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Positive Change: Connecting the Virtual and the Real

Editors

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Preface

Healthcare delivery systems have been evolving to rely more heavily on technology. There has been a shift in care prevention, diagnosis and treatment which has decreased the importance of traditional methods of care delivery.

We have put a great deal of effort into the definition of the structure of the volume and in the sequence of the contributions, so that those in search of a specific reading path will be rewarded. To this end we have divided the different chapters into six main sections:

1. Editorial: This introductory text expresses the position of the Editors – Brenda K. Wiederhold and Giuseppe Riva – about the focus of this year issue;
2. Critical Reviews: These chapters summarize and evaluate emerging cybertherapy topics, including technology-enhanced rehabilitation, Interreality, and Intersubjectivity;
3. Evaluation Studies: These chapters are generally undertaken to solve some specific practical problems and yield decisions about the value of cybertherapy interventions;
4. Original Research: These chapters research studies addressing new cybertherapy methods or approaches;
5. Clinical Observations: These chapters include case studies or research protocols with long-term potential.
6. Work in Progress: These chapters include papers describing a future research work.

For both health professionals and patients, the selected contents will play an important role in ensuring that the necessary skills and familiarity with the tools are available, as well as a fair understanding of the context of interaction in which they operate.

In conclusion, this volume underlines how cybertherapy has started to make progress in treating a variety of disorders. However, there is more work to be done in a number of areas, including the development of easy-to-use and more affordable hardware and software, the development of objective measurement tools, the need to address potential side effects, and the implementation of more controlled studies to evaluate the strength of cybertherapy in comparison to traditional therapies.

We are grateful to Chelsie Boyd from the Virtual Reality Medical Institute for her work in collecting and coordinating chapters for this volume. We sincerely hope that you will find this year's volume to be a fascinating and intellectually stimulating read. We continue to believe that together we can change the face of healthcare.

Brenda K. Wiederhold   Giuseppe Riva
Secretary General   President
International Association   International Association
of CyberPsychology   of CyberPsychology
Training, and Rehabilitation (iACToR)   Training, and Rehabilitation (iACToR)

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We would like to extend a warm and heartfelt thank you to all of the members of the review board whose help has made this year's publication possible:

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SECTION I

EDITORIAL

"Positive Technology" focuses on the use of technology for improving the quality of our personal experience, suggesting specific strategies to modify/improve each of the different dimensions involved, and generating motivation and engagement in the process.

The use of Positive Technology tools and strategies allows the expansion of healthcare beyond the traditional doctor's office and hospital to include advanced simulation technologies such as virtual reality or augmented reality, and spontaneous peer networks that encompass and utilize Web 2.0 properties (blogs, online communities, etc.) that are main fixtures of 21st-century living.

Wiederhold, Riva & Graffigna, 2013

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Positive Change: Connecting the Virtual and the Real

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Abstract. How do we lastingly change our lives for the better? There is not an easy answer to this question. However, due to the advances in psychology and neuroscience, now we have a better view of personal change, that is not limited to a specific viewpoint. In particular, the emergence of integrative and transdiagnostic accounts suggests that change is contextual, depending on the person, the issues, and the situation. More, personal change is a process, happening in discontinuous and nonlinear ways, following life transitions and traumatic events. In this process a key role can be played by technology: using the "Positive Technology" approach it is possible to use technology to manipulate the quality of experience, with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations and society.

Keywords. Positive change, positive psychology, cybertherapy, presence, flow, optimal experience

Introduction

How do we lastingly change our lives for the better? There is not an easy answer to this question. As noted by Higginson and Mansell [1]: "The mechanism of psychological change is not fully understood. This is clear in research demonstrating the efficacy of different therapeutic approaches and the significant rates of natural recovery." (p. 326).

On one side it is well known that different therapies can all facilitate psychological change [2; 3]. On the other side, it is also true that some people experience psychological change without the help of any form of treatment [1].

However, due to the advances in psychology and neuroscience, now we have a better view of personal change, that is not limited to a specific viewpoint. In particular, the emergence of integrative and transdiagnostic accounts suggests that change is contextual, depending on the person, the issues, and the situation [4]. More, personal change is a process, happening in discontinuous and nonlinear ways, following life transitions and traumatic events [5].

Recently Riva [6] identified some important properties of personal change:

- the focus of personal change is reducing the distance between goals and reality;

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- this reduction is achieved through: a) an intense focus on the particular experience creating the conflict; b) a reorganization of this experience;
- the focus and reorganization of the experience may happen both at the intuitive and at the rational level;
- this reduction requires a complex process based on different stages.

In particular, by merging the ideas of two influential transdiagnostic models of change - the Perceptual Control Theory [7; 8] and the TransTheoretical Model of Behavior Change [9-11] - it is possible to describe a process of personal change [4] following this sequence (pp. 19-20):

1. there is an expressed desire for change that is triggered by a crisis, trauma, or developmental transition;
2. a level of pain and discomfort is reached that can't any longer be ignored or denied;
3. there is an awareness or insight that something different must be done;
4. there is a gradual process of applying what was realized or learned into constructive action; and
5. there is recovery from inevitable relapses.

But in this view, what is the possible role of technology? In this chapter we suggest that within the "Positive Technology" approach it is possible to use technology to manipulate the quality of experience, with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations and society. In the following paragraphs we will endeavor to justify this claim.

1.   Cognition and Change

What is the role of our cognitive in the processes detailed above. According to Riva [6] our cognitive system is naturally shaped to identify and counter the experiential conflicts that are described in the points 1 and 2 of the above list. This is achieved through a specific cognitive process – presence - whose goal is the control of the activity of the individual [12-14]: I am present in a real or virtual space if I manage to put my intentions into action (enacting them).

On one side, there is a link between presence and the effectiveness of an action [14]: the greater level of presence a subject experiences in an activity, the greater the individual's involvement in the activity will be, and this increases the probability of the activity ending well (the transformation of the intention into action).

On the other side, presence provides the self with a feedback about the status of its activity [15]. Specifically, the self perceives the variations in the feeling of presence (breakdowns and optimal experience) and tunes its activity accordingly. The role of breakdowns in personal change is clear: to push individuals towards it. By perceiving a conflict (awareness) between different goals the subject is pushed to resolve the conflict between them.

Optimal experiences, also defined as "flow experiences" [16-18], instead, allow the individual to consider the long-term personal goals differently and start to experiment with changing them. In other words optimal experiences, when meaningful for the individual, widen the array of thoughts and actions, facilitating generativity and behavioral flexibility. However, the outcomes of optimal experience are not

automatically positive. As noted by Delle Fave and colleagues [19], they vary according to the meaning attributed to them: only the optimal experience that has a relevant meaning for the individual experiencing it (high level of presence) is able to sustain and promote personal change.

Within this context, the transformation of flow can be defined as a person's ability to draw upon a meaningful optimal experience and use it to marshal new and unexpected psychological resources and sources of involvement [20; 21]. As underlined by Massimini and Delle Fave, [22]: "To replicate [optimal experiences], a person will search for increasingly complex challenges in the associated activities and will improve his or her skill, accordingly. This process has been defined as cultivation; it fosters the growth of complexity not only in the performance of flow activities but in individual behavior as a whole." (p. 28). In other word, our cognitive system intuitively selects and cultivates activities, interests and relationships associated with meaningful optimal experiences. Put differently, meaningful optimal experiences carry indirect and long-term adaptive value because they facilitate personal change through the emergence of new solutions and skills.

2.   Flow and Technology

Emerging Cyberpsychology is a recent branch of psychology that is driven by the quest to help humans deal with their digital environments. The object of study in cyberpsychology, as it is for many Human-Computer Interaction researchers, is the change introduced by the technology and not the technology itself. In particular, it aims at the understanding, forecasting and activation of the different processes of change related to the use of new technologies.

Within this broad focus, however, cyberpsychology has two faces [6]. On one side, cyberpsychology tries to understand how technologies can be used to induce clinical change (cybertherapy) [23; 24]. On the other side, cyberpsychology focuses on the possible use of technology for improving personal development and well-being (positive technology) [25; 26]. Specifically, we can define "Positive Technology" as the scientific and applied approach to the use of technology for improving the quality of our personal experience through its structuring, augmentation and/or replacement - as a way of framing a suitable object of study in the field of personal change [26-29].

The core psychological background of "Positive Technology" is "Positive Psychology" a nascent discipline whose broad goals are to understand the human strengths and virtues, and to promote these strengths to allow individuals, communities, and societies to flourish [30]. Specifically, Positive Psychology views optimal functioning as the combination of emotional well-being, social well-being and psychological well-being.

In this chapter we suggested that it is possible to use technology to manipulate the quality of experience, with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations and society. First, we have classified positive technologies according to their effects on these three features of personal experience (Figure 1):

> Hedonic: technologies used to induce positive and pleasant experiences;
> Eudaimonic: technologies used to support individuals in reaching engaging and self-actualizing experiences;

Social/Interpersonal: technologies used to support and improve the connectedness between individuals, groups, and organizations.
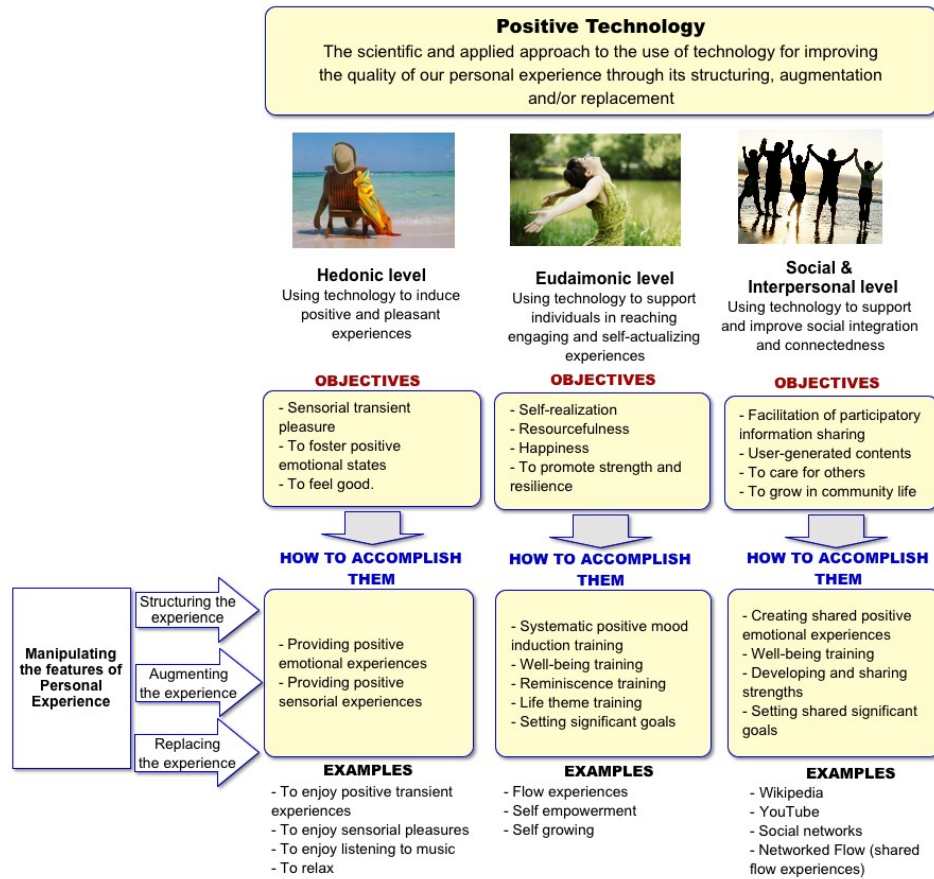
Figure 1. Positive Psychology Tools

Additionally, for each level we have identified critical variables – affect regulation for the Hedonic one, flow and presence for the Eudaimonic one; social presence, collective intentions and networked flow for the Social/Interpersonal one – that can be manipulated and controlled to guide the design and development of positive technologies.

Finally, the different examples show that technology can be used to manipulate the features of an experience in three separate but related ways (Figure 2):

By structuring it using a goal, rules and a feedback system [31]: The goal provides subjects with a sense of purpose focusing attention and orienting his/her participation in the experience. The rules, by removing or limiting the obvious ways of getting to the goal, push subjects to see the experience in a different way. The feedback system tells players how close they are to achieving the goal and provides motivation to keep trying.

By augmenting it to achieve multimodal and mixed experiences. Technology allows multisensory experiences in which content and its interaction is offered through more than one of the senses. It is even possible to use technology to overlay virtual objects onto real scenes [32].

By replacing it with a synthetic one. Using VR it is possible to simulate physical presence in a synthetic world that reacts to the action of the subject as if he/she was really there. More, the replacement possibilities offered by technology even extend to the induction of an illusion of ownership over a virtual arm or a virtual body [33].
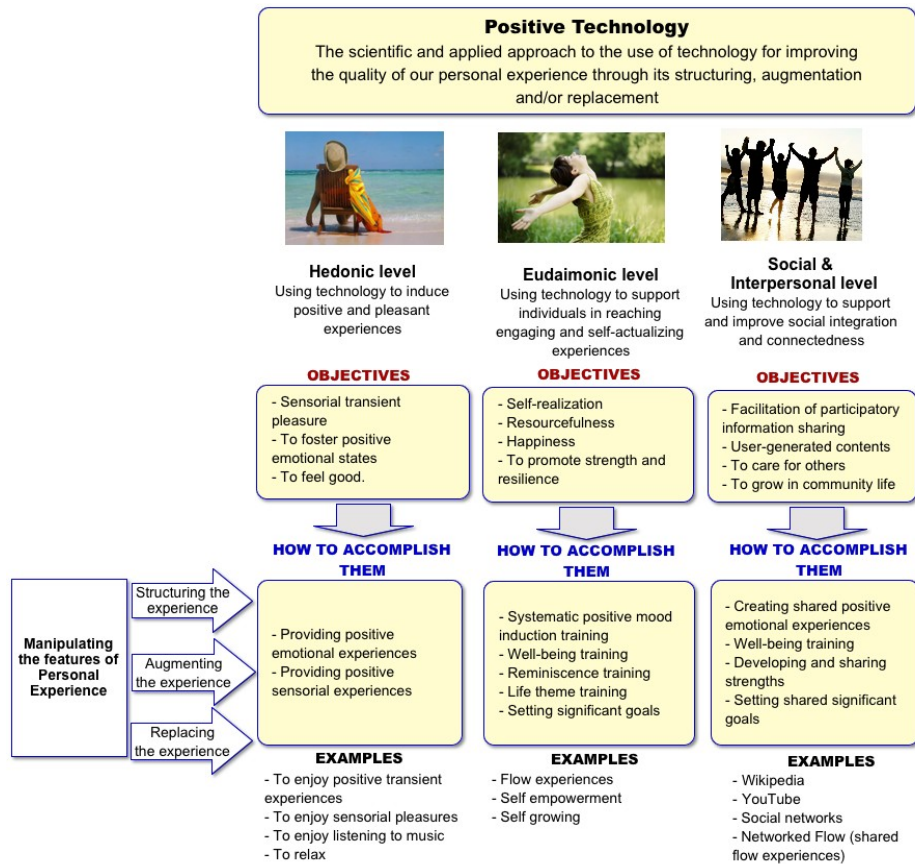
Figure 2. Positive Psychology Tools

Even if Positive Techology tools can be used in cybertherapy, too, there is a relevant difference [6]: to be effective, they have to adapt to specific stage of the process of change where the patient is in.

Within this process, Positive Technologies are successful only if they are able to sustain the patient engagement within the provided experience. Recently, Graffigna and colleagues [26; 34-36] defined "patient engagement" as the experience resulting from

the conjoint conative (act), cognitive (think) and emotional (feel) enactment of individuals in their care&cure management.

These different experiential dimensions play different (but complementary) driving roles, as key factors for promoting patients' advancement in this sense-making process. The unachieved synergy among the different subjective dimensions inhibits patients from engaging in their care&cure management, limiting their potential for obtaining the greatest benefit from the offered Positive Technologies.

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SECTION II

CRITICAL REVIEWS

In general, there are two reasons why cybertherapy is used: either because there is no alternative, or because it is in some sense better than traditional medicine.

In this sense telehealth has been used very successfully for optimizing health services delivery to people who are isolated due to social and physical boundaries and limitations.

Nevertheless, the benefits of cybertherapy, due to the variety of its applications and their uneven development, are not self-evident.

However, the emergence of cybertherapy is supporting the cost-effectiveness of certain applications, such as assessment, rehabilitation and therapy in clinical psychology and neuroscience.

Wiederhold & Riva, 2004

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Enabling eHealth as a Pathway for Patient Engagement: a Toolkit for Medical Practice

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Abstract. Academic and managerial interest in patient engagement is rapidly earning attention and becoming a necessary tool for researchers, clinicians and policymakers worldwide to manage the increasing burden of chronic conditions. The concept of patient engagement calls for a reframe of healthcare organizations' models and approaches to care. This also requires innovations in the direction of facilitating the exchanges between the patients and the healthcare. eHealth, namely the use of new communication technologies to provide healthcare, is proved to be proposable to innovate healthcare organizations and to improve exchanges between patients and health providers. However, little attention has been still devoted to how to best design eHealth tools in order to engage patients in their care. eHealth tools have to be appropriately designed according to the specific patients' unmet needs and priorities featuring the different phases of the engagement process. Basing on the Patient Engagement model and on the Positive Technology paradigm, we suggest a toolkit of phase-specific technological resources, highlighting their specific potentialities in fostering the patient engagement process.

Keywords. Patient engagement, people health engagement, chronic care, eHealth, new technologies, positive technologies

Introduction

Academic and managerial interest in patient engagement is rapidly earning attention and becoming a necessary tool for researchers, clinicians and policy makers worldwide to manage the increasing burden of chronic conditions. The need for overcoming the care paradigm of "one size fits all" healthcare is enabling personalized healthcare services to be delivered to individuals at any place and any time [1,2].

In order to support this care model evolution, an healthcare system which favors the links between the "inside" and the "outside" of healthcare organizations and between healthcare providers and the patients' daily life context is expected to provide personalized healthcare services at the right time, right place and right manner. In line with this requirement, the actions patients do – and do not – are recognized as crucial for successful management of the disease and its treatments [3].

An engaged patient is essential for delivery models focused on chronic disease treatment and prevention of health risk behaviors such as the Chronic Care Model [4,5]. Also clinical models such as the patient-centered medical home [6] highlight the importance of enabling an accessible and responsive care system, care coordination and an effective communication with the health providers in order to promote patient engagement and achieving increasing rates of treatment adherence, thus improving patient health outcomes and reduced costs of care. Engaging people is considered critical to understanding their experience of health and care; this, in turn, can lead to patient centered changes in practice and service delivery thus augmenting the quality of care [7].

1. Enabling eHealth Technologies for Achieving Patient Engagement in Healthcare

The concept of patient engagement calls for healthcare organizations to reframe their models and approaches to care. This also requires innovations that allow healthcare systems to effectively facilitate the exchanges between the patients and the providers [8]. In this sense, we are on the precipice of a health care crisis, and that in order to avoid it we must bend the health care cost curve. One way to bend the cost curve and to answer to the need for reframing care models is the implementation of new technologies, in that they promise to enable novel efficiencies in the health care system [9].

The use of new communication technologies in health management is labeled eHealth. It is a broad term that encompasses a broad range of phenomena, conceptions and instruments. Several definition of this term are available in the literature [10], most of them highlighting the importance of Internet-related technologies to support, enable, promote and enhance health or, more precisely, the process of healthcare. Across the wide variety of definitions, Electronic health (eHealth) technologies are widely recognized as a means of introducing new efficiencies into the health care system. The most cited definition was found to be the one by Eysenbach [11]. On the one hand, it highlights the medical information delivery (to patients and stakeholders) as enriched by the use of medical informatics. On the other hand, it underlines the need for a change in the state-of-mind by the health practitioners, who have to start thinking globally, since the only technical development is not sufficient for eHealth emerging.

To date, numerous interventions examined the efficacy of eHealth integrations in the process of care, for example in promoting physical activity [12,13], assisting chronically ill patients [14] and treating numerous diseases, both physical [15,16] and psychological [17]. If eHealth has been analyzed in its effectiveness for what regards the care process, less attention has been devoted to the understanding of eHealth impacting on the engagement of patients. eHealth is not simply a technology but a process, that is primarily characterized by a number of relationships [18]: the relationship between the clinician and the patient; the relationship between clinicians; the relationship between the provider of the telemedicine system and the user. At least the first and the third relationships are strongly connected to the act of engaging patients in the process of care, which means promoting effective behavior change within their complex lives [19]. In this sense, implementing an eHealth intervention means choosing, monitoring and managing an integrated system of technological resources, basing on the specific condition of the patient and on his specific needs. Yet,

one of the many benefits associated with eHealth technologies is their unprecedented ability to engage patients and enable them to participate more actively in their health care [18,19].

Generally speaking, eHealth technologies such as those driven by the Internet, can enable patients to easily have access to health information and improve their health literacy (e.g. Google, Wikipedia, eBooks, Twitter, library web portals), and can enable the creation of, and participation in, patients' virtual communities to favor social sharing of health topics, (e.g. Facebook, Google+, Twitter, patientslikeme.com). Moreover, technologies may be useful tools for sharing patient information within the healthcare system among healthcare professional and (sometimes) patients/lay people (e.g. EHR or PHR), or for supporting daily care through remote monitoring and for facilitating the connection between patients and health providers on demand (e.g. (mobile) phone, SMS, email).

2. A Toolkit for Engaging Patients through eHealth Solutions

As mentioned above, eHealth is recognized as potentially able to sustaining patient engagement in healthcare by enhancing the efficiency, quality, and safety of the care process [12-17,19]. However, the reflection about the eHealth efficacy in promoting patient engagement in healthcare is still in its infancy. Precisely, operative guidelines to implement eHealth tools in the light of patient engagement are still missing.

