser. SHTI, S. Andersen *et al.*, Eds. IOS Press, 2008, vol. 136, pp. 71–76.

[18] ——, "Computer games supporting cognitive behaviour therapy in children," *Clin. Child Psychol. and Psych.*, 2012, online first.

[19] F. Fernández-Aranda *et al.*, "Video games as a complementary therapy tool in mental disorders: PlayMancer, a European multicentre study," *Journal of Mental Health*, vol. 21, no. 4, pp. 364–374, 2012.

[20] P. Wicks, "E-mental health: A medium reaches maturity," *Journal of Mental Health*, vol. 21, no. 4, pp. 332–335, 2012.

[21] S. B. Messer and A. S. Gurman, Eds., *Essential Psychotherapies—Theory and Practice*. New York, USA: The Guilford Press, 2011.

[22] B. E. Wampold, *The Great Psychotherapy Debate—Models, Methods, and Findings*. New York, USA: Routledge, 2001.

[23] M. Spitzer, *Digitale Demenz*. Munich, Germany: Droemer Verlag, 2012.

[24] J. Creutzfeldt, L. Hedman, and L. Felländer-Tsai, "Effects of pre-training using serious game technology on CPR performance–an exploratory quasi-experimental transfer study." *Scandinavian journal of trauma, resuscitation and emergency medicine*, vol. 20, 2012. [Online]. Available: http://dx.doi.org/10.1186/1757-7241-20-79

[25] L. B. Merabet, E. C. Connors, M. A. Halko, and J. Sánchez, "Teaching the blind to find their way by playing video games." *PloS one*, vol. 7, no. 9, pp. e44 958+, Sep. 2012. [Online]. Available: http://dx.doi.org/10.1371/journal.pone.0044958

[26] F. Buttussi, T. Pellis, A. Cabas Vidani, D. Pausler, E. Carchietti, and L. Chittaro, "Evaluation of a 3D serious game for advanced life support retraining." *International journal of medical informatics*, vol. 82, no. 9, pp. 798–809, Sep. 2013. [Online]. Available: http://dx.doi.org/10.1016/j.ijmedinf.2013.05.007

[27] D. F. Halpern, K. Millis, A. C. Graesser, H. Butler, C. Forsyth, and Z. Cai, "Operation ARA: A computerized learning game that teaches critical thinking and scientific reasoning," *Thinking Skills and Creativity*, vol. 7, no. 2, pp. 93–100, Aug. 2012. [Online]. Available: http://dx.doi.org/10.1016/j.tsc.2012.03.006

[28] T. M. Connolly *et al.*, "A systematic literature review of empirical evidence on computer games and serious games," *Comp. & Educ.*, vol. 59, no. 2, pp. 661–686, 2012.

[29] V. Guillén-Nieto and M. Aleson-Carbonell, "Serious games and learning effectiveness: The case of It's a Deal!" *Computers & Education*, vol. 58, no. 1, pp. 435–448, Jan. 2012. [Online]. Available: http://dx.doi.org/10.1016/j.compedu.2011.07.015

[30] S. Freitas and F. Liarokapis, "Serious games: A new paradigm for education?" in *Serious Games and Edutainment Applications*, M. Ma, A. Oikonomou, and L. C. Jain, Eds. London UK: Springer, 2011, pp. 9–23.

[31] http://unity3d.com/, last visited: April 15, 2014.

[32] L. Reddemann, *Imagination als heilsame Kraft*, 17, Ed. Klett-Cotta, 2013.