In this contribution, we propose a preliminary roadmap of the domains that need to be addressed to achieve these results by depicting the specific potentialities of eHealth technologies to orient interventions specifically aimed at promoting patient engagement in healthcare. We believe that the development of eHealth tools that take into account the unique unmet needs that patients experience in the different phases of the patient engagement process will be critical in different domains. According to this vision, not only the disease condition and the therapy needs, but also the illness experience of the patient, are taken into consideration as fundamental references for eHealth tools design and implementation.

The patient engagement process features four incremental phases (disengagement, arousal adhesion, eudaimonic project), characterized by complex patients' experiential dynamics [20]. This evolutionary view of the patient engagement process suggests that a fully engaged patient status is the final outcome of a series of emotional, cognitive and behavioral reframing and that the patient's success at each phase of the process depends on the success in the earlier one.

In order to support the process of patient engagement, specific action priorities should be enacted. eHealth is recognized to have a crucial role in this process. However, eHealth tools have to be appropriately designed according to the specific patients' engagement experience. In this sense, the Positive Technology framework [21] may cast light on the role of technology for improving the quality of the patients' personal experience with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations, and society thus fostering their active engagement in health management.

Starting from considering the Patient Engagement process [20] and the Positive Technology framework [21], in the following paragraphs a preliminary toolkit of phase-specific technological resources will be described, highlighting their particular strengths in fostering the patient engagement process (see Figure 1).
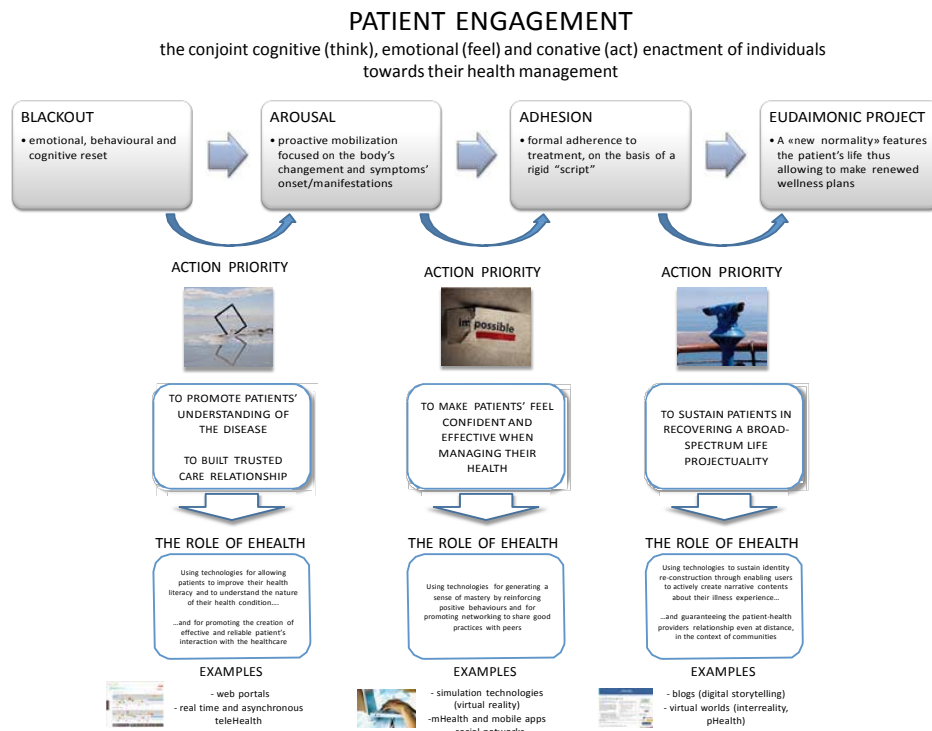
Figure 1. A toolkit for eHealth interventions aimed at promoting patient engagement

2.1 The patient transition from the blackout to the arousal phase

The disease onset has a great impact on the patient psychological functioning. The patient has to accept and understand his new health condition, which also disrupts and de-organizes the structure of knowledge and beliefs he has about himself. In other words, the individual has to accept that now he is also a patient, a person with a disease by gaining health literacy.

Action priorities to address the patient's unmet needs

To overcome the emotional confusion related to the loss of identity, the patient needs to promote the self-reframing by understanding the nature of his own body changes, as well as of his own psychological status. There is the need to improve the patient's understanding of his health and related conditions. To address this need it is necessary to create a safe care environment by fostering the patient-health provider relationship

which may function as the catalyzer of the care process. Moreover, it is necessary to sustain caregivers in understanding the patients' reactions to their illness experience.

What can eHealth do?

Technological applications allow the patient to find information about his pathological condition and the available healthcare resources to manage it. This task is carried out by healthcare web portals [22], which help patients in transforming information management into knowledge management: namely, that information is a guide for action or an information with a direction [23]. Also, new technologies for communication allow to deliver health services at distance (teleHealth), real time (the medic and the patient interact simultaneously via videochat) or asynchronously ("store-and-forward", that means collecting data, transferring them to consult/analyze them at a later time) [24]. These type of technologies are usually well-accepted by patients, being their acceptance related to perceived usefulness and experienced ease of use [25].

2.2 The patient transition from the arousal to the adhesion phase

In this phase, patients are emotionally activated and experience loss of control over their body and emotional reactions and, as a consequence, they feel a reduced agency and power over their disease management and over their daily life.

Action priorities to address the patient's unmet needs

To favor the patients' advancement along the engagement process there is acknowledged the need for making patients' feel confident when managing their health by valuing and reinforcing positive behaviors. To accomplish this goal, patients should be empowered and sustained in prioritizing goals, identifying obstacles and build a trustworthy relational care network.

What can eHealth do?

The reduced agency and power over life can be conceived as a loss of self-efficacy. According to Bandura [26, 27], self-efficacy can be defined as the beliefs about one's ability to perform a given course of actions. Traditionally, Bandura identified four sources of self-efficacy beliefs, that are the mastery experiences (past experiences of success performing the actions), vicarious experiences (to have seen other people successfully performing the action), social persuasion/social influence (others' opinions about our ability influence our self-perceptions of efficacy) and emotional/physiological states.

New technologies present remarkable opportunities to foster the achievement of such sources, directly influencing the personal sense of control/power perceived by a user [28]. On the one hand, simulation technologies (such as Virtual Reality, videogames, serious games) constitute an opportunity for an individual to exercise his own abilities in simulated contexts, thereby achieving experiences that, although simulated, generate a sense of mastery [29-31]. In this context, also mobile apps for healthcare can play an important role in disease self-management, patient education and remote monitoring [32]. On the other hand, new communication technologies foster the engagement of people in shared platforms, such as social networks, in which

they could share experiences and benefit of the positive confrontation with others [33,34]. Moreover, these two features (interactivity/simulation and social networking) are nested in the phenomenon of Virtual worlds, which were often used in educational and health-related contexts [35-37]. Finally, in this phase a continuity of the care process should be maintained, through the active involvement of the medics, the caregivers and the patient himself. Precisely, the patient needs a continue contact/communication with the medic. In this scenario, new technologies are helpful in supporting the healthcare communication. Mobile technologies have been implemented to foster health as well as wellbeing (mHealth) [33]. Since smartphones are now constantly present in everyday lives, they allow (1) to extend medic-patient interaction and consultation beyond the face-to-face meetings for diagnosis and treatment and (2) to register and monitor behavioral and physiological data during daily life, also providing immediate feedbacks to the patients [38].

2.3 The patient transition from the adhesion to the eudaimonic project phase

A patient going through the passage from the adhesion to the eudaimonic project phase have to face with a reduction in their life horizons and context of actions. In other words, in order to manage their disease they have been confined to their patients' role and, as a consequence, they have reduced their daily life spheres thus often experiencing limitations in daily living due to disease implications.

Action priorities to address the patient's unmet needs

Successfully moving on this state entails patients gaining a positive approach to health management and recapture of an active role in the society by making wellness plans that consider the disease management a part of the whole patients' life.

What can eHealth do?

Entering the third phase means fostering the patient's ability to make and pursue life projects. In this context, patients benefit of the confrontation and collaboration within communities of other patients and healthcare providers. This is possible implementing the care process in 3D avatars-mediated Virtual Worlds, within the context of an innovative eHealth service that provides personalized immersive therapy (pHealth) [39]. The key factor is "interreality", namely a hybrid augmented experience merging the real and the virtual world [40,41]. It is achieved through the following [39]:
- Extended sense of presence [42,43]: health guidelines are turned into experience. The patients do not receive abstract information but live meaningful experiences
- Extended sense of social presence [44,45]: the patient/user is provided with social support in the context of virtual groups and communities
- Feedback between the virtual and the real world: the patient receives health guidelines form the virtual world; also, features of the virtual experience can modify according to the development of the patient's condition.
     Also, it is acknowledged that some new technologies have a tremendous potential in sustaining identity management and re-construction. According to narrative psychology, people's stories are an important part of their identity construction [46], since the act of storytelling allows people to give sense to their world and experiences; moreover, also psychological wellbeing is maintained thanks to the construction of

stories that are helpful in making sense of negative events such a disease onset [47,48]. Digital storytelling, which encompasses a broad range of tools and methods, showed how new technologies enable users to actively create narrative contents on the web [49]. Weblogs or blogs are an important example of this trend, and to date they were frequently used both in educational and in health related contexts [50-52]. On the one hand, they allow the patient to express and re-construct his own identity through a continuing illness autobiographical narration. On the other hand, the patient's blog can be implemented in broader communities of patients, where the blog authors are motivated to share their experiences and knowledge. The use of blogs as a discourse tool support the emergence of a community by affording patients opportunities to socialize, be involved in dialogue with peers, seek support and assistance, and express feelings and emotions [53-55].

3. Patient engagement and eHealth: Lesson Learned

Making patients active and engaged in their healthcare is certainly a gold standard in the 21st century health policy and medical practice as far as it enables and retains autonomy and self-determination, and protects patients' rights to make decisions about their own future care. On these bases we advocate for innovation in the care models that exploit the undeniable potentialities of new technologies for engaging patients in their own care [56,57].   In this paper, we propose a roadmap for engaging patients through eHealth solutions. The major contributions of the paper are: (1) identifying the main unmet patient's need that have to be addressed when developing interventions aimed at fostering their engagement in healthcare (2) providing a toolkit of the enabling technologies for interventions to support patient engagement along the care process; (3) illustrating the features of health technologies that are more suitable according to each phase of the patient engagement process.

Future research should be devoted to include caregivers in the patient engagement interventions featuring eHealth. Delivering eHealth interventions aimed at engaging patients in their care remains a challenge because of the lack of reflection upon the complexity of providing psychosocial support and skills training for caregivers within current models of formal healthcare services. We thus claim for further research lines aimed at considering eHealth tools as a means to favor not only dyadic exchanges between the patient and the healthcare providers but also triadic exchanges that take in consideration also the primary role of caregivers in the care process.

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SECTION III

EVALUATION STUDIES

To date, some cybertherapy applications have improved the quality of health care, and later they will probably lead to substantial cost savings.

However, cybertherapy is not simply a technology but a complex technological and relational process.

In this sense, clinicians and health care providers that want to successfully exploit cybertherapy need a significant attention to clinical issues, technology, ergonomics, human factors and organizational changes in the structure of the relevant health service.

Wiederhold & Riva, 2004

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Positive Technology: A Free Mobile Platform for the Self-Management of Psychological Stress

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Abstract. We describe the main features and preliminary evaluation of Positive Technology, a free mobile platform for the self-management of psychological stress (http://positiveapp.info/). The mobile platform features three main components: (i) guided relaxation, which provides the user with the opportunity of browsing a gallery of relaxation music and video-narrative resources for reducing stress; (ii) 3D biofeedback, which helps the user learning to control his/her responses, by visualizing variations of heart rate in an engaging 3D environment; (iii) stress tracking, by the recording of heart rate and self-reports. We evaluated the Positive Technology app in an online trial involving 32 participants, out of which 7 used the application in combination with the wrist sensor. Overall, feedback from users was satisfactory and the analysis of data collected online indicated the capability of the app for reducing perceived stress levels. A future goal is to improve the usability of the application and include more advanced stress monitoring features, based on the analysis of heart rate variability indexes.

Keywords. Stress, biofeedback, heart rate, wearable sensors, mobile health, positive technology

Introduction

Psychological stress contributes to many chronic diseases suffered by citizens in today's society: according to the World Health Organization, mental health problems and stress-related disorders are the biggest overall cause of early death in Europe [1]. Exposure to prolonged stress is known to increase the risk of physical and mental health problems, including depression and disabling anxiety conditions. In recent years, several research groups have started investigating the opportunities offered by wearable biosensors and computers to address psychological stress. The combined use of wearable biosensors and smartphones allows collecting, elaborating and transmitting real-time information related to the psychophysiological state of the user and provide appropriate recommendations/exercises. Here, we describe the main features and

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preliminary evaluation of Positive Technology, a free mobile platform for the self-management of psychological stress.

1. Positive Technology Platform: Main Features

The Positive Technology application (free download at: http://positiveapp.info/) consists of the following three main components, which are described in more details below:

a)   Guided Relaxation;
b)   Biofeedback;
c)   Stress self-reporting and tracking.

1.1. Guided Relaxation

The guided relaxation component provides the user with the opportunity of browsing a gallery of relaxation music and video-narrative resources for stress therapy designed by professional therapists. The user can choose among four different 3D interactive environments (from beach or forest to campfire or mountain hiking) and six relaxing music traces that are designed to support relaxation. Once a relaxation environment has been chosen the user can also set the duration of the exercise, typically in the time range of 5 to 15 minutes.
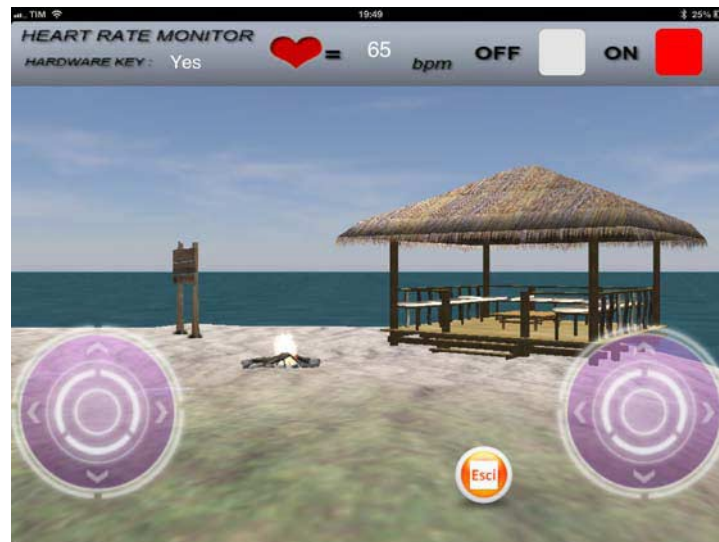
Figure 1. A screenshot of the Positive Technology app

1.2. Mobile biofeedback

The aim of the biofeedback component is to establish a feedback loop between the user and the relaxation environment. It consists of a portable heart rate monitor connected

via Bluetooth interface with the mobile application (the current version of the application supports all commercial cardiac monitoring sensors providing Bluetooth Smart protocol). The heart rate is displayed in form of animated 3D visual feedback to the user: by controlling the respiration rate, variations in the heart rate control the features of the virtual environment, such as the increase or the decrease of the size of a virtual campfire or waterfall. In this way, the user learns to control autonomic responses to stressful situations.

1.3. Stress self-reporting and tracking

The user has two options to track his/her stress levels: (i) manually, by reporting perceived stress level on a 10-point scale, and the arousal-valence levels on a modified version of the Self-Assessment-Manikin (SAM), the non-verbal pictorial assessment scales developed by Lang [2]. The arousal scale includes 5 values (1=relaxed; 5=excited); the valence scale includes 5 values (1=unpleasant; 5=pleasant) (ii) automatically, by having the application capturing instantaneous heart rate values immediately before and immediately after taking a stress management exercise (either biofeedback or relaxation). Values collected by the application are updated on the remote server through Internet connection. The user can also visualize the history of stress levels variations by logging into the service website.

2. Pilot Evaluation

The pilot evaluation took the form of an online trial, having participants using the application and self-reporting arousal-valence levels before and after a biofeedback or relaxation training. In addition, heart rate of participants wearing the wrist sensor was recorded. All users provided online an informed consent to the collection of their self-reported data.

3. Results and Discussion

Overall, 288 users downloaded the Positive Technology app. However, only the data collected from those users who performed at least one stress management exercise (either relaxation training or biofeedback), for at least 120 seconds, were considered in the analysis. Out of the 32 users who met these criteria, only 7 used the software in combination with the wrist sensor. From the selected sample, a total of 182 relaxation sessions were analyzed. A one-way repeated measure ANOVA was performed on perceived stress, arousal, valence and the heart rate to determine the effects of mobile stress management exercises. Results indicated a significant decrease of perceived stress level ($F=15.2$; $p<.01$); a significant decrease of arousal ($F=13.7$; $p<.01$) and a significant increase of valence ($F=13.1$; $p<.01$). There was a pre-post decrease in mean heart rate values, albeit not statistically significant.

   These findings show that the relaxation exercises performed with the application were effective in reducing users' stress, as indicated by the significant decrease in self-reported levels of anxiety/arousal and by the increase of positive values of hedonic valence after the relaxation session. In addition, a pre-post decrease of mean heart rate

values was observed, although the difference was not statistically significant. However, it should be noted that heart rate was monitored only in 7 participants and the relative small number of sessions in which cardiac activity was recorded (46) might have decreased the statistical power of the analysis. Despite preliminary, these data suggest that even a short-duration relaxation exercise performed on a mobile application might be useful to reducing psychological stress and supporting positive emotional states.
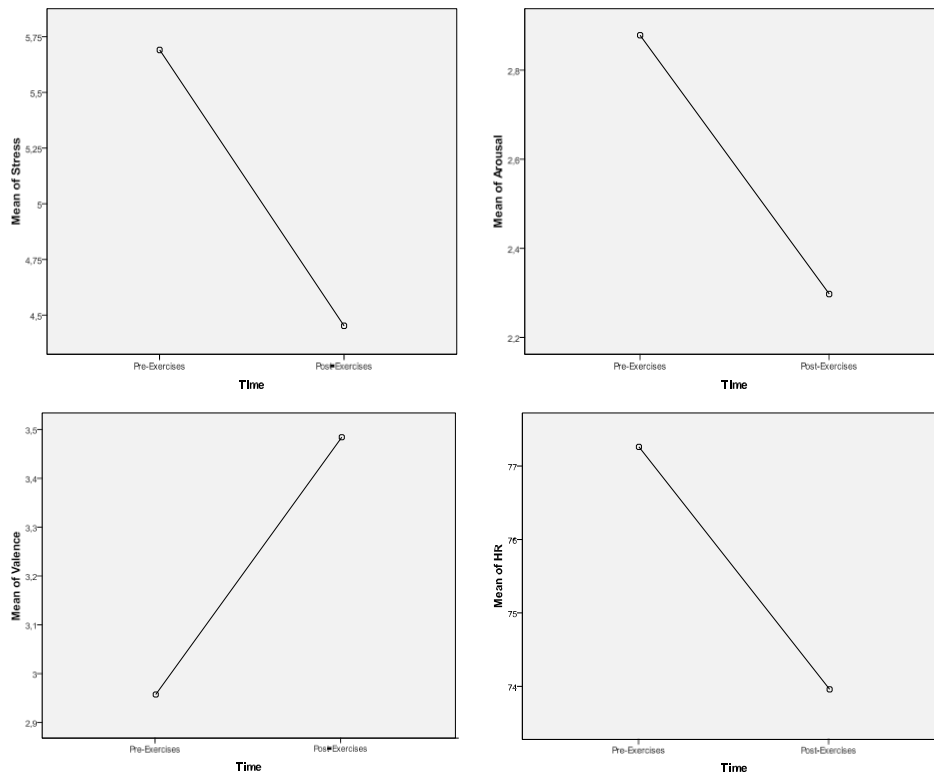
Figure 2. Results of pre-post ANOVA

Conclusion

Chronic stress has become an increasingly important public health concern. Stress-related disorders have been shown to cause and exacerbate physiological and behavioural disturbances ranging from immune system dysfunction to psychiatric disorders. Financial costs of work-related stress in the EU-15 were estimated to be 20 billion Euro in 2002, while in the U.S. alone cost estimates are as high as $200 billion per year including accidents, absenteeism, employee turnover, diminished productivity, and direct medical, legal, and insurance costs. Mobile meantal wellness tools may provide a potential effective approach to integrate prevention strategies into the everyday lives of citizens [3-4]. Here, we described the key features and preliminary evaluation of Positive Technology, a mobile platform for self-management of psychological stress. To our best knowledge, Positive Technology is the first free

mobile stress management platform available on the market which combines relaxation training, biofeedback and interactive 3D contents. In fact, most existing applications use mainly text instructions for relaxation training and breathing exercises, while others are "monitoring" and recording emotional status by simple and easy text questions that appear on the screen of the mobile device. There are applications that include a biofeedback feature, however this is usually achieved by tapping on the screen during each breath or using the camera as a less reliable heart rate monitor.

Findings of the pilot evaluation showed that the Positive Technology app was effective in reducing users' perceived stress levels. However, due to the limited number of users wearing the wrist cardiac monitor it was not possible to support these subjective findings with objective stress correlates. A future goal is to improve the usability of the application and include more advanced stress monitoring features, based on the analysis of heart rate variability indexes.

Acknowledgments

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Virtual Humans and Formative Assessment to Train Diagnostic Skills in Bulimia Nervosa

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Abstract. Carrying out a diagnostic interview requires skills that need to be taught in a controlled environment. Virtual Reality (VR) environments are increasingly used in the training of professionals, as they offer the most realistic alternative while not requiring students to face situations for which they are yet unprepared. The results of the training of diagnostic skills can also be generalized to any other situation in which effective communication skills play a major role. Our aim with this study has been to develop a procedure of formative assessment in order to increment the effectiveness of virtual learning simulation systems and then to assess their efficacy.

Keywords. Virtual humans, formative assessment, medical education, psychological education, bulimia nervosa, psychopathological exploration

Introduction

The training in psychopathological exploration through graphic simulation methods has several advantages compared to traditional procedures:

Cost is lower as there is no need to carry out the necessary "logistics" involved in training with real patients.

Allows training with patients who have unusual pathologies.

Provides higher control of the various situational parameters and so it is possible to isolate or highlight environmental dimensions that are significant to the student´s learning process.

Facilitates auto-training and overlearning, given that the student does not have to wait for the situations to occur in real life but can produce and reproduce them when desired.

Allows a more customized design of the different learning hierarchies so that the student can be exposed to as many situations as possible.

It's a secure environment and the tutor or student can at all times control what is happening.

It's an activity that is mainly directed by the student. There are well-known theories highlighting that self-directed activities are best for learning and thus for behavioural modification too.

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Our aim with this study has been to develop a procedure of formative assessment in order to increment the effectiveness of virtual learning simulation systems and then to assess their efficacy.

1. Methods

A virtual environment was developed in which the learner could conduct a clinical interview with different Virtual Patients (VPs). Each of these VPs showed a specific mental disorder that corresponded to bulimia nervosa or to other disorders that may mimic bulimia. In this simulation, skills of differential diagnosis are taught via a series of diagnostic interviews conducted with these VPs. The objective of the interviews is to obtain enough data to formulate a diagnosis. To do so, the user selects the most suitable question at each stage of the interview; the system informs him/her how accurate his/her choice is, and the VP responds to his/her questions. The user decides at each stage whether to continue asking questions or whether s/he has enough information to formulate a diagnostic hypothesis. If s/he selects the correct diagnosis at any given time during the interview, the system will only accept it if the VP has been fully examined.

Figure 1. Virtual patient selection

The performance in a final test of a group of students who received formative assessment and a group who did not was compared. A total of 42 students were included in the study. They were following core or optional courses as part of their bachelor's degree in Psychology (University of Barcelona) and in which skills in psychopathological explorations are part of the course.

The participants were randomly assigned to two groups: formative assessment group (21 students) and another group (control) without formative assessment (21 students). The experiences of the group that received formative assessment were explored in two interviews that took place at the end of the first month and two weeks before the end of

their course. The purpose of these interviews was to review the students´ degree of understanding of the assessment criteria of the simulated explorations and to what extent they believed they had achieved a positive performance based on these criteria. In the second interview students were reminded of their previous answers and were asked to comment on them. The results of the exercises on psychopathological exploration were used in the interviews to discuss with the students the concrete examples of their work.

The questions used in the interviews of formative assessment were based on Sadler´s model on formative assessment [1], which was later elaborated by Nicol & Macfarlane-Dick [2]. During these interviews, conversations held with the students were aimed to analyze their perception on the purpose and characteristics of a correct psychopathological exploration and the results they had attained so far in the exercises with the VPs. The conversations were stirred to try and guide the analysis towards the student's self-assessment on their performance and how they could improve the quality of their work in future exercises. In the second interview we sought in particular to focus the student´s attention on their progress since their first interview. During both interviews our aim was that the students should acquire awareness of their degree of understanding and internalizing the criteria that allow to assess the quality of a psychopathological exploration.

Table 1. Interviews of formative assessment

Areas of analysis	Questions
Which is the strategy applied?	Explain how you have prepared the exercises in psychopathological exploration that you have done until now (contents and other course materials consulted, questions asked to tutors, exchange of knowledge and information with other students, contents and materials related to the course but obtained from other sources-other subjects, internet databases etc.) What are the similarities and differences in the procedure you have followed to prepare the exercises for a psychopathological exploration compared to other students.
According to the student, what are the requirements for a correct psychopathological exploration?	In general, what should a correct psychopathological exploration be like? Can you give concrete but fictitious examples of a correctly carried out intervention during a psychopathological exploration? Can you give concrete but real examples taken from your own exercises of a correct intervention during a psychopathological exploration? Can you give concrete but fictitious examples of incorrect interventions during a psychopathological exploration? Can you give concrete but real examples taken from your own exercises of incorrect interventions during a psychopathological exploration? On what sources of information or experiences do you base your criteria concerning the correctness or incorrectness of the interventions that take place during the course of a psychopathological exploration?

How does the student interpret the feedback given by the tutor on the results of their exercises in psychopathological exploration?	What do you think the tutor is looking for with the way the exercises on psychopathological exploration assigned to you are laid out and you have completed so far?
	What is your opinion about the evaluative comments made by the tutor on exercises in the psychopathological exploration you have completed so far?
	How do you think you can improve your abilities in psychopathological exploration during the next exercises from the comments received by the tutor on the work you have done so far?
	(Second interview) In what aspects do you reckon that your abilities in psychopathological exploration have improved since the last interview until now taking into account the comments made by your tutor on your progress?
How does the student evaluate his own learning of abilities for a psychopathological exploration?	Independently from the reviews you have received from the tutors, how do you value your level of learning attained so far?
	On what do you base this evaluation of your learning process?
	What are the similarities and differences between the learning you have attained compared to other students?
How will the students´ personal evaluation of his performance so far, influence future strategies for learning?	From your experience with the exercises in psychopathological exploration and the results obtained so far, what aspects of the preparation and implementation of future exercises would you modify?

2. Results

To verify the efficacy of the formative assessment procedure, the final exam scores on the abilities for a psychopathological exploration were compared between the groups that carried out the exercises of training abilities in the exploration with formative assessment with the group that carried out the exercises without formative assessment (table 2).

Table 2. Scores on the test of abilities for a psychopathological exploration of bulimia nervosa

Group	N	Mean	Standard deviation
Formative assessment	21	9,16	,57
Control	21	8,21	1,01

As observed below, the group that received formative assessment achieved better scores in the final test of abilities for a psychopathological exploration of bulimia nervosa. The difference in means was statistically significant ($t = 3,76$; $p < 0.01$).

With the purpose of assessing the satisfaction of the students with the formative assessment procedure, the scores observed on the Likert scale (10 points) used to measure this variable in both groups were compared (table 3).

Table 3. Satisfaction with the tutorials

Group	N	Mean	Standard deviation
Formative assessment	21	8,81	,68
Control	21	7,66	1,19

Conclusions

The results obtained indicate that the training of skills in the exploration of psychopathological disorders such us bulimia nervosa can increase its effectiveness by including explicit discussions about the learning process. This therefore allows both students and professors to modify specific learning strategies based on these conversations and according to the procedures of formative assessment.

The cost of implementing these strategies is higher compared to carrying out activities that do not involve formative assessment. It would be interesting to analyze in future studies, not only the efficacy of such procedures, which seems to have been demonstrated, but also the efficiency. The aim could be to evaluate if the increase in cost of its implementation during teaching hours is compensated by the improvement in the learning process of the students.

Along these lines, the possibility of computerization of these procedures could be a very interesting alternative. If we can manage to incorporate some type of modules through which the system can automatically provide the student and the tutor the necessary information within the programs of virtual simulation of psychopathological explorations, allowing them to carry out formative assessment, the elevated cost of implementing such a procedure of evaluation compared to more traditional methods can cease being an obstacle.

Acknowledgments

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A Personal Health Information Toolkit for Health Intervention Research

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Abstract. With the emergence of mobile health (mHealth) apps, there is a growing demand for better tools for developing and evaluating mobile health interventions. Recently we developed the Personal Health Intervention Toolkit (PHIT), a software framework which eases app implementation and facilitates scientific evaluation. PHIT integrates self-report and physiological sensor instruments, evidence-based advisor logic, and self-help interventions such as meditation, health education, and cognitive behavior change. PHIT can be used to facilitate research, interventions for chronic diseases, risky behaviors, sleep, medication adherence, environmental monitoring, momentary data collection health screening, and clinical decision support. In a series of usability evaluations, participants reported an overall usability score of 4.5 on a 1-5 Likert scale and an 85 score on the System Usability Scale, indicating a high percentile rank of 95%.

Keywords. Mobile health, mHealth, eHealth, psychological health, personalized intervention, clinical decision support

Introduction

PHIT for Duty is a self-assessment and self-help mobile health app we are developing and evaluating for individuals with moderate psychological health problems, such as post-traumatic stress (PTS), anxiety, or insomnia [1]. PHIT for Duty comprises a variety of collection instruments, self-help activities, health information, feedback, cognitive behavior, and other modules to address health issues. Our experience has led us to realize that a more generalized and reusable approach for app development was needed, especially for projects with strong research and evaluation components.

As mobile devices become more prevalent, possibilities are growing for medical applications to gather and process data using these devices. Consumers are using mobile health applications to manage their own health and wellbeing; healthcare professionals are using them to improve patient care; and researchers are innovating new applications daily. Unfortunately, many research projects are typically "one and done" with little reuse between projects. Consequently, new health apps are developed from scratch which delays the evaluation research while increasing project risk and cost.

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To address these issues, we developed a personal health intervention tool (PHIT) platform to facilitate building PHIT for Duty and subsequent health intervention applications. The primary goals of the PHIT framework program were to:

>   Create a common platform from which many and varied mobile health intervention applications can be readily developed
>   Standardize how data collection instruments and interventions are implemented, fostering reuse from a common cross-study library
>   Hide the complexities of software development to reduce development time and enable researchers to focus on the research aims

In this paper we present an overview of the PHIT platform, its architecture, component elements, instruments and interventions libraries to date. We also present the PHIT for Duty app, and results of usability evaluations of the PHIT platform.

1. Methods

Personal Health Intervention Tool Platform

One of our goals is to create a common platform from which many health management and data gathering applications can be readily developed, and to experiment with alternative ways of configuring research Apps. The PHIT system accomplishes this, in part, by integrating different forms of data inputs ranging from survey style questionnaires to diaries to external physiological and environmental sensors.

PHIT integrates multimodal data collection with an intelligent virtual advisor (iVA) that analyzes real-time data to recommend, tailor, and present domain-specific activities based on established rules and scripted processes (Figure 1). PHIT facilitates building Apps with self-entry and autonomous sensor-based instruments. Objective data are acquired via cognitive tests, interactive exercises, serious games, and various Bluetooth sensors. All acquired data are stored an encrypted database, periodically uploaded to a secure server, and available analysis via a password-protected website.
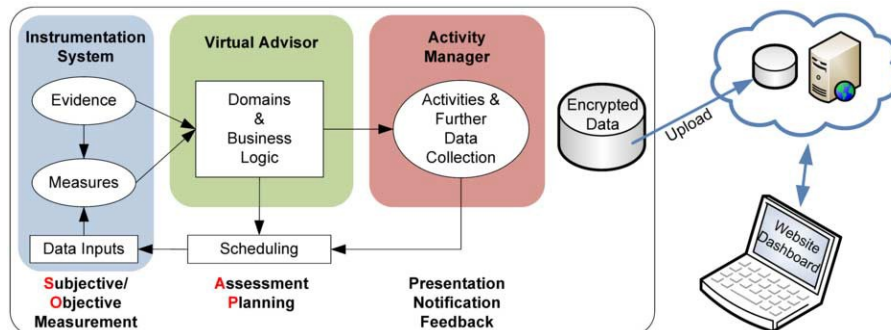
Figure 1. PHIT mobile health application framework architecture.

The PHIT platform is highly extensible, flexible and secure. Developing PHIT components such as instruments, activities, and iVA modules is straightforward yet the XML structures and scripting provide considerable power in customizing the content.

For example, as a health assessment (e.g., for anxiety) is completed, these data are immediately available to the iVA, which is able to determine how to proceed with the user. The iVA may choose to begin a self-help intervention (SHI) or contact a clinician for referral. User acti ns, like completing a sleep quality questionnaire, are managed via a user-friendly task menu screen. The task list is updated daily according to logic rules managed via the iVA. Periodic assessments of various domains are analyzed to instruct users and recommend activities tailored to the scope of the application.

The PHIT framework comprises a variety of subjective and objective data collection instruments, interactive self-help activities, health information, personal feedback, and other presentation modules. Instruments and activities are designed as a series of forms containing data collection and presentation "widgets" along with associated java-like scripting. User-programmed business logic can be executed on entry and exit of each instrument, and instrument form, for dynamic tailoring of user interactions according to changing health status.

A variety of widgets are available as presented in Figure 2, including:

> Data entry: text, number, time, date radio, checkbox, button/icon array
> Mobile: GPS, geolocation map, vibration accelerometer, battery
> Sensor: Bluetooth linked heart rate, Sony smart watch, Pebble smart watch
> Cognitive: reaction time, go/nogo choice reaction time
> Output: charts, waveform plots, formatted HTML
> Media: image, video, audio, slideshow, embedded browser, youTube

Figure 2. Examples of data collection and presentation widgets for instruments and interventions.

Using such forms and widgets, a variety of standardized data collection instruments and several health interventions have been developed (Table 1). These resources can be easily reused and tailored according to research study protocol requirements using XML-based scripts and configuration settings.

Table 1. Currently available health assessment instrument and self-help intervention resources.

Assessment Instruments	Health Interventions
Alcohol Use Disorder Identification Test (AUDIT)	Arousal Control
Brief Anger Assessment (BAA)	Arousal Control (meditation)
Brief Coping Scale (Brief Cope)	Attention Absorption
Brief Traumatic Brain Injury Scale (BTBIS)	Attention Absorption (meditation)
CAGE Questionnaire (CAGE	Combat & Operational Stress Control
Clinical Anger Scale (CAS)	Mindfulness-Based Stress Relaxation
Combat Exposure Scale (CES)	Relaxation Breathing
Concussion Checklist (CCL)	Mindful Body Scan
Connor-Davidson Resilience Scale (CD-RISC)	Sitting Meditation
Difficulties in Emotion Regulation Scale (DERS)	Walking Meditation
General Anxiety Disorder-7 (GAD-7)	Pain & Somatic Discomfort Mgmt.
Impact of Event Scale-Revised (IES-R) Insomnia	Pain & Somatic Disc. (meditation)
Severity Index (ISI), with nightmares	Alcohol and Stress
Multidimensional Scale of Perceived Social Support	Calories, Costs, and Consequences
Perceived Stress Scale-4 (PSS-4)	Drink Smarter Skills
Perceived Stress Scale-10 (PSS-10)	Blood Alcohol Level Simulator
Pittsburgh Sleep Quality Index (PSQI)	Improving your Sleep
Pittsburgh Sleep Quality Index Addendum (PSQIA)	Preparing for Sleep
Psychological Health Questionnaire (PHQ-8)	Personal and Environmental Factors
PTSD Checklist-Military (PCL-M)	Reclaiming your Bedroom
Short Screening for PTSD	Sleep Smarter Skills
User Demographics and History	Nightmares

2. PHIT for Duty Mobile Health App

PHIT for Duty is intended to be used for secondary prevention of psychological health problems in persons who have been exposed to psychological trauma and may be having some symptoms of distress. At baseline, personal, psychological, social and combat history data are collected (Figure 3). Then, health status is evaluated weekly in five domains (i.e., stress, anxiety, sleep quality, depression, and alcohol use), and these screening data are analyzed by the iVA.
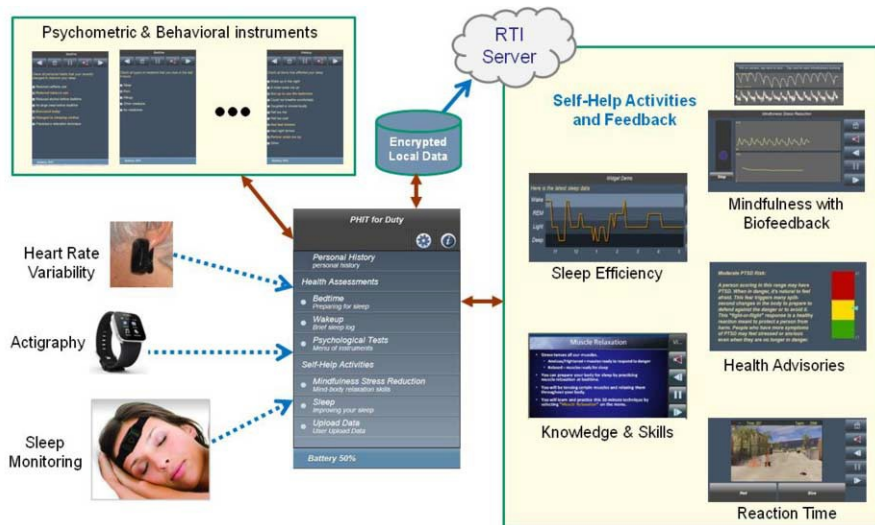
Figure 3. Representative use of the PHIT for Duty application.

Persons with high risk are advised to consult a professional. Persons with mild or moderate risk are presented with a suite of interventional, therapeutic, and monitoring activities, such as health management information (i.e., cognitive lessons), skills acquisitions (e.g., meditation, sleep hygiene, muscle relaxation), and self-monitoring (e.g., alcohol use diary). The "to-do" list of assessments and activities to be performed by the user is updated daily and displayed on the PHIT for Duty task list screen.

3. Results

Usability was evaluated in 31 male and female participants, aged 18 to 41 years, after completing informed consent in at-home studies ranging from 7-14 days. These studies were designed to engage participants in various aspects of PHIT for Duty assessment instruments, interventions, and devices. Self-report assessments and diaries were tested using a mix of sham and actual data including daily bedtime and wakeup sleep diary entries, mindfulness-based stress reduction training with heart rate variability biofeedback, simple reaction time testing, and additional activities. Some participants also tested the ear pulse sensor (N=23), Zeo sleep monitor (N=27), and wrist actigraphy (N=27) (Table 2).

Table 2. Integrated usability results (Range of 1 to 5 (very hard to very easy)

PHIT subsystem	Mean ± SD	N
Overall system	4.5 ± 0.6	31
Self-report instruments	4.5 ± 0.7	31
Ear pulse sensor	3.7 ± 1.2	23
Zeo sleep monitor	4.4 ± 0.7	27

The System Usability Scale (SUS) was used to quantify usability of the PHIT for Duty system in 9 of the above participants. The average SUS score reported by these nine participants was 85±12 (mean±sd). The percentile rank for this average score is 95%, meaning that the usability of the near-final PHIT for Duty system exceeds 95% of all products tested using the System Usability Scale.

Conclusions

The PHIT platform facilitates designing instruments, user displays, task scheduling and data storage, so researchers can create a mobile application in much shorter time than development from scratch. Researchers can focus on the protocol, instruments, and interventions without having to worry about how the application is constructed, thereby implementing and evaluating mobile health interventions in less time and lower effort.

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Cognitive Assessment of OCD Patients: NeuroVR vs Neuropsychological Test

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Abstract. This study aimed to evaluate the reliability and validity of the Neuro-Virtual Reality as tool for the neuropsychological assessment in OCD patients. We used the neuropsychological battery and a virtual version of the Multiple Errand Test (V-MET), developed using the NeuroVR software, in order to evaluate the executive functions, the ability to plan ahead on complex problem solving tasks in daily life in 30 obsessive compulsive disorder (OCD) patients and 30 healthy controls. The results showed the presence of difficulties of OCD patients: lower levels of divided attention and higher levels of errors; higher mean rank of inefficiencies, interpretation failures and rule breaks and longer time of execution of the whole task. By contrast, controls have higher level of efficiency and better performance. In addition, a significant correlation was found between the V-MET and the neuropsychological battery which confirms and supports the ecological validity of neurocognitive assessment through NeuroVirtual Reality.

Keywords. Obsessive-compulsive disorder, virtual multiple errands test, executive functions, neuropsychological assessment

Introduction

Obsessive–Compulsive Disorder (OCD) is a debilitating mental disorder characterized by recurrent, intrusive and unwanted thoughts, impulses and images that cause an increased amount of anxiety and often associated with compulsive behaviors that are repetitive, time consuming and often ritualized. Globally, neuropsychological findings are consistent with the frontostriatal etiologic hypothesis of OCD and include impairments in a variety of domains: neurocognitive deficit and executive dysfunction appears to be representative of the perseverative and repetitive behavior [1, 2]. Specifically, patients with obsessive compulsive disorder are characterized by the impairment of several skills such as attention, planning, problem-solving and behavioral control [3]. Further, OCD is often associated with impairments of visuospatial skills [4], and of memory functioning, including visual, verbal, and numerical [5]. However, the neurocognitive assessment under typical clinical laboratory condition are unsatisfactory because it presents trials independent from any activities of daily living, and for this reason lacking in ecological validity [6]. By

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contrast, the present study is aimed at evaluating the reliability and validity of the Virtual Reality as tool (able of providing an ecologically valid context) for the neuropsychological assessment in OCD patients.

For this purpose, we used neuropsychological battery and a virtual version of the Multiple Errand Test (V-MET) [2, 7, 8], developed using the NeuroVR software 2.0 [9], in order to evaluate the executive functions and the ability to plan ahead on complex problem solving tasks in daily life, in OCD patients and in healthy controls. Several studies shows that Virtual Multiple Errand Test can offer new possibilities for the assessment of executive functions providing an additional support to the traditional paper and pencil tasks [7, 8, 10, 11].

A supermarket was chosen as the virtual environment, performed in a shopping setting where there are items to be bought and information to be obtained. After the tasks and the rules have been explained, patients are able to plan and choose the sequence of actions to complete the tasks. In this way, the stimulated executive functions are numerous, from the ability to plan a sequence of actions, to problem solving and to cognitive and behavioral flexibility.

1. Methods

1.2 Participants

A total of 60 participants were included in the study: 30 patients suffering from Obsessive Compulsive Disorder diagnosed by DSM IV (M=15, F=15; mean age=33,07 years, std.dev.= 9,906) and 30 healthy controls (M=16, F=14; mean age=34,00 years, std.dev.=10,841) (table 1). Patients were selected from the Outpatient Unit of Psychiatry of Palermo University Hospital.

Table 1 Population characteristics

	Experimental group	**Control group**
	n = 30	*n* = 30
Age (Mean ± SD)	33,07 ± 9,906	34,00 ± 10,841
(range)	18 - 54	20 - 57
Gender (M, F)	15, 15	16, 14

The exclusion criteria for the clinical group were: severely impaired mental status according to neuropsychological assessment; motor impairment which does not allow subject to perform the virtual procedure; presence of severe difficulties in visual discrimination skills and language comprehension; psychiatric comorbidity. The control group consisted of healthy subjects without motor and cognitive impairments.

1.3 Instruments and Procedure

There were two methods of assessing cognitive functions: 1) using a validated neuropsychological battery and 2) using of the Virtual Multiple Errands Test (V-MET).

The neuropsychological battery including: Frontal Assessment Battery (FAB), Trail Making Test (TMT, Forms A, B and B-A), Phonemic and Semantic Fluency, Tower of London (ToL) and Memory Battery (Digit span, Corsi's memory span and supra-span, Short Story recall and word recall tests). Scores were corrected for age, education level and gender where appropriate.

After a neuropsychological evaluation, we used the Virtual Multiple Errands Test (V-MET) both in cases and in controls. In this version, after a training session in a smaller version of the virtual supermarket environment, the subjects were requested to select and to buy various products presented on shelves with the aid of a joy-pad. The products were in categories including food, hygienic products, frozen food, and on-sale products. Furthermore, while doing his shopping, the participant had to follow specific rules, i.e. not to go in the same aisle more than once, not to enter in any aisle unless the participant needs to collect something in it, do not speak to the person observing you unless this is part of the exercise.

While completing the Multiple Errands Test procedure, the time of execution, total errors, partial tasks failures, inefficiencies, rule breaks, strategies and interpretation failures were measured [7, 8].

1.4 Statistical Analyses

At baseline, groups were similar in terms of gender, age and education level.
One-way analyses of variance (ANOVAs) were used to compare patients and controls performance. Pearson Correlation was used to compare neuropsychological and VR tests.

2.   Results

Neuropsychological assessment showed intact cognitive levels in OCD patients and in controls. However, the clinical sample compared to controls show a performance significantly lower, with the exception of memory trials (Short Story recall and word recall tests).

After virtual reality assessment, the ANOVAs revealed a clear presence of difficulties of OCD patients. These seem to reflect deficits in the attention function. Particularly, OCD patients showed: lower level of divided attention (F=13,531, p=0,001); higher levels of errors (F=20,894, p=0,000), higher levels of partial errors for the sub-tests 6 (buying two products from the refrigerated products aisle), (F=13,417, p=0,001) and partial errors 7 (going to the beverage aisle and asking about what to buy, (F=13,373, p=0,001), which require a change in the primary task and the ability to respond simultaneously to multiple task demands; higher mean rank of inefficiencies (F=6,407, p=0,014), interpretation failures (F=5,654, p=0,021), self correction (F=13,718, p=0,000), and longer time of execution of the whole task (F=4,069, p=0,048).

It could suggest that OCD patients tend to engage in a more extensive planning activity. By contrast, controls have higher level of divided attention and self correction, fewer interpretation failures and higher level of efficiency, so their performance is better than patient's performance.

With regard to clinical sample, *correlations* between neuropsychological tests and the variables of the virtual test are shown in Table 2.

Table 2. Pearson Correlation between neuropsychological test and VMET tests

†. Correlation is significant at the 0.01 level (2-tailed).*. Correlation is significant at the 0.05 level (2-tailed)

	FAB		ToL		TMT A		TMT B		TMT B-A	
	r	p	r	p	r	p	r	p	r	p
Errors	-,497†	,000	-,416†	,003						
Partial errors 6	-,351*	,014	-,461†	,001	,434†	,002	,435†	,002	,389†	,006
Partial errors 7	-,593†	,000	-,512†	,000	,500†	,000	,468†	,001	,403†	,004
Inefficiencies	,437†	,002	,505†	,000	-,406†	,004	-,301*	,036		
Sustained attention	-,340*	,017			,406†	,004	,472†	,001	,438†	,002
Divided attention	-,402†	,004	-,619†	,000	,437†	,002	,448†	,001	,400†	,004
No perseveration	-,531†	,000			,358*	,011	,342*	,016	,299*	,037
Self correction	-,568†	,000	-,404†	,004	,361*	,011	,360*	,011	,316*	,027

	Corsi's memory span		Short Story		Corsi's supra-span		Semantic Fluency	
	r	p	r	p	r	p	r	p
Errors	-,282*	,050	-,342*	,016	-,540†	,000	-,463†	,001
Partial errors 6			-,392†	,005	-,543†	,000	-,352*	,013
Partial errors 7	-,286*	,046	-,331*	,020	-,464†	,001	-,346*	,015
Inefficiencies			,469†	,001	,442†	,001		
Time	-,310*	,030	-'302*	,035				
Sustained attention			-,386†	,006	-,291*	,043		
Divided attention	-,334*	,019	-,369†	,009	-,566†	,000	-,377†	,008
No perseveration	-,314*	,028	-,309*	,031	-,427†	,002		
Self correction	-,329*	,021	,341*	,017	-,561†	-000	-,421†	,003

Our results show V-MET data, about total errors, partial errors (sub test 6 and 7), inefficiencies, time of execution, sustained attention and divided attention, self correction, absence of perseveration, correlate with results of the neuropsychological battery.

Therefore, patients who showed a high test score FAB are also able to recognize their mistakes and to correct itself by changing their behavior and their strategies according to the objective to be achieved.

In addition, individuals who possess good planning skills (TOL) and memory ability put in place a more strategic behavior (i.e. using a map of the supermarket, check the instructions, using the reference points for orientation, etc.), recording consequently minor inefficiencies.

Conclusions

Results of the analyses carried out within the present study confirm previous data about OCD cognitive impairment and about ecological validity of V-MET as an instrument for the evaluation of executive functions in patients with OCD.

In particular, procedure was able to detect the cognitive difficulties that are typical of Obsessive Compulsive Disorder and specifically the deficits in planning, which is the strategy that allows the correct execution of the task, in problem solving, in divided attention and in mental flexibility. Furthermore, our study proved the presence of impaired strategic behaviour and set shifting abilities in these types of patients, when compared with matched healthy subjects.

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A (Cyber)place For Wellbeing: Managing Interactions in eHealth

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Abstract. Yukendu is a personal mobile coaching service that supports people in reaching good levels of psychological and physical wellbeing through the use of an app and a relationship with a health coach. Presenting Yukendu's app functioning, this paper aims not only to show that by means of web 2.0 tools is possible to manage in a functional way effective eHealth coaching interactions, but also that relationships between a coach and a coachee managed in such a way give birth to what we could call a 'cyber-wellbeing-place'.

Keywords. Cyberplace, eHealth, interactions, app

Introduction

Research shows that lifestyle changes are difficult to achieve and that diet programs only help slow down weight gain [1]. Health-coaching programs are the only technique proved to support and result in positive health behaviors [2]. Yukendu is a personal mobile coaching service launched recently on the market which successfully integrates wireless and wearable technologies with a health coaching service. The results of the analyses show that through the app environment it is possible to manage eHealth coaching interactions effectively and create what we could call a 'cyber-wellbeing-place'.

1. Health Coaching

Coaching is a result-oriented functional equal partnership between coach and coachee. Coachees have an active role in reaching the objectives they set for themselves together with their coaches. It's a relationship focused on setting plans of action to reach a personal change. Self-actualization, growth and change are driven by insight, which is gained as a result of reflections and conversations with the coach. The coaching process is based on the coachees' motivation to change and ability to set reachable goals, decision making, and willingness to pursue an encompassing wellbeing. In this process,

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the coaches must have good communication skills, ability to ask the coachees questions aimed to raise their self-awareness and ability to independently develop solutions to their problems, active and empathetic listening, ability to give constructive feedbacks and to motivate the coachees.

2. Yukendu

Yukendu is a wellness service, targeting healthy individuals who desire to change their lifestyles, control their weight and feel better and more energetic. Yukendu offers to its clients a health pack comprising a mobile app to monitor and track progress, which also is a gateway to other devices (scale, etc.), a non-prescriptive dietary plan, a home fitness plan and a set of telephone and chat based coaching session to be managed and carried out via app. Coaching sessions support the clients in achieving their health objectives and in developing strategies to solve their problems and to use the tools Yukendu offers in an effective way. A more detailed description is available in [3].

3. Mediated Interactions: Cyberspace and Cyberplace

The term 'cyberspace' refers to all the technological aspects (i.e. software and hardware components, HCI factors) of a Virtual Environments. While being a cyberspace is condition sine qua non for interaction, not all cyberspace can become 'cyberplaces', that is, environments where actors can construct shared meanings and make sense of their virtual experience [4,5,6]. Shared meanings and mutual intelligibility are based on three dimensions:

> Organization-functional dimension: actors recognize their own and the other's position in the context they are acting in and their subjectivity (intended as identity enacted in interaction) and intersubjectivity;
> Pragmatic-normative dimension: actors agree how to interact within the setting and how to manage their relationship;
> Symbolic-cultural dimension: actors negotiate the meanings connected to the objects that makes their relationship possible, and are present in the context and within their relationship.

When all the requirements above are met, then actors can safely establish a common ground for interaction and a cyberspace can become a cyberplace.

4. Research Questions

While it is evident that Yukendu can be considered a cyberspace because it is app based, whether it can also be considered a cyberplace is the object of this contribution. Therefore the research questions are

1. Are the previous dimensions present in Yukendu coach-coachee interactions? and
2. How are the three dimensions managed within the interaction between coach and coachee?

5. Methodology

Two researchers independently listened to 30 Yukendu-based coaching sessions, for a total of 60 conversations (20 minutes for conversations; 4 coaches with 6-7 coachee each). 20 conversations from 4 coachees were transcribed and recurrent phenomena were identified through a Content Analysis [7]. Through Conversation Analysis [2] it was possible to zoom into micro-mechanisms governing the three requirements for mutual intelligibility communicative that are present in parts of these conversations.

6. Results

6.1. Research Question 1: Dimensions of Mutual Intelligibility

The three dimensions seem to be present and respected through all the conversations in different degrees. Specifically:

> Organization-functional dimension: coach and coachee recognize and validate each others' role in the relationship, which is not a helping relationship but an empowering one;
> Pragmatic-normative dimension: coach and coachee within the first sessions decide how to communicate with each other (call or text), when it is fitting to use one medium or the other, and the scheduling of the sessions.
> Symbolic-cultural dimension: coach and coachee both have different knowledge and previous experience with diets and coaching, and have to create a new common ground based on shared meanings on these topics.

6.2. Research Question 2: Management of Mutual Intelligibility

The second research question focuses on how coach and coachee interactively create and manage the three requirements for mutual intelligibility. The three dimensions are managed through conversational mechanisms aimed to avoid unwanted inferences, that is, "something that could be inferred from what is said, but which the speaker does not wish to commit to, or be held accountable for" [8].

The organization-functional dimension does not pose any problem, because coach and coachee share a common culture (all adults, from northern Italy, with a middle-high education level, familiar with mobile technology) from the very beginning of their relationship. The relationship coach/coachee is already coded since the coachees are aware that they are buying a coaching service as Yukendu is marketed as such. The following citation exemplifies the disambiguation of the coach's role and its leaning to the coachee's needs, which is accepted by the coachee, who validates and recognizes the coach's subjectivity with their enthusiasm:

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[2] In this contribution technical features required by Conversation Analysis are not reported and only the relative examples and their pragmatic impact are documented. At the same time, the conversational sequences were not transcribed using the conventional transcription system for Conversation Analysis to facilitate reading. All sequences are from the same coaching session.

Sequence 1

Coach1: "...and I'd like to explain my role a little better... I am your coach, if you like, for all the length of the program, you'll be able to talk to me, so you can text me or you can video-call me as we are doing now or we can use a normal telephone call. Communication medium aside, I'm the person that will be along for your path to change, as we called it.
Coachee1: Ok, that's great
Coach2: I'll give you a push when you need a push, I'll support you when you feel you need support, and everything you feel you need and I don't get on my own, please let me know and I'll do my best for sure, ok?
Coachee2: Great! Great!

Instead the pragmatic-normative dimension concerns the conversational aspects, and in particular the coach and coachee's pragmaliguistic abilities: they both have to be aware that what they say has consequences on their relationship, both in terms of co-creation of meanings and behaviors.

Unwanted inferences in the symbolic-cultural dimension affect cultural competences and semiotic cues. For the first aspect, coach and coachee set rules about courtesy (i.e. to be on first name basis or use the polite form). Semiotic cues instead indicate a common reference (or lack of thereof) to personal narratives, documents and artifacts, i.e. familiarity with the app functions.

Sequence 2

Coach1: when you start to follow the program, it's important that you tell me how you feel, for the first 15 days, I am going to ask you to weight yourself every day, to send me a text with your weight and fill in the indicator if you are feeling hungry...
(...)
Coachee1: but I gotta tell you if I am feeling hungry every time... I mean, I have to use this indicator, when? I have to tell you how I feel when I weight myself in the morning?
(...)
Coach2: Ok, great! So, now, what I would like you to do as soon as you get the scale, is to get in touch with me, so I can give you the dietary plan, and we can start with our adventure!
Coachee2: Perfect and...I have a question: I message you, right? I mean, I tell you when I get the scale, but do I use Skype or I text you?
Coach3: No, when you get the scale you schedule an appointment as you did for today
Coachee3: Ah!
Coach4: Look, it's ok. As for now, I really liked getting in touch with you and I am happy to have met you... I don't do empty compliments, I got a fantastic first impression!
(...)
Coachee4: Perfect, as soon as I get the scale, I'll schedule an appointment!
Coach5: Very well, can't wait!
Coachee5: Me too!

In this example, the coach gives indications on times and action the coachee has to partake; the coachee validates the coach's speech act by using the exact same words in their own speech acts (i.e. 'indicator') and ratifying the coach's utterance. The last speech acts (4 and 5) contain elements linked to contents and actions.

There is full intelligibility between coach and coachee as a result of a good balance between a negotiation of both content ('indicator') and interaction management (scheduling the appointment; reciprocal courtesy). Coach and coachee demonstrate a good level of cooperative work in avoiding unwanted inferences at pragmatic-normative level, and this contributes strongly to a co-joint construction of intersubjectivity.

Conclusions

The aim of this contribution was to ascertain whether Yukendu could be defined as a cyberplace. The analysis of micro-processes revealed full fulfillment of mutual intelligibility (communicative level) and intersubjectivity (interactional and relational levels) requirements and allows to assert that the psychosocial context created within the coach-coachee interaction in the Yukendu environment presents all the features essential to define the environment itself as a cyberplace aimed to health promotion, or a cyber-wellbeing-place. Mutual intelligibility and intersubjectivity as a result of a correct management of inferential mechanisms and consequentially, of the conversational processes, are indeed guarantee of the cyberplace-like nature of Yukendu.

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Simulated Job Interview Improves Skills for Adults with Serious Mental Illnesses

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Abstract. Adults with serious mental illnesses (e.g., Autism Spectrum Disorder [ASD], schizophrenia, post-traumatic stress disorder [PTSD]) often have difficulties obtaining employment. The *Job Interview Training System with Molly Porter,* developed in collaboration with Yale and Northwestern Universities and vocational rehabilitation specialists with funding from The National Institutes of Health (R43/44MH080496), allows learners to practice job interviews on computers in a stress free environment. The system includes user-driven educational materials, an interactive job application, a practice simulation with a fictional interviewer (*Molly Porter*), and extensive feedback. SIMmersion's PeopleSIM™ technology allows each conversation with *Molly* to provide a unique interview experience, enabling users to gain confidence while building skills. The on-screen coach provides insight during the conversation, and a comprehensive after-action review provides learners with feedback on the entire interview. In a randomized control trial, the system was proven effective at improving participants' interview skills and confidence. Ninety-six (96) unemployed adults with ASD (n=26), schizophrenia/other (n=37) or PTSD (n=33) were recruited. Participants were randomized into control (n=32) and experimental (n=64) conditions. The control group was "wait-listed" to receive training, and the experimental group used the training system with *Molly Porter*. Both groups completed pre- and post-intervention role-play interviews and self-assessment questionnaires. Analyses of covariance showed that the simulation provided a highly significant training effect, with experimental group participants scoring better in the role-play interviews and self-assessing higher than control group participants. By increasing skills and confidence, this system may ultimately reduce the length of unemployment for adults with mental illnesses.

Keywords. Simulation, Virtual Reality Training, Job Interview, Serious Mental Illness, Disabilities

Introduction

Obtaining and maintaining employment has been proven to improve quality of life among adults with serious mental illnesses (e.g., Autism Spectrum Disorder [ASD], schizophrenia, post-traumatic stress disorder [PTSD])[1], more than two-thirds of whom want to work. Yet these individuals often have difficulties obtaining and maintaining employment. Supported employment (SE), which typically includes job coaching, technical assistance, accommodating work settings, clinician-facilitated role-plays, and

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other psychosocial supports, is the gold standard for vocational interventions[2]. However, access to these programs is limited, and only 30% of participants reported that practicing job interviews in SE was helpful[3].

To overcome these limitations, researchers developed a virtual-reality role-play utilizing PeopleSim™ technology. The computer-based *Job Interview Training with Molly Porter* program merges evidence-based principles for both effective job interviewing[4] and effective simulation training[5]. Learners have the ability to repeatedly practice conveying their individual experiences, job-relevant knowledge, and social effectiveness to a simulated human resource manager while receiving in-the-moment feedback. The customizable training package creates an immersive, realistic, and stress-free environment that allows learners to make and address errors across a spectrum of skills and strategies.

1. Job Interview Training with Molly Porter

Job Interview Training with Molly Porter was designed to teach, reinforce, and refresh job-interview skills to adults with mental illness who are actively seeking employment. The system incorporates user-driven educational materials, an interactive role-play simulation, and formative feedback to create a training experience consistent with high-fidelity simulations[5], successful job interviews[4], and adult learning theory.

The educational component includes approximately five hours of training materials designed to help learners prepare for interviews and complete the other steps necessary to find a job. Some of the topics covered include creating a resume, researching a position, selecting a job that meets individualized needs, deciding what to wear to an interview, selecting appropriate questions to ask, deciding whether or not to disclose a disability, and taking appropriate follow-up steps. The system also includes an interactive job application that allows learners to practice completing an on-line application. These didactic materials adhere to the sixth grade reading level and are arranged in an easy-to-navigate, user-friendly interface. The straightforward presentation allows learners to customize the experience to their individual needs by allowing them to find and access the materials they want, when they want them.

The interactive role-play simulation with *Molly Porter* includes 10+ hours of practice and was designed to provide a different experience each time it is used. SIMmersion's patented PeopleSim™ technology combines video, voice recognition software, and non-branching logic to create an interactive environment that allows users to experience complex social cues and realistic interpersonal exchanges, build skills, clarify concepts, and increase retention. *Molly* personalizes the training experience for each individual learner based on their answers to the job application questions about preferred job (i.e., cashier, stock clerk, customer service, maintenance/grounds, janitorial, food service, inventory, or security); education, employment history, and job-related skills; and optional questions about disabilities (e.g., spinal cord injury, visible disability, hidden disability), history of mental illness, military history, past substance abuse, and criminal history.

Molly has a database of more than 1000 video-recorded questions that range from general inquiries (e.g., "Tell me about yourself?") to specifics about personal history (e.g., I noticed on your application that there are gaps in your work history. Can you tell me about that?) and job duties (e.g., This position will require you to work closely with other associates. Do you enjoy working as part of a team?). The non-branching

logic of PeopleSim creates dynamic links between *Molly's* questions and the 2000 available learner responses, allowing learners to try new approaches to answering questions during each interview. *Molly's* simulated brain includes memory and a wide range of realistic emotions and personality that allow her to further tailor the interview to each trainee. For example, if someone applies for a customer service position and responds that he prefers to work independently, *Molly* may say, "That job requires that you work closely with others. Are you still interested in it or would you prefer something else?" The combination of learner options and *Molly's* realistic demeanor ensures that trainees experience a new interview each time they talk with her.

The script includes a wide variety of natural choices, so learners have multiple opportunities to provide both appropriate and inappropriate responses during the simulated interview. Because of the variety of responses available to the user at any time, there is no one "right" or "wrong" choice at any point in the conversation. This allows users to move beyond judgment training (i.e., Which of the statements is best?) to learn conversational skills (i.e., What should I say next?).

Every learner response dynamically affects *Molly's* confidence that the learner is the right person for the job, just like in real life. *Molly* may patiently ask for additional information to clarify a vague response given early in the interview but will not be as forgiving when similar mistakes are made later. Throughout the conversation, learners receive real-time support and feedback from an on-screen coach who provides nonverbal cues regarding the learners' responses. If the learner wants more information, "help" buttons prompt the coach to explain the gesture or provide insights into the kind of response *Molly* is hoping to receive. Upon the conclusion of each interview, learners receive qualitative and quantitative feedback that evaluates how well they performed each of the learning objectives.

Images of *Molly* and access to the virtual role-play can be found at http://www.jobinterviewtraining.net.

2. Evaluating Efficacy

To evaluate the efficacy of *Job Interview Training with Molly Porter*, researchers conducted a randomized control trial with three distinct groups of participants: community dwelling adults with autistic spectrum disorders (ASD; n = 26), community dwelling individuals with schizophrenia and other serious mental illnesses (Schizophrenia/other; n = 37), and Veterans diagnosed with PTSD who received outpatient care at Hines VA in Chicago (n = 33). At recruitment, all participants were unemployed but searching, or planning to search, for work. Participants from each group were randomized to a Wait-list Control (WLC) group or *Job Interview Training with Molly Porter* Intervention (Molly) group at a ratio of 1:2. Researchers hypothesized that participants in the Molly group would demonstrate improvements in job interview role-play skills and self-confidence about job interview skills compared with participants in the WLC group. Additionally, they hypothesized that the Molly intervention sessions would be rated as easy to use, enjoyable, and helpful.

2.1. Methods

Baseline assessments were conducted for all participants including 1) demographic and vocational interviews, 2) neurocognitive and social cognitive assessments, 3)

standardized interview role-plays, and (4) a self-report of self-confidence. Vocational data included prior participation in vocational training programs and amount of time (in months) since any prior employment was held. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) was administered to assess neurocognitive functioning, and the Bell-Lysaker Emotion Recognition Task (BLERT) was used to assess basic social cognition. There were no significant differences between conditions for any of the three groups.

Table 1. Characteristics of the Study Sample

	ASD		Schizophrenia/other		PTSD	
	WLC (SD) (n=10)	**Molly** (SD) (n=16)	**WLC** (SD) (n=12)	**Molly** (SD) (n=25)	**WLC** (SD) (n=10)	**Molly** (SD) (n=23)
Demographics						
Mean Age	23.2 (3.0)	24.9 (6.7)	44.3 (10.3)	50.0 (11.6)	50.8 (10.4)	51.2 (11.5)
Gender (% male)	80%	75%	16.7%	64.0%	100%	95.7%
Vocational History						
Prior Voc. Training	20%	43.8%	25.0%	32.0%	50%	43.5%
Months since employ	26.5 (24.9)	32.7 (22.2)	47.2 (60.5)	42.1 (43.4)	38.7 (62.5)	41.3 (55.9)
Cognitive function						
Neurocognition, mean	89.0 (19.2)	89.8 (21.4)	91.3 (15.4)	95.2 (19.9)	90.7 (4.9)	88.9 (12.7)
Social Cognition, mean	.81 (.11)	.72 (.17)	.75 (.13)	.70 (.16)	.63 (.14)	.66 (.12)

Interview role-plays were conducted by trained actors with experience working as interviewers. Each 20-minute interview was scored by trained raters (ICC = 0.85) on nine skills that contribute to successful job interviews[4]: 1) conveying dependability, 2) sounding easy to work with, 3) conveying professionalism, 4) negotiating for individual needs, 5) sharing in a positive way, 6) sounding honest, 7) demonstrating interest in the job, 8) displaying comfort, and 9) establishing overall rapport with the interviewer. Both actors and raters were blind to condition. Participants rated their self-confidence about interviews using a 7-point Likert scale (higher scores reflect more positive opinions) to answer nine questions about comfort and skills.

Following the baseline assessments, the WLC group received no additional training beyond their previously scheduled vocational services. The Molly group was asked to complete 10 hours of training with *Job Interview Training with Molly Porter* (approximately 20 trials) over the course of 5 visits. Both groups returned after the two-week intervention period to complete the follow-up self-confidence measure and two additional standardized role-plays.

2.2. Results

An analysis of covariance (ANCOVA) was performed with post-intervention role-play scores as the dependent variable, treatment condition and diagnostic group as fixed factors, and pre-intervention role-play scores as the covariate. This analysis showed a highly significant treatment condition effect for the Molly group ($F_{1,86}$ = 8.3, p < .005). A second ANCOVA was performed with the post-intervention self-confidence measure as the dependent variable, treatment condition and diagnostic group as fixed factors, and pre-intervention self-confidence measure as the covariate. This analysis also showed a highly significant training effect ($F_{1,86}$ = 12.18, p < .001).

59 out of 63 participants (94%) assigned to the Molly groups completed 3 or more hours of training. All were asked complete the Treatment Experience Questionnaire

(TEQ) and rate characteristics of *Job Interview Training with Molly Porter.* Using a 7-point Likert scale (7 being the most positive), participants scored the system 5 or above (mean) on all characteristics, with the majority receiving mean scores above 6.

Table 2. Mean Score on Training Experience Questionnaire (TEQ), mean (SD)

	ASD (n=16)	Schizophrenia/other (n=25)	PTSD (n=23)
Ease of use	5.8 (1.2)	6.1 (0.9)	5.8 (1.0)
Enjoyable	5.1 (1.6)	6.4 (1.0)	6.5 (0.7)
Helpful	5.4 (1.6)	6.3 (1.1)	6.8 (0.4)
Instilled confidence	5.4 (1.7)	6.0 (1.2)	6.8 (0.4)
Prepared for interviews	5.8 (1.4)	6.0 (1.0)	6.5 (0.6)

3. Conclusions and On-going Research

Job Interview Training with Molly Porter showed a moderate to large effect on improving job interview skills in live role-play interviews and increasing self-perceptions of confidence, comfort, and readiness for job interviews. Differences by diagnostic group were not significant, suggesting that this intervention, like other skills training interventions, may be beneficial to a wide range of disorders. Additionally, the product's integrated customization options allow it to be used by a general audience.

Follow-up research is being conducted to determine if the increase in skill and confidence demonstrated by participants in the Molly group leads to higher employment rates compared to participants in the WLC group. Preliminary reports from 27 participants contacted 20 weeks post-intervention indicate that of the 16 randomly assigned to the Molly group, 9 (56.3%) had obtained work; while only 3 of the 11 (27.2%) assigned to the WLC had obtained work. 15 of the 16 Molly participants strongly agreed that, looking back, the interview training was helpful, and 13 agreed or strongly agreed that it gave them more confidence in the real job interviews. Researchers anticipate that the larger sample of post-intervention data will follow the same trends as these preliminary reports demonstrating that by increasing job interview skills and confidence, this system may ultimately reduce the length of unemployment for adults with mental illnesses.

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Controlling a Stream of Paranoia Evoking Events in a Virtual Reality Environment

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Abstract. Although virtual reality exposure has been reported as a method to induce paranoid thought, little is known about mechanisms to control specific virtual stressors. This paper reports on a study that examines the effect of controlling the stream of potential paranoia evoking events in a virtual restaurant world. A 2-by-2 experiment with a non-clinical group ($n = 24$) was conducted with as two within-subject factors: (1) the cycle time (short/long) for when the computer considers activation of a paranoia evoking event and (2) the probability that a paranoia-evoking event (low/high) would be triggered at the completion of a cycle. The results showed a significant main effect for the probability factor and two-way interaction effect with the cycle time factor on the number of paranoid comments participants made and their self-reported anxiety.

Keywords. Paranoia, virtual reality, stressors, exposure

Introduction

Several studies [2, 10] report that exposure in virtual reality (VR) can elicit paranoid thought. Paranoia is a continuous phenomenon and has been studied also in a non-clinical population, which shows similar yet smaller effects than found in a clinical population [10]. This paper explores the idea of exposing individuals in a virtual environment (VE) to a random set of independent events. In a state of paranoia, characterized by hypervigilance, emotional arousal and selective attention for threat, people's interpretation and sense making process might combine these events and result into paranoid thought. Controlling the stream of these events, would potentially give therapists the ability to dynamically control paranoia evoking stimuli in the VE and therefore offer the ability of controlled gradual exposure. The hypothesis was therefore that the stream of paranoia evoking events affects paranoid thought.

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1. Method

1.1. Virtual World Characteristics

A virtual restaurant world was selected as a suitable social environment for prolonged exposure where an individual could sit for a relatively long time while observing several virtual humans engaged in social interactions. Given this setting, the following stressors were selected that would fit naturally within this social setting: the eye gaze of other virtual restaurant visitors directed towards the individual, their facial expression, snatches of their conversation or laughter, people passing by, people passing by who stop to look around, and flash news messages on a TV screen. To control all these events, an event-stream manager [4] was developed that allows operators to set the probability for each of these events. In addition, operators could set the ratio from 0 to 100 for three mutually exclusive events: (1) conversation or laughter, (2) angry or happy facial expressions, and (3) the walking characters looking at the individual or looking at other virtual characters. The event-stream manager cyclically considered whether to trigger these events or not. As events in the natural world occur at a different pace, the event-stream manager used three timers to control the cycles to consider triggering specific behaviors of (1) sitting characters, (2) the walking characters, and (3) the TV news flashes. With a single slider, the operator could set the cycle time for these timers to go off and force the manager to consider whether or not to trigger an event based on the probability set by the operator for that event. For this, the manager would take a random number between 0 and 1. If this number was lower than the probability set by the operator, the paranoia-evoking event in the virtual restaurant would be triggered. A list of 52 dialogue snatches were pre-recorded and 27 news flash texts were made. Both lists were rated by 3 patients in treatment for first episode psychosis and 7 therapists, resulting in 37 snatches rated as paranoia provoking and 15 rated as more neutral snatches. For news flashes, 14 were rated as paranoia provoking and 13 were rated as more neutral. The neutral snatches and news flashes were used as neutral events when the randomizer did not select a paranoia-evoking event if a timer went off.

1.2. Materials and Measurements

To immerse the participants into the VE, the participants wore a Sony HMZ-T2 Personal 3D Viewer Head Mounted Display (HMD). To track the participants' view position and orientation, the Razor tracker with 3 Degrees of Freedom was used. As individuals with paranoid thoughts may also experience arousal and anxiety, the Mobi8 data recorder with Xpod Oximeter from TMSi was used to measure the participants' heart rate and their Galvanic Skin Response (GSR). Furthermore participants were asked to report their anxiety on the Subjective Unit of Discomfort (SUD) scale [12]. Prior to the experiment, they were asked to complete the Social Interaction Anxiety Scale (SIAS) [7], the Green et al. Paranoid Thoughts Scale (GPTS) [3], the Computer Experience Questionnaire (CEQ) [9], the Immersive Tendencies Questionnaire (ITQ) [11] and Simulator Sickness Questionnaire (SSQ) [6]. After the experiment participants completed the Igroup Presence Questionnaire (IPQ) [8] and SSQ. Furthermore, participants were instructed to observe their surroundings and to give running commentary on their experiences. They were instructed to focus their comments on how they perceived the environment rather than providing simply an 'objective'

description of the environment or an assessment of the quality of the VR environment. The participants' voice was recorded using Audacity software. In additions, after the exposure in virtual reality, they were asked to summarize their experience. The comments were coded using two coding schemes: the Coding Scheme Paranoid Thoughts Commentaries (CSPTC) [5] to classify the type of paranoid thought (i.e. persecution/accusation, distress, and threat), and one to classify the type of stressors that had elicited the paranoid thoughts (i.e. eye gaze, emotion, laughing, snatch of conversation, walk, walk and look, news flash, other, and unclear). Both schemes used mutually exclusive categories. CSPTC was extended with a Self-Reference category for references regarding mistakenly believing that a virtual character is talking about, referring to, or laughing about the individual, for example: *the man behind me is laughing about me*; *somehow I feel like he is talking about me*; *I don't know whether they are talking about me or about someone else*. Not included in this category were references that factually state that a virtual character was looking at them.

1.3. Experimental Design

The experiment had a 2-by-2 within-subjects design, with the cycle time (short or long) and the probability of the paranoia evoking events (low or high) as within-subjects factors. The cycle time for the sitting characters, walking characters, and TV news flashes were set to 18, 90 and 36 seconds respectively for the long cycle time condition, and to 10, 50 and 20 seconds respectively for short cycle time condition. In the low probability condition, probability was set to 20% and in the high condition to 80%. The mutually exclusive event ratios were set to 50. As participants were exposed to all four experimental conditions, the order of the conditions was counterbalanced.

1.4. Procedure and Participants

Twenty-four students (21 males and 3 females) of Delft University of Technology participated in the experiment. The participants' age ranged between 21 and 42 years old (M = 28.42, SD = 4.83) and all participants had at least a bachelor degree. All participants reported to have no history of paranoid disorder and to have little to no experience in developing a virtual world. To obtain a based-line physiological and SSQ measurement and train participants on the think-aloud protocol, participants were first exposed in a neutral virtual world [1] that consisted of a small room with TV set and no virtual characters were present in this room. On a virtual TV set, participants could look at a wildlife video. After this, participants saw a 6.5-minute video of a news report on street violence and read a fake news report about violence in the Netherlands. This priming procedure has been shown to induce paranoid thought in a non-clinical population [5]. Next, participants were exposed in the virtual restaurant world four times, for three minutes each time. Directly after each exposure condition, participants were asked for a SUD score and asked to summarize their experience. At the end of the experiments, participants completed IPQ and SSQ. Ethical approval for the experiment was obtained from the university ethics committee.

1.5. Statistical Analysis

Analysis of the number of coded paranoid comments made by an individual both during exposure in VR (Spearman r = .87, n = 96, $p. < .01$) and afterwards (Spearman r

= .75, n = 96, $p.$ < .01) showed an acceptable level of consistency between two independent coders. On comments that coders initially coded differently, the coders were asked to discuss and agree on a single classification. Of 24 participants only 13 made paranoid comments, therefore a Generalized Linear Mixed Model analysis with repeated measures was conducted on the number of paranoid comments made by these 13 participants, while for SUD, GSR, and heart rate data the analyses were conducted on data of all participants. The comments analysis used a negative binomial probability distribution while the other analyses used a gamma probability distribution. All analyses used a log link function and a diagonal covariance structure for both the repeated and the random intercept covariance. Furthermore, to reduce variance caused by individual differences in GSR baseline levels, the (a) measurement from the experimental conditions were set against the (b) measurement obtained from the neutral virtual world, using the following formula: $(a\text{-}b)/b$. To avoid negative or zero values for the log function transformation, a constant value of one was added to the SUD and to GSR values used in the analyses.

2. Results

Table 1 shows the participants' characteristics. Some significant increase of simulation sickness was reported after the exposure (t-test, $p.$ = 0.02, bootstrap). Probability of events had a significant effect (during exposure: $F(1, 16) = 16.14$, $p = .001$; after exposure: $F(1, 26) = 17.22$, $p < .001$) on the number of paranoid comments made by the 13 participants that made these comments. More paranoid comments were made in the high probability condition (during: $M = 2.5$, $SD = 2.8$; afterwards: $M = 1.4$, $SD = 1.6$) than in the low probability conditions (during: $M = 0.6$, $SD = 1.0$; afterwards: $M = 0.4$, $SD = 0.8$) (Figure 2). For comments made during the exposure, the analysis also found a significant two-way interaction effect ($F(1, 13) = 5.92$, $p = .03$) between the cycle time and the probability of the events. As figure 2 shows, in the low probability conditions significantly ($t(25) = 2.26$, $p = .033$) more comments were made in the short cycle time condition than in long cycle time condition, whereas no significant ($t(19) = 1.05$, $p = .305$) difference was found in the high probability conditions.

Table 1. Participants' characteristics.

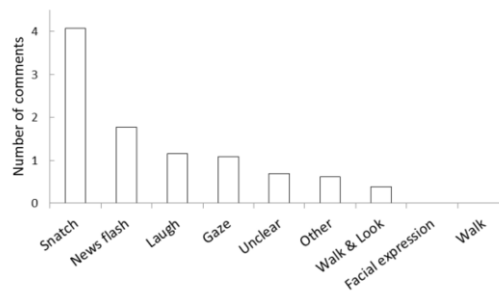| Measure	M(SD)
Paranoid thoughts (GPTS)	
Persecution	21.3(6.8)
Social reference	31.2(9.7)
Total	52.5(14.3)
Social Anxiety (SIAS)	26.0(12.9)
Computer Experience (CEQ)	14.8(2.6)
Immersive Tendencies (ITQ)	69.3(14.3)
Presence (IPQ)	49.4(11.8)
Simulation Sickness (SSQ)*	
Before exposure	78.5(20.4)
After exposure	108.5(35.2)

*sig (p<.05) difference before and after

Figure 1. Mean number of paranoid comments made according to paranoia-evoking stressors.

Whereas no significant difference was found between the extended CSPTC categories of the type of paranoid thought ($x2(3) = 3.86$, $p = .28$) (e.g. threat and self-

reference), a Friedman analysis found significant ($x2(3) = 30.26$, $p < .001$) difference between the paranoia-evoking stressors (e.g. laughing and news flash) of the paranoid comments. As figure 1 shows, snatches of conversation were related to a relative higher number of paranoid comments, whereas facial expressions and characters only walking around were never mentioned in these comments. The analysis also found a significant two-way interaction effect ($F(1, 7) = 9.16$, $p = .021$) in the self-reported distress. In the low probability conditions, participants reported significantly ($t(19) = 2.89$, $p = .010$) more distress in the short cycle time condition than in the long condition (Figure 3). No significant effects ($p > .05$) for probability and cycle time factors were found in the GSR and heart rate data.
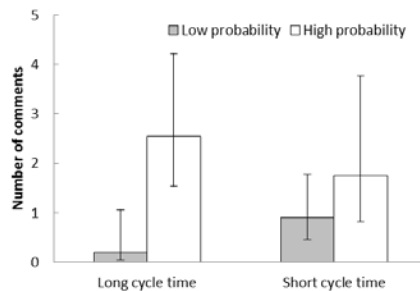
Figure 2. Mean (95% CI) number of paranoid comments made during exposure.
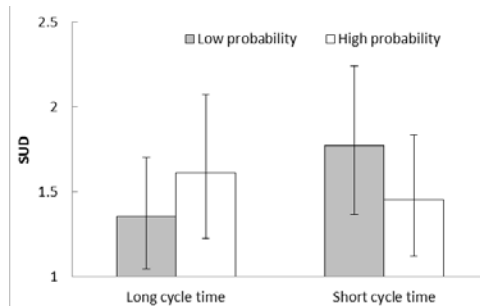
Figure 3. Mean SUD score made at end of exposure (95% CI).

Conclusion

Controlling the cycle time and probability of events can give therapists the ability to dynamically control paranoia evoking stimuli in the virtual environment as the results show that it can increase the number of paranoid comments and self-reported anxiety.

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Compelling Evidence that Exposure Therapy for PTSD Normalizes Brain Function

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Abstract. Functional magnetic resonance imaging (fMRI) is helping us better understand the neurologic pathways involved in posttraumatic stress disorder (PTSD). We previously reported that military service members with PTSD after deployment to Iraq or Afghanistan demonstrated significant improvement, or normalization, in the fMRI-measured activation of the amygdala, prefrontal cortex and anterior cingulate gyrus following exposure therapy for PTSD. However, our original study design did not include repeat scans of control participants, rendering it difficult to discern how much of the observed normalization in brain activity is attributable to treatment, rather than merely a practice effect. Using the same Affective Stroop task paradigm, we now report on a larger sample of PTSD-positive combat veterans that we treated with exposure therapy, as well as a combat-exposed control group of service members who completed repeat scans at 3-4 month intervals. Findings from the treatment group are similar to our prior report. Combat controls showed no significant change on repeat scanning, indicating that the observed differences in the intervention group were in fact due to treatment. We continue to scan additional study participants, in order to determine whether virtual reality exposure therapy has a different impact on regional brain activation than other therapies for PTSD.

Keywords. Vrtual reality, exposure therapy, posttraumatic stress, combat stress, functional magnetic resonance imaging

Introduction

Cognitive behavioral therapy (CBT) in conjunction with exposure therapy has been widely recognized by expert panels and consensus groups as the preferred approach for treating PTSD. To date, the most widely employed form of exposure therapy is known as "imaginal," requiring the patient to imagine themselves reliving the traumatic experience, and to then recreate it in increasingly vivid detail for the therapist, in order to facilitate working through their feelings and impact on their behaviors. While this works well for those who are able to do it, asking someone who by definition is

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inclined to avoid reminders of the trauma to repeatedly relive it is a formidable request, and it is therefore not surprising that many are reluctant or unable to engage in such an approach. Virtual reality exposure therapy (VRET) might seem even more daunting, since a semblance of the trauma is literally put it "in the face" of the patient, providing highly realistic visual, auditory, and even tactile and olfactory, cues. However, we believe VRET also provides distinct advantages. First, it can be presented in a graduated manner, so that the initial scenes are only remotely related to the trauma, followed by progression to more immediate approximations as the patient becomes more comfortable. This should trigger the patient's memories, get them talking about how they feel when they confronted by these and similar cues, and increase their comfort in the face of such stimuli.

The "Virtual Iraq/Afghanistan" environment builds on 15 years of prior work with VRET for PTSD, providing heightened realism and sophistication. The patient can explore the environment on foot or as the driver, passenger, or gunner in a "HUMVEE" (military human transport vehicle), and even to transit from one position to another; moreover, they can be alone, with a buddy, or with an entire patrol. The therapist can insert the participant anywhere in the environment, and can control the weather and time of day, while introducing such stimuli as vehicles, aircraft, explosions, ambushes, mortars, and intermittent or persistent machine gun fire. The patient walking through the environment can control their direction and pace via a controller mounted on an authentic size and weight replica rifle, and can "feel" the explosions and rumble of vehicles thanks to a vibration platform, while a smell machine adds odors like burning trash, Eastern spices, and chordite.

Our original study randomized military service members (SMs), with PTSD related to deployment to Iraq or Afghanistan, to either VRET or the form of imaginal exposure with the most evidence to support its use, Prolonged Exposure (PE), developed by Foa and colleagues. Our preliminary report described fMRI findings before and after treatment for all participants who were able to undergo MRI scanning, though there were a number who were not able to do so due to shrapnel or other contraindications. Using an Affective Stroop paradigm, we identified brain activation patterns on fMRI consistent with prior reports of PTSD: hyperactivity in the amygdala, subcallosal gyrus, and the lateral prefrontal cortex, with inhibition in the anterior cingulate gyrus [1]. Of greater significance, and novel in this field, we also demonstrated significant improvements, or normalization, in the activation of each of these brain areas following PTSD treatment. However, our original study design did not include repeat scans in control participants, so we could not be certain how much of the observed normalization in brain activity was due to treatment as opposed to a practice effect. We hypothesized that performing repeat scans in controls would help to identify fMRI as a potent, novel method for objectively assessing the impact of trauma and recovery on the central nervous system.

1. Methods

1.1 Participants

Nineteen combat veterans with PTSD were randomized to VRET vs. PE in 12-20 90-minute sessions. Ten completed a course of PE and 9 completed VRET. Ten (6 PE and 4 VRET) of this sample completed fMRI both at baseline and post-treatment. The

control group included combat veterans without PTSD (PTSD Checklist Score (PCL-M) [2] of less than 50), n=18, who were scanned both at baseline and at 3-4 months.

1.2   Data Acquisition and Analysis

All participants provided written informed consent and the study design was approved by institutional review boards at Walter Reed National Military Medical Center, Uniformed Services University, and the National Institutes of Health (NIH). All participants completed the PCL-M and the Clinician-Administered PTSD Scale (CAPS) [3] at baseline and follow-up. Baseline and follow-up scores were compared using paired t-tests with MS Excel. FMRI was performed at NIH using the Affective Stroop paradigm previously described [4]. Treatment and control group data was analyzed separately within the framework of the general linear model using Analysis of Functional Neuroimages [5]. The model involved six motion regressors and these task regressors: negative congruent, negative incongruent, negative view, neutral congruent, neutral incongruent, neutral view, positive congruent, positive incongruent and positive view, as well as a regressor modeling incorrect responses.   All regressors were convolved with a canonical hemodynamic response function (HRF). For the treatment group, a 3 (emotion; negative, positive, neutral) x 3 (condition; congruent, incongruent, view) x 2 (time: baseline, post-treatment) Analysis of Covariance (ANCOVA) was used, with performance scores and reaction time as covariates. For each individual and for each of their two experimental sessions, the statistical maps for the overall regression analysis were thresholded ($Z > 4.0$), aligned, and combined to identify the significant voxels across the two sessions. The thresholded statistical map was overlaid with the ROI map to identify contiguous voxels showing a significant experimental effect within each ROI. From each experimental session, the BOLD response averaged over the significant voxels within each ROI was obtained. These region time series data were analyzed using multiple regression with the same statistical model used for the whole brain analysis, with Statview software.   Multiple regression analyses provided estimates of the effect size for each task component. These effect estimates were compared with ANOVA to distinguish differences in response magnitude associated with task components, drug effects and group effects.   For conciseness, Emotion x Time interaction is presented here, focusing on the differences between negative and neutral images. For the control group the regression coefficients from individual subject analyses were analyzed using a 3 (emotion; negative, positive, neutral) x 3 (condition; congruent, incongruent, view) x 2 (time: baseline, 3-4 month) whole-brain repeated measures ANCOVA with PCL scores as a covariate. The AFNI ClustSim program was used to establish a p=.05 corrected threshold (37 voxel clusters at p=.005) for a whole-brain analysis. For conciseness, the main effect of Time is focused on here since it addresses the impact of practice effect.

2.   Results

VRET significantly reduced mean CAPS scores from baseline 80.44 (SD 13.31) to post treatment 64.5 (23.07), p<0.05, but no significant change was seen with PE therapy: 72.7(13.01) before and 75.9 (11.79) after, p =0.27. However, both treatments were associated with significant (p<0.05) reductions in PCL scores: from 60.44 (13.65) at baseline to 47.67 (13.73) at post treatment for VRET, and 64.9 (10.39) to 49.9 (11.51)

for PE. For all receiving either form of treatment who also completed fMRI before and after, the decrease in mean CAPS scores did not achieve significance, 84.1 (12.62) baseline to 80.67 (14.97), p =0.12, but for mean PCL scores it did, 64.2 (12.74) to 51.7 (15.49), p<0.05.

For the control group, the baseline mean CAPS score was 21.67 (12.53) and mean PCL-M score was 27.11 (7.48). Interestingly, these significantly decreased (p<0.05) by the time of follow-up, in the absence of an intervention, to 12.39 (11.06) and 23.44 (5.5) for the CAPS and PCL, respectively.

Consistent with our previous findings, those with PTSD who completed a course of exposure therapy demonstrated significant reduction in amygdala activation levels following treatment. This change was observed in association with negatively charged, but not neutral, imagery. The ventromedial prefrontal cortex (vmPFC) initially demonstrated significantly reduced activation with negative imagery, and effect that was ameliorated by therapy. While the anterior cingulated cortex (ACC) also demonstrated significantly reduced activation initially, therapy was associated with significant improvement in association with neutral rather than negative imagery (Figure 1). For the control group, no significant changes were observed in any area of the brain on repeat compared to initial scans (Figure 2).

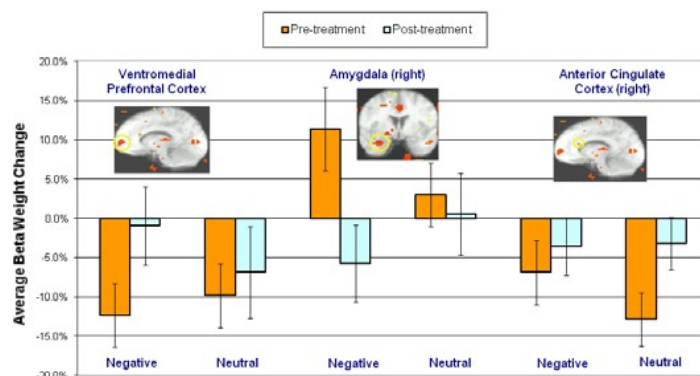Figure 1. Treatment group Emotion x Time interaction
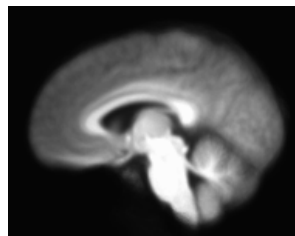

Figure 2. Control group Time main effect

3. Discussion

Exposure therapy encompasses a range of behavioral and cognitive behavioral approaches that help individuals to confront stimuli (e.g., thoughts, images, objects,

situations, or activities) associated with their traumatic experience through progressively more intense exposure, providing the therapist with opportunities to identify and neutralize behavioral cues. PE has been the most widely employed exposure element, in which the therapist asks the patient to repeatedly recall their traumatic experience in progressively greater first-person, multisensory detail; since avoidance of reminders of the trauma is a defining feature of PTSD, this is exceedingly difficult for many. Virtual reality (VR) has the potential to expand the application and efficacy of exposure therapy by attracting and effectively engaging in exposure therapy those who would otherwise not be. In fact, with the CAPS considered the gold standard for assessment of PTSD, our results suggest that VRET may have even greater efficacy than PE for combat-related PTSD.

Sample size limitations did not allow us to directly compare the fMRI results for PE and VRET, though we are continuing to perform imaging in a similar manner with the ultimate intent to directly compare the impact of VRET relative to other therapies. At this point, we can say that exposure therapy significantly ameliorates the hypoactivation in the vmPFC and hyperactivation in the amygdala that is characteristic of PTSD [6]. Significant improvement in hypoactivation was also seen in the ACC (a region critical to cognitive control[7]) with treatment. Overall, our findings imply that exposure therapy promotes recovery, or return to baseline, in brain regions that are associated with emotion regulation and management of stress.

The demonstration of no change with repeat scanning of a combat-exposed control group that we first report here is highly significant. In our prior report showing significant regional brain function improvement with a smaller number of SMs with combat-related PTSD, we could not be certain how much of the change was due to greater comfort with being in the scanner and with the stimuli inherent in the Affective Stroop, relative to the impact of treatment, we now know that repeat scanning alone has no impact, and it is really exposure therapy that is responsible for the demonstrated improvements. It is interesting that we actually found significant reductions in PTSD symptoms in the clinically healthy controls, who all had their first scan within 2 months after return from combat, providing evidence that it is normal to have some symptoms after return, but they are not associated with altered regional brain function and seem to gradually improve on their own, whereas full blown PTSD is associated with alterations in regional brain function, that improves with exposure therapy.

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Effects of Simulation Fidelity on User Experience in Virtual Fear of Public Speaking Training – An Experimental Study

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Abstract. Realistic models in virtual reality training applications are considered to positively influence presence and performance. The experimental study presented, analyzed the effect of simulation fidelity (static vs. animated audience) on presence as a prerequisite for performance in a prototype virtual fear of public speaking application with a sample of N = 40 academic non-phobic users. Contrary to the state of research, no influence was shown on virtual presence and perceived realism, but an animated audience led to significantly higher effects in anxiety during giving a talk. Although these findings could be explained by an application that might not have been realistic enough, they still question the role of presence as a mediating factor in virtual exposure applications.

Keywords. User experience, fidelity, fear of public speaking, virtual environments

Introduction

Virtual Reality (VR) training and therapy applications in general are a success story among immersive virtual reality developments [1, 2]. Virtual fear of public speaking environments for example are known to be effective by inducing fear in participants [3-5] and can also lead to a reduction of fear of public speaking symptoms [6-10].

However, research on the underlying mechanisms of those effects is still scarce. Training applications often use high levels of fidelity with the goal of producing a realistic experience for the user, thereby creating high levels of presence. The primary goal of such applications though is not to induce high levels of presence experienced by the users. The underlying assumption is rather that higher levels of presence may lead to higher performance [11], especially when the application context emphasizes creating certain states (for example inducing emotions like fear in phobia treatment).

State of research shows that immersion or fidelity aspects affect presence and performance [11]. To analyze hard- and software characteristics of immersive virtual environments (IVEs), researchers typically relate on Mel Slater [12] and his definition of 'immersion', namely the objective level of sensory fidelity a VR system provides. Presence, in contrast, is defined as a user's subjective response to a VR system.

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Initial findings show that higher simulation fidelity as an objective system characteristic (degree of realism of the replication of environments and objects in virtual environments, [13]) does not only lead to higher presence and performance, but also to better transfer of gained skills into practice for speech anxiety training [14].

However, research also hints that too realistic appearance and behavior lead to a reduction in experienced presence. This effect is similar to the Uncanny Valley theory [15] from robotics research. Mori [15] stated that the relation of familiarity that humans experience towards robots and their anthropomorphism is not linear. When robots are too similar to human beings, they appear uncanny. This effect is even increased by robot behavior. The theory has already been transferred to avatars [16] and could well be relevant to virtual audiences.

Therefore, the interesting question to face is what level of fidelity is really needed to create sufficient levels of presence and performance to make applications effective. Against the background of side effects (like a reduction of presence experienced due to a possible uncanny valley effect), an answer to this research gap is essential.

The study presented in this paper aims at a first step to overcome this problem by testing the effects of simulation fidelity on presence, anxiety and perceived realism in fear of public speaking applications.

Due to contradictory findings from state of research, we formulated the following non-directional hypothesis: Being confronted with a static audience (low fidelity) will lead to different levels of experienced presence than being confronted with an animated audience (high fidelity). Further, we explored anxiety induced in the two conditions, as well as perceived realism of the audience.

1. Method

In order to evaluate the prototype, an experimental, cross-sectional, 2×2 within-subject laboratory study was conducted. The first independent variable was level of simulation fidelity, with a static audience display (low fidelity) versus an animated audience display (high fidelity) of a virtual scene. Order of presentation was the second independent variable to control for sequence effects. Dependent variables were virtual presence, state anxiety, and perceived realism.

1.1. Virtual Scene

The virtual 3D scene depicted an audience consisting of 29 male persons sitting in a lecture room. The audience was seen from a first person perspective (see Figure 1). Participants stood in front of the audience (with a distance of approximately four meters from the projection screen). The total duration of the scene was approximately five minutes.

Figure 1. Screenshot of the Public Speaking Anxiety Application (alpha-version).

In the static condition, participants saw an audience without behavior animation. In the animated condition, the audience showed random behavior actions like coughing, scratching their heads or leaning forward. Due to the early development stage of the application, only two models were included in the scene. Also, only a small selection of nonverbal behavior actions was implemented at this time.

1.2. Experimental Environment

The hardware setup for the experiment consisted of a workstation that provided the virtual environment. The VE was created on a DELL Workstation with an Intel(R) Xeon(R) CPU X5650 @ 2.67 GHz, 12 GB of RAM and a NVIDIA GeForce GTX 560 graphics card with 2 GB of RAM. The stereo image was projected on a projection screen with reflective coating (2500 ×1500 mm) by a LG BX327 3D DLP-Projector with a native XGA (1024 ×768) resolution. The incorporated software setup was based on the CryEngine3 (Version PC v3.4.0 3696 freeSDK) as a 3D engine for real time rendering.

1.3. Measures

A German as well as an English questionnaire were developed in order to include German as well as international students in the sample. Sense of virtual presence was measured by an adapted version of the Slater-Usoh-Steed (SUS) questionnaire [17]. Original items were adapted to a public speaking scenario. Fear during the talk was measured by using the A-State scale from the short form of the State-Trait Anxiety Inventory [18]. To check on perceived realism of the audience, an item was developed on the basis of the second item of the Reality Judgement and Presence Questionnaire [19], namely: "How realistic did you perceive the audience in the virtual lecture-room compared to a real audience?"

1.4. Procedure

The study was conducted from January to February 2013 at a German university. In the invitation to the study, participants have been asked to prepare a short talk of three to five minutes on a subject of their own choice (for example their last holiday) to present to the virtual audience. After a short oral briefing, participants were provided with shutter glasses and were presented either the static or the animated scene while giving their talk. After the first round, the subjects were asked to complete a semi-standardized questionnaire provided on a laptop computer. This process was repeated subsequently with a scene where the display was swapped from static to animated or vice versa. After the second round, participants were asked to complete the questionnaire a second time. At the end of the experiment, participants were given the opportunity to report their overall impressions followed by an oral debriefing.

1.5. Sample

A total of 42 undergraduate students and academic staff were acquired through university mailing lists and oral invitations. Two participants were excluded due to technical problems during the experimental session. The final ad-hoc sample ($n = 40$) consisted of 23 men (58 %) and 17 women (42 %) with a mean age of 24 years

(*SD* = 2.30). All subjects reported having normal or corrected-to-normal visual acuity with 17 participants wearing glasses or contact lenses during the experiment.

2. Results

As discussed above, we tested a non-directional hypothesis that a static vs. an animated audience leads to different effects in experiencing virtual presence. Contrary to this hypothesis, we found a null-effect (see Table 1, *t* = .33, *df* = 39, *p* = .73, *n* = 40). The standardized effect size was minimal (*d* = .06) with an achieved power of *1*-ß = .06. Both audiences created a medium level of presence experienced. This could be because both audiences might not have been realistic enough.

Concerning state anxiety, we assumed that an animated audience will lead to higher feelings of fear than a static audience. The descriptive statistics are presented in Table 1. Simulation fidelity led to a significant difference in fear experienced during the talk (*t* = 3.11, *df* = 39, *p* < .001, *n* = 40) with a medium effect (*d* = .49). Therefore, findings from previous studies (see section on related work) have been confirmed by our data.

Table 1. Means and standard deviations for virtual presence, anxiety, and realism according to simulation fidelity (static vs. animated audience; n = 40).

	Simulation Fidelity			
	static		animated	
	M	*SD*	*M*	*SD*
Virtual Presence	3.48	1.06	3.54	1.07
Anxiety[a]	11.10	2.96	12.98	4.06
Realism	2.78	1.64	2.73	1.38

In regard to perceived realism, it has to be noted that neither of the audience versions seemed to be very realistic to participants (see Table 1). The means even show a very slight but not significant tendency that static audiences seem to be more realistic (*t* = .18, *df* = 39, *p* = .86, *n* = 40) with a small effect (*d* = .17; 1-ß = .19). This could be explained by the alpha-version of the prototype where only two models and only a small selection of behavior actions have been implemented.

3. Discussion and Conclusion

The study presented examined the effect of simulation fidelity (static vs. animated audience) on presence as a mediating factor for performance in a public speaking anxiety application. Contrary to state of research, a null-effect was found. However, simulation fidelity did influence anxiety, which is an important aspect for fear of public speaking. Only perceived realism of the audience was related to presence, although neither condition seemed realistic to the users. This might be an explanation for the null-effect: maybe the application was not realistic enough, given a simple alpha-version of the prototype that was tested.

Further, the study has certain limitations: the prototype was tested by academic non-phobic users. Participants suffering from fear of public speaking might have shown other reactions. Also, a real performance measure was not included at this early stage of development. Still, our findings challenge the role of presence assumed as a prerequisite for performance and its increase during training in phobic training

applications. Future studies should explore if presence is really needed as an important mediating factor for performance in VR exposure applications.

Acknowledgments

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Development of a VR Application for Binge Eating Treatment: Identification of Contexts and Cues Related to Bingeing Behavior in Spanish and Italian Patients

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Abstract. The objective of this study was to identify frequent situations and
specific cues that produce the craving to binge in Spanish and Italian samples of
patients with eating disorders (ED). There were two main aims: to assess
transcultural differences in the contexts and cues that elicit food craving; and to
develop valid, reliable VR environments for effective cue-exposure therapy (CET)
for patients from both countries. Twenty-six Spanish and 75 Italian ED patients
completed an *ad hoc* questionnaire to assess contexts and cues that trigger the
craving to binge. No differences between groups were found. All patients reported
experiencing higher levels of craving in the afternoon/early evening and in the late
evening/night, between meals, when alone, and more frequently at the end of the
week. Being in the dining room, the kitchen, the bedroom, the bakery and the
supermarket were the specific situations that produced the highest levels of craving
to binge. We used the questionnaire results to develop a virtual reality application
for CET.

Keywords: Virtual reality, food craving, binge eating, cue-exposure therapy,
clinical sample

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Introduction

Cue-exposure therapy (CET) has proved effective in binge eating treatment in patients with bulimia nervosa (BN) and binge eating disorder (BED) [1-6]. However, logistical drawbacks and a lack of ecological validity have prevented the widespread use of this intervention [7-8]. Virtual reality (VR) technology allows the simulation of real life situations. It increases ecological validity and facilitates the availability of both contextual and proximal cues, while maintaining good control over situational parameters. Consequently, VR could be a good alternative to in vivo exposure in CET [9].

The objective of this study was to identify frequent situations and specific cues that produce the craving to binge in Spanish and Italian samples of patients with eating disorders (ED). The study had two main aims: first, to assess transcultural differences in the contexts and cues that elicit food craving; second, to develop valid, reliable VR environments for CET that are applicable to both groups.

1. Procedure

One hundred and one ED patients (50 BED and 51 BN-purgative subtype) participated in the study. Twenty-six participants were Spanish and 75 were Italian. Eighty-eight percent were female. The mean age was 30.1 years (*SD*=8.02, range 18 to 54). Forty-three of the participants were considered to be of normal weight (BMI = 18.5-24.99), 39 were overweight (BMI = 25-29.99), and 19 were obese (BMI = 30+). The sample was recruited from three hospitals in the area around Barcelona (Spain) and Milan (Italy), each of which was collaborating with the research project. The protocol was previously reviewed and approved by the corresponding Ethics Committees of these institutions. Inclusion criteria were as follows: having an ED diagnosis according to DSM-5 criteria, presenting binge eating behavior, and being over 18 years old. Participants were excluded if they had any comorbid psychotic disorder. All participants signed an informed consent form.

No differences in body mass index (BMI) and symptom severity (assessed with the BULIT-R) were found between the Italian and Spanish groups. All participants completed an *ad hoc* questionnaire developed on the basis of the literature [10-12] to assess the level of binge craving in different areas related to binge eating: meal, time of the day, day of the week, presence of others, situations, mood, hunger, and types of food. For each area that was assessed, we included different items that required participants to imagine the specific situation, to try to visualize it, and to indicate their desire to binge on a Likert scale ranging from 0 (no desire) to 4 (very high desire). Participants were also asked to describe in a blank text box which of the stimuli present in that context made them want to binge. Demographic items were included at the beginning of the questionnaire to gather information about age, diagnosis, weight, height, and BMI. The inventory showed good internal consistency both in the Spanish (Cronbach's a = 0.90) and the Italian (Cronbach's a = 0.81) samples.

Descriptive analyses were conducted separately for the Spanish and the Italian groups, to find which contexts and specific cues provoked higher levels of food craving in the BED and BN patients of each country. Likewise, several independent-samples *t*-tests (applying the Bonferroni adjustment to the alpha level) were conducted to assess differences between groups.

2. Results

Table 1 shows the mean binge craving level in the Spanish and Italian samples for each craving-inducing context that was assessed, as well as the results of *t*-tests. No significant differences between groups were found. Both Spanish and Italian patients showed higher levels of craving in the afternoon/early evening (between 4.01 and 8. p.m.) and in the late evening/night (between 8.01 p.m. and midnight), between meals, when alone, and more frequently at the end of the week on Friday, Saturday and Sunday. Among the specific situations that were assessed, being in the dining room, the kitchen, the bedroom, the bakery, and the supermarket were those that produced the highest levels of binge craving. The most frequently reported specific cue in all the situations was the presence of palatable food. Being hungry and a negative mood were also strongly associated with craving.

Table 1. Mean binge craving levels for triggering contexts in the Spanish and Italian samples, and the results of the independent-samples *t*-tests

Context	Spanish sample *M (SD)*	Italian sample *M (SD)*	*t*	*P*
Meal				
Breakfast	1.16 (1.52)	0.88 (1.10)	.850	.401
Lunch	1.42 (1.32)	1.67 (1.09)	-.842	.406
Snack	2.54 (1.24)	2.17 (1.03)	1.348	.186
Dinner	2.42 (1.42)	2.97 (0.96)	-1.837	.075
Between meals	**3.04 (1.08)**	**3.03 (0.96)**	.061	.952
Presence of others				
Being alone	**3.42 (0.83)**	**3.56 (0.53)**	-.797	.432
Family	1.80 (1.29)	1.79 (1.02)	.047	.963
Friends	1.52 (1.33)	1.45 (0.95)	.228	.822
Situations				
Kitchen	**2.33 (1.37)**	**2.63 (1.44)**	-.878	.382
Bedroom	1.96 (1.46)	**2.55 (0.98)**	-1.817	.080
Dining room	**2.52 (1.39)**	**2.87 (1.11)**	-1.134	.264
At work/ college	1.41 (1.40)	1.32 (0.68)	.288	.776
Restaurant	1.91 (1.47)	1.76 (1.06)	.462	.647
Cafeteria	1.78 (1.59)	1.64 (0.83)	.412	.684
Bakery	**2.71 (1.55)**	**2.17 (1.42)**	1.574	.119
Supermarket	**2.17 (1.58)**	**2.17 (1.02)**	-.019	.985
Outdoor place	1.04 (1.37)	1.00 (0.75)	.143	.888
Preparing food	1.79 (1.44)	1.52 (1.19)	.923	.358
Party	1.87 (1.63)	1.49 (0.86)	1.061	.298
Starting to eat	1.92 (1.56)	1.84 (0.81)	.231	.819
Time of day				
5:01-9:00	0.73(1.32)	0.87 (0.62)	-.481	.635
9:01-13:00	1.50 (1.22)	1.41 (0.96)	.349	.728
13:01-16:00	2.08 (1.32)	2.04 (1.10)	.160	.873
16:01-20:00	**2.75 (1.19)**	**2.79 (1.13)**	-.137	.892
20:01-24:00	**2.85 (1.01)**	**2.97 (0.80)**	-.649	.518
24:01- 5:00	1.78 (1.93)	1.79 (1.19)	-.010	.992

Day of the week				
Monday	2.60 (1.09)	2.48 (0.86)	.522	.603
Tuesday	2.45 (1.19)	1.96 (0.83)	1.731	.096
Wednesday	2.43 (0.87)	2.16 (0.89)	1.233	.221
Thursday	2.86 (0.85)	2.65 (.95)	.886	.378
Friday	**2.91 (0.92)**	**3.15 (0.36)**	-1.184	.249
Saturday	**3.17 (0.98)**	**3.35 (0.48)**	-.813	.424
Sunday	**3.14 (1.21)**	**3.19 (0.39)**	-.193	.849
Mood				
Bored	**3.16 (1.03)**	**3.27 (0.89)**	-.499	.619
Stressed	**3.00 (1.22)**	**3.01 (1.01)**	-.055	.956
Anxious/Tense	**3.50 (0.66)**	**3.50 (0.51)**	.000	1.00
Irritable	2.67 (1.31)	2.75 (1.14)	-.289	.774
Frustrated	**3.13 (1.18)**	**2.97 (0.90)**	.579	.565
Angry	2.32 (1.57)	2.52 (1.48)	-.575	.566
Depressed	**3.12 (1.30)**	**3.35 (1.01)**	-.904	.368
Quiet	1.21 (1.35)	0.85 (1.02)	1.184	.245
Happy	0.86 (1.21)	0.43 (0.66)	1.628	.116
Euphoric	1.00 (1.41)	0.76 (0.87)	.771	.448
Hunger				
Very hungry	**2.68 (1.45)**	**2.60 (1.06)**	.237	.815
Quite hungry	**2.75 (1.18)**	**2.92 (1.01)**	-.593	.555
Moderately hungry	1.93 (1.03)	1.92 (1.14)	.042	.967
Not very hungry	1.31 (0.79)	1.21 (0.78)	.462	.645
Not hungry	0.81 (1.05)	0.73 (1.02)	.281	.779

Conclusions

No differences between Spanish and Italian samples were found. Both groups experienced higher levels of food craving in the same contexts and with the same cues. We used the results of the questionnaire to develop a VR application for CET. The software consists of four VR environments (kitchen, dining-room, bedroom, and bakery/cafe) and 30 palatable foods that can be combined to construct an exposure hierarchy adapted to the specific needs of each patient. The therapeutic aim of this application is to extinguish a conditioned craving response and facilitate the generalization of craving extinction.

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SECTION IV

ORIGINAL RESEARCH

Health care is one of the areas that could be most dramatically reshaped by these new technologies.

Distributed communication media could become a significant enabler of consumer health initiatives. In fact they provide an increasingly accessible communications channel for a growing segment of the population.

Moreover, in comparison to traditional communication technologies, shared media offer greater interactivity and better tailoring of information to individual needs.

Wiederhold & Riva, 2004

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The Mediating Role of Facebook Fan Pages

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Abstract. Using the dual mediation hypothesis, this study investigates the role of interestingness (the power of attracting or holding one's attention) attitude towards the news, in the formation of Facebook Fan Page users' electronic word-of-mouth intentions. A total of 599 Facebook fan page users in Taiwan were recruited and structural equation modeling (SEM) was used to test the research hypotheses. The results show that both perceived news entertainment and informativeness positively influence interestingness attitude towards the news. Interestingness attitude towards the news subsequently influences hedonism and utilitarianism attitudes towards the Fan Page, which then influence eWOM intentions. Interestingness attitude towards the news plays a more important role than hedonism and utilitarianism attitudes in generating electronic word-of-mouth intentions. Based on the findings, the implications and future research suggestions are provided.

Keywords. Facebook fan page, use and gratification theory, dual mediation hypothesis, eWOM intentions

Introduction

Since 2011, social networking sites (SNSs) became an important marketing channel with 50% of users connecting to a brand [1]. This trend attracted many companies who invested in building relationships with consumers by SNSs. Facebook is the SNS with the largest number of users worldwide. Word of Mouth (WOM) has higher persuasion and faster diffusion characteristics than traditional advertisements. The emergence of electronic word of mouth (eWOM) has made the diffusion scope even wider and larger than oral WOM. Corporations try to take advantage of using eWOM on SNSs. SNSs users who become fans of a brand Fan Page are more likely to accept the content from the Fan Page and provide positive word of mouth (WOM) [2]. Since the characteristics of SNSs provide companies with a platform to place advertisements without restrictions on time, geography and space, many are eager to determine the factors

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which affect users to generate eWOM intentions. Based on the use and gratification theory, we propose a model that identifies the factors which influence users to generate eWOM intentions. In addition, we identify the mediating role of interestingness attitude toward the news on Facebook Fan Page in the proposed model.

1. Method

1.1. Sample and Data Collection

This study examines Facebook Fan Page users as the sampling scope and tries to understand and study the generation process of Fan Page users' eWOM intentions. Thus, the respondents are Facebook users who have joined a corporate's official Fan Page on Facebook for at least 6 months. An online questionnaire survey was conducted and 1135 participants participated in this study. After deleting 484 invalid samples, 599 samples with 311 male (51.9%) and 288 female (48.1%) were used for statistical analyses.

1.2. Measures

The items of the questionnaire were modified to fit the research context. The measures of perceived news entertainment [3], perceived news informativeness [3], intention to give information [4], intention to pass information [4], and intention to obtain information [4] use 7-point Likert scale (1= "Strongly disagree", 7= "Strongly agree"). Interestingness attitude toward the news on Fan Page [5], hedonism attitude toward the Fan Page [1], and utilitarianism attitude toward the Fan Page [1] use 7-point semantic differential scale.

2. Results

2.1. Measurement Model

The results showed an adequate model fit: x^2/df = 0.763, goodness-of-fit index (GFI) = 0.941, comparative fit index (CFI) = 0.985, and root mean square error of approximation (RMSEA) = 0.038. Item loadings are all above 0.7 [6]. Squared multiple correlation values are all above 0.5 [7]. Composition reliability values are all above 0.8 and average of variance extracted values are all above 0.5, which represent all measurement variables are significantly related to each of the corresponding construct [8]. Cronbach's a values of all constructs are also calculated to evaluate construct reliability, and the results show the values all above 0.7[9]. Since the square root of AVE of a specific latent construct is higher than the correlations of this particular latent construct with other constructs, the discriminant validity is acceptable.

2.2. Model Fit

The results in Table 1 showed an adequate model fit: x^2/df = 4.684, goodness-of-fit index (GFI) = 0.872, comparative fit index (CFI) = 0.932, and root mean square error

of approximation (RMSEA) = 0.078. The research model is acceptable in the Facebook Fan Page context. Except H6a, 9 of the 10 hypotheses were supported.

Table 1: Results of proposed model

Hypothesis Relationships				
H1	Perceived News Entertainment	◆	Interestingness of Attitude towards the News	0.672***
H2	Perceived News Informativeness	◆	Interestingness of Attitude towards the News	0.162***
H3	Interestingness of Attitude towards the News	◆	Hedonism of Attitude towards the Website	0.435***
H4	Interestingness of Attitude towards the News	◆	Utilitarianism of Attitude towards the Website	0.317***
H5	Hedonism of Attitude towards the Website	◆	Intention to Give Information	0.491***
H5b	Hedonism of Attitude towards the Website	◆	Intention to Pass Information	0.512***
H5c	Hedonism of Attitude towards the Website	◆	Intention to Obtain Information	0.551***
H6a	Utilitarianism of Attitude towards the Website	◆	Intention to Give Information	0.041
H6b	Utilitarianism of Attitude towards the Website	◆	Intention to Pass Information	0.101*
H6c	Utilitarianism of Attitude towards the Website	◆	Intention to Obtain Information	0.159***

Note: *** p<0.001; **p<0.01; *p<0.05

2.3. Post analysis: tests of mediation effects

This study applies the Sobel test for further mediation effect examination [10]. The results of the Sobel test are shown on Table 1. The mediation effect on both routes perceived news entertainment–interestingness attitude towards the Fan Page–hedonism attitude towards the Fan Page and perceived news entertainment–interestingness attitude towards the Fan Page–utilitarianism attitude towards the Fan Page is significant.

Table 2: Mediation analysis through the Sobel test

IV	M	DV	Sobel Test
PE	IN	HW	4.907***
PI	IN	UW	3.340***

Note：PE = Perceived News Entertainment; PI = Perceived News Informativeness; IN = Interestingness Attitude towards the News; HW = Hedonism Attitude towards the Fan Page; UW = Utilitarianism Attitude towards the Fan Page

Conclusion

The research findings support the proposed model. The results show that both perceived news entertainment and informativeness positively influence interestingness attitude towards the news on a Facebook Fan Page. Interestingness attitude toward the news on Fan Page positively influences hedonism and utilitarianism attitude toward the Fan Page and subsequently influences eWOM intentions. The results also show that the mediation role of interestingness attitude towards the news on Fan Page in the proposed model. It suggests that the content of news published on Fan Page is an important factor that provokes users' eWOM intentions. These findings and their implications can be useful for companies who are developing their SNS advertising strategies.

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Marketing Analysis of a Positive Technology App for the Self-Management of Psychological Stress

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Abstract. The INTERSTRESS project developed a completely new concept in the treatment of psychological stress: *Interreality*, a concept that combines cognitive behavioral therapy with a hybrid, closed-loop empowering experience bridging real and virtual worlds. This model provides the opportunity for individual citizens to become active participants in their own health and well-being. This article contains the results of the Marketing Trial and analysis of the opinions of individual consumers/end users of the INTERSTRESS product. The specific objective of this study was to evaluate the feasibility, efficacy and user acceptance of a novel mobile-based relaxation training tool in combination with biofeedback exercises and wearable biosensors. Relaxation was aided through immersion in a mobile virtual scenario (a virtual island) featuring pre-recorded audio narratives guiding a series of relaxation exercises. During biofeedback exercises, a wearable biosensor system provided data which directly modified the virtual reality experience in real-time. Thirty-six participants evaluated the product and overall feedback from users was positive, with some variation seen based on participant gender. A larger market study is now underway to understand if there are cultural variations in acceptability of the device.

Keywords. Stress, biofeedback, heart rate, wearable sensors, mobile health, positive technology

Introduction

In spite of the advancements in medical technologies and a general increase in income levels, healthcare continues to pose challenges of affordability, complexity and access across the world. An increasing number of European citizens need access to healthcare. This trend is extremely expensive for national healthcare systems, hence there is a strong need to find new cost-effective solutions to promote the improvement of existing care. To face this global challenge the European Commission realizes that the employment of telemedicine health systems can help to reduce the heavy burden of demand for services. New mobile platforms, as well, can help participants to become active participants in their own health and well-being, thus moving from a disease

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model to a health promotion/disease prevention model of individual responsibility. This can help to achieve the objectives of improved healthcare outcomes and decreased costs; enhanced accessibility to existing services by those who need them most; and igniting of innovative and entrepreneurial activities.

In this framework, the growing problem of chronic stress has become an increasingly important public health concern throughout Europe. Stress-related disorders have been shown to cause and exacerbate physiological and behavioral disturbances ranging from immune system dysfunction to psychiatric disorders [1]. Financial costs of work-related stress in the EU-15 were estimated to be €20 billion per year including accidents, absenteeism, employee turnover, diminished productivity, and direct medical, legal, and insurance costs. [2]

The INTERSTRESS project aimed to address these problems by developing a completely new concept in the treatment of psychological stress: *Interreality*, a concept that combines cognitive behavioural therapy with a hybrid, closed-loop empowering experience bridging real and virtual worlds. This model provides the opportunity for individual citizens to become active participants in their own health and well-being.

1. Methodology

The experimental training was provided through the mobile application "Positive Technology" (http://www.positiveapp.info/) using the iPad and iPhone and with heart rate monitoring devices, Mio Alpha and Empatica.

Prior to the marketing trial, an online survey was created using the using the System Usability Scale. Study equipment was purchased which was followed by the synchronization of the application, mobile and heart rate monitoring devices. A protocol was developed, and staff participated in training and testing prior to beginning the trial.

Participants were guided through every feature on the application and then were encouraged to use the product independently. Heart rates were recorded on a paper form at three different stages: 1. Baseline 2. After several minutes using the app's features 3. After exiting the biofeedback features. Half of the group used the iPhone first and the iPad second and half did the reverse. Each participant was given an information sheet which contained the relevant project information and were required to complete an Informed Consent Form. All data was collected anonymously.

The participant was guided through two types of stress-management exercises:

B*iofeedback:*
The mobile Heart Rate Biofeedback Training is aimed to help users in managing and coping with psychological stress. It consists of a portable heart rate monitor connected via Bluetooth interface with the mobile application.

The heart rate is used to calculate indexes of heart-rate variability (HRV) that are displayed in the form of animated 3D visual feedback to the user: by controlling the respiration rate, variations in the Heart Rate Variability indexes controls the features of the virtual environment, such as the increase or the decrease of the size of a virtual campfire or waterfall. In this way, the user learns to control autonomic responses to stressful situations. Heart rates were recorded during this exercise.

Relaxation technique:
Guided relaxation training is based on the most effective stress management techniques, such as Autogenic training and Progressive Muscle Relaxation. The relaxation training is provided in the form of audio narratives within engaging virtual reality scenarios (i.e. the "relaxation island").

2. Evaluation

The aim of the evaluation was to assess the efficacy and usability of the mobile-based relaxation training tool in combination with biofeedback exercises and a wearable cardiac monitoring sensor. During the study, both subjective (self-report) and objective measures (heart rate) were obtained to help determine if the product was successful at reducing the participant's stress levels. Healthy volunteers, male and female, aged 18 – 65 were recruited through e-mails and flyers in locations in Brussels and Leuven in Belgium. Our sample included an even distribution of genders and a variety of nationalities, ages and levels of education. Post-trial measures included self-reported stress levels and cardiac activity data. In addition, participants were asked to fill in a System Usability Scale (SUS) [3].

Feedback from users was overall quite positive, with the main advantage they saw being the availability and accessibility allowed by a mobile solution. The biofeedback also proved popular among users, successfully decreasing the heart rates of most participants. Users also found the product fun and easy-to-learn, comparing it to playing a game.

The most common response to the product's disadvantages was the cost of the biosensors which many reported to be potentially prohibitively expensive. (This of course is an add-on and our platform can be marketed with this as an option). It was also suggested that if the graphics were improved to be more realistic, a more immersive environment might be achieved. (However, although this was noted, it was also noted that users had a decrease in heart rate, indicating a reduction in physiological arousal, during use.)

Participants felt relatively confident using the system, reporting it was easy to use and straightforward. Some, however, were unsure if they would use the product frequently.

Users reported feeling the system reduced their stress levels, with the average score being 2.91/5.00. This was also seen objectively with the Biofeedback Training and Relaxation Island. Sixty-eight percent of participants had a reduction in heart rate, indicating physiological relaxation and stabilization after only a few minutes of use and instruction. Below in Figure 1, we show the comparison of actual heart rate fluctuations with self-reported stress-level reduction. For this, we have evaluated the percentage change from resting heart rate to heart rate after using the biofeedback feature. There was a low positive correlation of 0.24 for these variables. In training and testing participants and patients over the past 17 years, we have seen that often trainees are unaware of physiological arousal or relaxation when they first come to the clinic. After training sessions, they are able to become aware and self-report becomes synchronous with physiology. So this correlation was similar to population responses from previous studies and would be expected to change as participants became more self-aware.
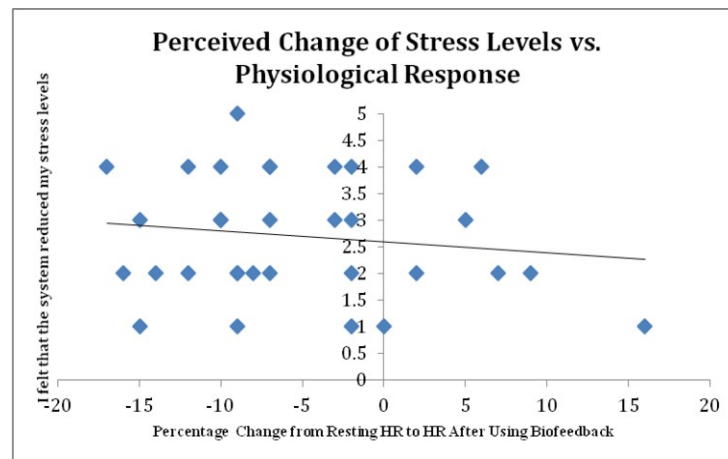
Figure 1. Perceived change of stress levels vs. physiological response.

In the marketing study, we did find some variation amongst groups. Females rated the application more positive overall than did our male participants (as shown in Figure 2 below). There was also some variation among ratings given by those in the different age groups. Participants in the age group 35-44 were the most positive about the product overall, however the youngest age bracket, 18-24, reported that our product reduced their stress levels most significantly.

Figure 2. Male and female ratings of perception of product's effect on stress levels.

A larger market study is now underway to understand if there are cultural variations in acceptability of the device. However, it can be anticipated that feedback from users was overall quite positive, with the main advantage they saw being the availability and accessibility allowed by a mobile solution. The 3D biofeedback also proved popular among users, successfully decreasing the heart rates of most participants.

Conclusion

In this contribution, we described the key features and preliminary evaluation of Positive Technology, a mobile platform for self-management of psychological stress. To our best knowledge, Positive Technology is the first free mobile stress management platform available on the market which provides real-time monitoring of the user for continuous and reliable feedback. A further original feature of this application is the combination of biofeedback and interactive 3D contents, which has not been implemented before on a mobile device. A future goal is to improve the usability of the application and include more advanced stress monitoring features, based on the analysis of heart rate variability indexes.

Acknowledgments

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VR Mobile Solutions For Chronic Stress Reduction in Young Adults

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Abstract. Chronic stress in young adults has become a growing problem within recent decades and many are unable to find cost-effective and accessible treatment for psychological stress in their daily lives. We analyze the market of using a mobile application, Positive Technology, as a solution. Eleven participants, aged between 18 and 24, participated in the exercise. Self-reported stress reduction was measured via an online marketing survey, while physiological measurements were monitored via peripheral devices. Secondary goals assessed the app's ease-of-use, accessibility, and cost. Results indicate that participants enjoyed the availability of the mobile solution and found the app to be fun and easy to learn. Stress levels were reduced in 73% of the participants, with higher effects in females and in participants aged 18-24. We conclude that the mobile platform is an effective means of delivering psychological stress reduction, and could provide an accessible, cost-effective solution.

Keywords. Virtual reality, mobile application, chronic stress, young adults

Introduction

Defined by Cohen *et al* as the mental state where an individual considers his or her personal capacity cannot meet environmental demands, stress has shown to have well-documented socioeconomic ramifications [1]. High levels of stress negatively influence an individual's professional and personal life, commonly resulting in decreased mental and physical functions, lost work days, and higher healthcare costs. Consistent exposure to stressful environments may result in a higher likelihood of developing anxiety [2]. Extreme levels of exposure have been associated with depression, cardiovascular disease, and HIV [1]. The World Health Organization (WHO) Global Burden or Disease Survey uses disability-adjusted-life-years to rank mental disease, including stress-related disorders, to be the second highest cause of disabilities by 2020 [3].

A growing issue, as reported by the American Psychological Association, is the trend of chronic stress in young adults. Current parenting trends are causing teens to mirror the high-stress lives of their parents, and placing them at increased risk of stress-related disorders. In addition, coping mechanisms are not well developed in their age group; further increasing risk of adverse events [4]. McEwen studied the effect of chronic stress to biological adaptations of the hippocampus. As a center for declarative, spatial, and contextual memory, the hippocampus has high structural plasticity and adapts to adrenal glucocorticoids secreted by the hypothalamic-pituitary-adrenocortical

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axis in response to chronic stress. Repeated stress eventually overloads the adaptive nature of the hippocampus and eventually causes adverse damage if the stressors are not removed [5]. Addressing chronic stress is difficult due to its complexity and the personal nature of stressors. Many deny the adverse effects of stress in their daily lives and others report that they do not know how or where to search for coping strategies [4]. A form of self-management of chronic stress can be constructive in reducing psychological stress.

We propose a mobile application (app) as a platform to deliver virtual reality to combat chronic stress early in young adults. Virtual reality (VR) is effective in treating various conditions, such as posttraumatic stress disorder [6 -8], anxieties and phobias [9], pain syndromes [10-11], and in performing neuropsychological assessment and rehabilitation [12]. Moreover, the fast-paced development of VR technologies and its utilization with peripherals such as data gloves, physiological monitoring, and the internet, supports application of new technologies for additional medical disorders [13].

A mobile application was chosen as the method of delivery due to several key factors. Mobile phones are familiar to most users, requiring minimal instruction. Portability is a core value to creating an easily accessible treatment that overcomes traditional barriers. And lastly, graphics quality is continuously improving and software upgrades can be performed automatically, which are advantageous for the quickly developing VR field.

1. Methods

1.1 Participants

Eleven subjects, between the ages of 18 and 34, participated anonymously in the marketing survey. Each signed an Informed Consent Form.

1.2 Equipment and Mobile Application

The mobile application used in this experimental setup was "Positive Technology" (http://www.positiveapp.info/) on the iPad. It was developed as part of the European-funded INTERSTRESS project, an information and computer technology-based project for the diagnosis and treatment of psychological stress. "Positive Technology" integrates a 3D virtual island that users can explore. Mio Alpha and Empatica heart rate watches were worn by the participants during the trial to collect physiological data.

During the trial, users were given the choice of two programs based upon which they would perceive as most relaxing: Music and Biofeedback with Narratives. The Biofeedback program responds to user stress levels monitored by heart rate (HR). Within the virtual island, features such as a waterfall and campfire respond to user stress levels by varying size and intensity as users' heart rates increase or decrease. These features help users manage and cope with psychological stress by providing a response mechanism in stressful situations.

1.3 Measures

Success of the trials was determined based upon two factors: user-submitted responses on a predetermined System Usability Scale online marketing survey, and heart rate. The 27-question online survey was created to collect demographic data, gauge user

stress levels, and gauge app usability**.** Staff aided in setting up the mobile application and heart rate monitors and guided participants through the features of the app. Participants were then given 10 minutes to explore the virtual environment, while staff monitored heart rate. Following the exercise, each participant completed the online survey.

2. Results and Discussion

Feedback from the participants was positive overall. Specifically, they found the system to be easy to use and easy to learn without a technician. Participants communicated that the features of the app were very well integrated into a virtual reality system. All users reported confidence in using the system. However, others were hesitant about purchasing a biosensor watch to accompany the mobile app. Other drawbacks to the system seemed to revolve around the controls being cumbersome to use and limited interactivity.

In terms of reducing stress, the app performed relatively well. Many users reported that the music and narratives were relaxing in their reviews. The scaled question "I felt the product decreased my stress levels" resulted in an average score of 2.55 out of 5.00. 73% of the participants reduced their heart rate after the study, providing evidence of stress mitigation.

Demographic reviews of the data found interesting trends. Age groups were divided into age ranges of 18-24 and 25-34. Participants in the 18-24 age group scored significantly higher in stress reduction than those of ages 25-34. This may be due to higher initial stress levels of school, as almost every participant in the 18-24 group reported being a student, while the older participants held other occupations. Gender reports found that females had greater stress reduction than males. A similar study was conducted in Europe, using the same survey and experimental setup, and found very similar results, with the 18-24 age group and females reducing their stress levels most significantly [14].

Figure 1. Perceived stress reduction reported in marketing survey, divided by age group.

Figure 2. Perceived stress reduction reported in marketing survey, divided by gender.

To compare the subjective market survey with an objective measure, i.e. heart rate, a graph with a trend line correlation is shown in Figure 3. Subjects reported the environments caused notable relaxation, and many were pleased with how effective the session was in reducing stress. Objective measures, however, did not always correlate with subjective responses. There are often competing effects when users first encounter virtual environments. For example, novelty can cause heart rates to increase even though patients are relaxed [14]. Future studies may need to measure heart rate variability as a more sensitive measure reflecting physiological balance.
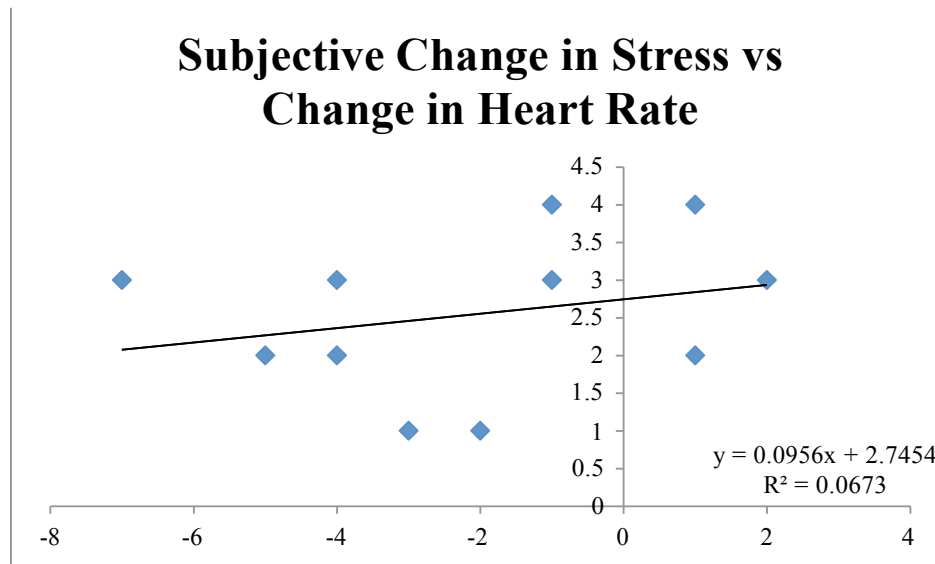
Figure 3. Comparison of subjective self-reports with objective heart rate physiology.

Conclusion

The purpose of this marketing study was to gauge the efficacy of using a mobile application to deliver relaxing virtual reality for psychological stress reduction. Results show that the mobile component of the study was very successful. Not only did participants report that the app was easy-to-use and fun, but also that little help was needed in using the app effectively. A common barrier of VR is that it can be expensive and technically restrictive, but we can conclude with this study that the mobile platform can deliver VR in a cost-effective and accessible manner. The combination of biofeedback and a 3D environment is effective in providing stress relief. Future goals include measuring levels of presence and immersion as well as follow-up studies with different age and demographic groups to further study market penetration for this product.

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Quantifying the Effectiveness of Virtual Reality Pain Management: A Pilot Study

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Abstract. Sensory pathways, consisting of chains of neurons, which spread from the receptor organ to the cerebral cortex, are responsible for the perception of sensations (including pain). In this study, we set out to determine how effective virtual reality (VR) could be in distracting patients from pain experienced through thermoreceptors on the skin. Six healthy subjects were exposed to uncomfortable pain stimuli with and without VR distraction. Subjects reported a drop in pain while in the VR environment, and mean pain rating was significantly lower than the session with no VR distraction. These results indicate that VR distraction can diminish pain experienced by subjects, thus we conclude by eliciting future directions for quantifying effectiveness of VR as a pain management solution.

Keywords. Virtual Reality, pain management, biofeedback, intervention therapy

Introduction

Unlike most somatosensory receptions which are informative, pain is a protective. It can be defined as an unpleasant sensory (or emotional) experience associated with actual or potential tissue damage. In order to experience pain, there is a level of cognitive attention that must be drawn to the painful stimulus [1]. Due to a limited attentional capability, humans can only process so much information at one time. Computer-generated graphical environments, or virtual reality (VR) environments, have been found to reduce performance on divided attention tasks [2]. While preoccupied in a virtual environment (VE), patients have less attentional capacity to focus on incoming signals from somatosensory receptors (including pain receptors). VR distraction therapy is recognized as an interventional method; visual and auditory stimulus presented by VR intervenes on incoming sensations of pain and discomfort.

In addition to providing a distraction to patients, VR can be used in combination with a variety of state-sensing modalities including but not limited to: brain mapping, heart and respiration rate, skin conductance, motion capture, gaze, and others. These modalities provide clinicians and researchers a better perspective of patient state while immersed in a VE.

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The current project's objective was to study how healthy individuals respond to painful stimuli while immersed in a virtual environment. State sensing devices were used to monitor physiological responses to stimuli.

1. Methods

Six volunteers (2 women, 4 men) were recruited through the private practice of Virtual Reality Medical Center (VRMC) to participate in this study. All participants signed an informed consent form and the protocol was approved by an IRB. Participants were exposed to one of two uncomfortable stimuli; thermal pain from placing their hand in a bucket of ice water, or mild electric shock from a TENS unit. First, participants were exposed to the stimuli without any form of distraction (control condition) to determine their normal response to uncomfortable stimulus.

Next, participants navigated through a VR world, Icy Cool World, (Figure 1) using a head-mounted display (HMD). Icy Cool World was constructed to allow the user to navigate a large virtual world containing buildings, stairs, and an open natural environment while listening to pleasant music. The outdoor scenario presents the user with a gentle snowfall and occasional light wind sounds. An indoor environment, consisting of an ice castle with pleasant sound effects such as tinkling of ice and running water complements a color scheme of predominant blues, greens and greys. Visitors to Icy Cool World may shoot laser lights at penguins that are frozen in ice cubes in order to release them. Penguins respond with cheerful sounds after being released.

During each condition, participants rated their perceived level of pain on a 0-10 scale. Participants were also monitored for their physiological response to the stimulus using an electroencephalograph (EEG), electrocardiogram (ECG), skin conductance, abdominal respiration and temperature sensors. At the end of the session, participants rated their overall experience in the virtual world.
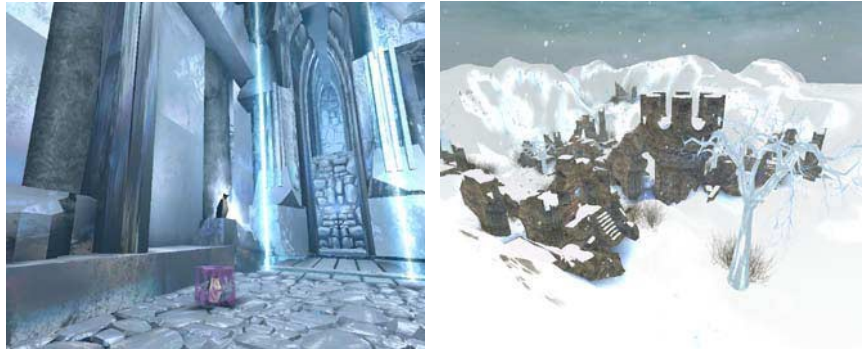
Figure 1. Screenshots of Icy Cool World

2. Results

All six subjects reported a drop in pain while in the VE, and the magnitude of pain reduction from the VR compared to the non-VR condition was significant. Both cold exposure and TENS unit stimulation were effective at generating discomfort in normal subjects at baseline. When participants were allowed to navigate the virtual world, their subjective pain ratings were decreased. The chart below, Figure 2, illustrates mean subjective responses to the two pain stimuli in the VR and non-VR conditions.
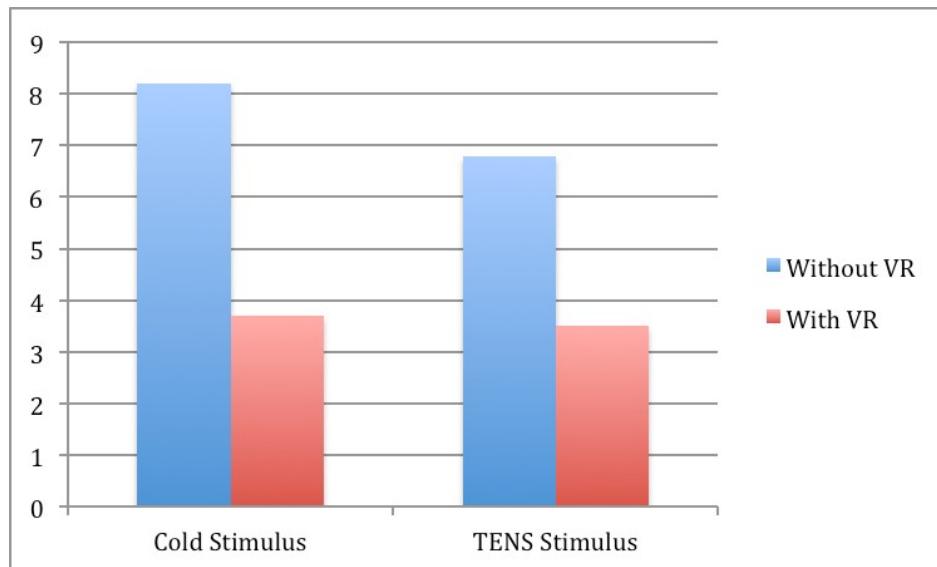
Figure 2. Mean subjective responses to pain stimuli

3. Discussion

The purpose of this pilot study was to establish whether or not a virtual environment could effectively decrease pain ratings when participants were exposed to painful stimuli. We note that both a cold pressor and electrical stimulation pain ratings were effectively decreased with VR distraction. What is interesting is that the reduction in

pain while exposed to a cold ice bath was reduced while navigating scenes from an Icy Cold virtual world. This suggests that virtual content may be less important than the actual experience of navigating in the immersive, interactive environment. We believe that the primary driver of virtual distraction is the level of presence and immersion. What is needed is an objective measure that reliably measures these constructs during experimental and clinical studies.

There were no adverse effects reported by participants while engaged in the virtual environment. These environments are safe and can be used in patients experiencing acute or chronic pain from medical conditions or procedures.

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Parental Mediation and Cyberbullying – A Longitudinal Study

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Abstract. Parents use active and restrictive mediation strategies to guide and regulate children's online participation and the online risks they encounter. However, changes in parental mediation do occur over time and the effectiveness of these strategies on cyberbullying demands for further empirical investigation. The current study addresses these issues with a sample of 1084 students (49% girls) in a longitudinal, three-wave design. Gender differences were tested via multi-group analyses. Longitudinal growth models showed that parental use of both active and restrictive mediation decreased over time. For both types of mediation, the mean rate of change had a significant effect on boys' engagement in cyberbullying, but not for girls. Initial levels of restrictive mediation, but not active mediation, were found to be significantly predictive of cyberbullying in both genders. Girls had higher initial levels of both parental mediation types in comparison to boys. The results reveal that the effectiveness of active and restrictive mediation in relation to students' cyberbullying differs and informs us on gender differences. The implications of these results for parental education in online mediation are discussed.

Keywords. Parental mediation, active mediation, restrictive mediation, cyberbullying

Introduction

Previous research has found that the family acts as a protective factor in youths' engagement in online risky behaviors. In cyberbullying literature, a caring and supportive family environment has been found to be a significant correlate of less engagement in cyberbullying. Parental support is found to be associated with less involvement in cyberbullying [1] and youths who reported cyberbullying are found to be more likely to report poor emotional bonds with parents as compared to other groups of Internet users [2]. Over time, the influence of the family is also evidenced. In a longitudinal study, adolescents who reported greater family social support report fewer incidents of cyberbullying and cyber victimization a year later [3].

1. Parental Mediation

Parental mediation theory postulates that parents employ different and varied parental strategies to mediate the negative effects of media on their children [4]. These strategies are used to prevent or reduce the online risks that children may be exposed to

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in our highly technological society, where the Internet is readily available and easily accessed.

Active and restrictive mediation are two types of parental mediation strategies [4,5]. These mediation strategies have been found to lower adolescents' chances of online risky contact [6] and are associated with lower levels of unsafe Internet behavior [7]. Active mediation refers to parental efforts to actively communicate, evaluate and discuss online content with their children [4]. Youths whose parents discuss Internet safety are equipped to be more conscious of the risks they encounter when surfing the web [8]. Children are supported through active mediation to become critical thinkers of media and to take a proactive role in understanding media [9] and minimizing online risks. Restrictive mediation refers to the regulation of children's behaviors through the setting of rules on online access and content [4]. Restrictive mediation limits the access that children have to the Internet [10] and reduces the incidences of adolescents' online risky behaviors [7].

To the authors' knowledge, no previous work on changes in parental mediation has been done. Active and restrictive mediation have been tested in relations to online risky behaviors but as parents adjust their strategies over time to be attuned to children's development and growth, these changes in their active and restrictive mediation over time have not been looked into.

Thus, the current study aims to test the changes in active and restrictive mediation over three years and the effects of these changes on students' engagement in cyberbullying in the third wave. Gender differences are also tested via multi-group analyses.

2. Method

Data were collected through questionnaires from 1084 students (49% girls) aged 10 to 17 at wave 3 of a longitudinal, three-wave design. Active mediation was measured in terms of parental guidance and communication with regard to children's risky online activities such as the disclosure of personal information online and dealing with cyber bullies. Restrictive mediation was measured in terms of the rules parents set on children's online content, activities and time. Responses for both active and restrictive mediation were made in dichotomous categories (yes/no). Cyberbullying was measured by three indicators whereby students were asked if they had made rude comments (Rude), spread rumors (Rumors) or made aggressive and threatening comments (Threat) online in the past 12 months. Their responses were made on a 5-point scale from "Less than few times in the past year" to "Everyday/Almost everyday".

3. Results

The correlations in Table 1 revealed that active and restrictive mediation shared positive associations across three years. Active mediation was negatively associated with the three indicators of cyberbullying. Negative associations were also obtained between restrictive mediation and the indicators of cyberbullying.

Longitudinal growth models were tested for active mediation (Figure 1) and restrictive mediation (Figure 2). The fit indices of both models were found to be satisfactory.

Table 1. Zero-order Correlations among the main Variables

	Rude	Rumours	Threat	W3 Active	W2 Active	W1 Active	W3 Res	W2 Res
Rude	1							
Rumours	.54**	1						
Threat	.64**	.66**	1					
W3 Active	-.15**	-.09**	-.13**	1				
W2 Active	-.09**	-.08**	-.11**	.48**	1			
W1 Active	-.06*	-.04	-.06	.31**	.36**	1		
W3 Res	-.16**	-.12**	-.14**	.34**	.28**	.13**	1	
W2 Res	-.14**	-.12**	-.14**	.26**	.31**	.20**	.42**	1
W1 Res	-.13**	-.11**	-.12**	.20**	.25**	.25**	.34**	.46**

*p<.05, **p<.01
Note: Res – Restrictive mediation, W1 - Wave 1 data collection, W2 – Wave 2, W3- Wave 3

For active mediation (Figure 1), a decreasing mean rate of change was found for both genders over the three waves. The decreasing rate of change in active mediation had a negative effect on cyberbullying at W3 for boys but not for girls. This indicates that the steeper the decrease in active mediation, the more likely boys engaged in cyberbullying behaviors. Girls experienced a higher initial level of active mediation as compared to boys. However, initial levels of active mediation were not significant predictors of cyberbullying behaviors for both genders.
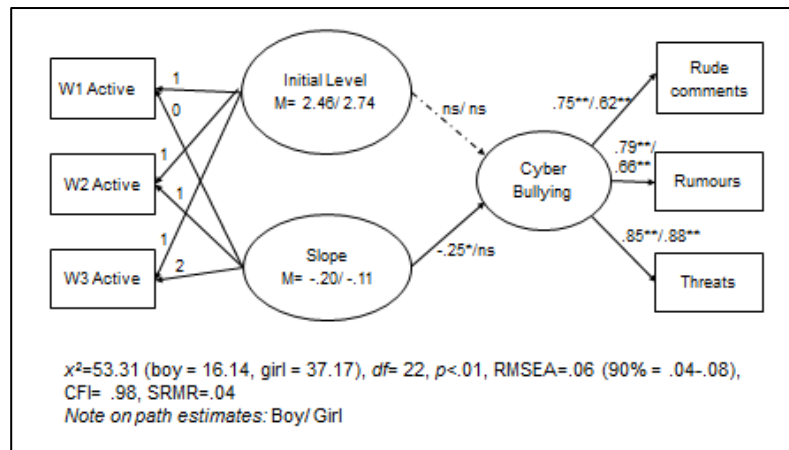
Figure 1. Longitudinal growth model of Active Mediation for boys and girls

For restrictive mediation (Figure 2), the results also showed a decreasing mean rate of change for both genders over the three waves. The decreasing rate of change in restrictive mediation had a significant negative effect on cyberbullying for boys but not for girls. This indicates that the steeper the decrease in restrictive mediation, the more

likely boys engaged in cyberbullying behaviors. Girls experienced a higher initial level of restrictive mediation as compared to boys. For both genders, initial levels of restrictive mediation exerted negative effect on cyberbullying behaviors.
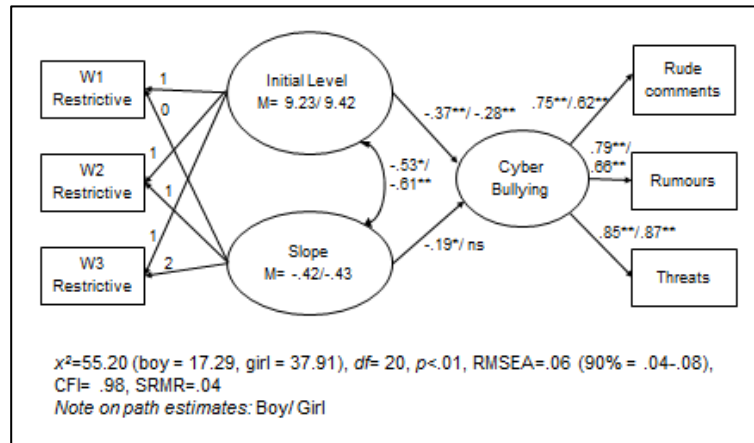
Figure 2. Longitudinal growth model of Restrictive Mediation for boys and girls

4. Discussion

The results revealed that parental use of active and restrictive mediation reduced over time. This provides empirical longitudinal evidence that as children get older, parents begin to reduce their online mediation. This reduction may be attributed to parental trust in the growing adolescent and also the gradual maturation of children's social cognitive capacities. In line with previous literature, girls received higher levels of parental mediation as compared to boys [5].

It was also found that the steeper the decrease in active and restrictive mediation, the more likely boys engaged in cyberbullying behaviors, but these effects were not shown for girls. This gender difference may indicate that changes in parental online mediation for boys should be more gradual over time as boys appear to be more likely to engage in cyberbullying with inadequate parental supervision and guidance.

The results showed that initial levels of restrictive mediation were found to have negative effects on children's cyberbullying behaviors but this was not found for active mediation. Restrictive mediation reduces children's online use and access [10], which may in turn reduce children's opportunities to cyberbully. Children are clear about the boundaries set by their parents and may also develop better self-regulatory skills. However, the use of restrictive mediation has to be attuned to children's growth as older adolescents tend to react poorly to such controlling strategies. In one study, this form of mediation was demonstrated to be counterproductive, such that the more parents attempted to restrict children's internet usage, the higher the number of online risky behaviours children engaged in [11]. Active mediation had no significant effect in this study but previous work has shown that as children age, the effectiveness of restrictive mediation may decrease while active mediation may be more effective [6]. More research is needed to ascertain the necessity of active mediation as an effective strategy in relation to cyberbullying.

These findings imply the significance of informing parents on the use of parental online mediation and the effects of the changes in their mediation strategies over time. Parents should be made aware of the importance of restrictive mediation in relation to decreasing cyberbullying acts but excessive use of restrictive mediation should not be encouraged as this may negate its effectiveness as children get older. Nevertheless, it is vital that parents monitor and set limits on their children's online access and use.

In terms of gender differences, the results suggest that the tapering off in parental online supervision over time should be more gradual for boys. The authors acknowledge that this finding has to be further established as there may be other confounding variables of contextual and dispositional factors which were not tested in this study. Nonetheless, parents should be made aware that a steeper decrease in parental mediation over time can have negative effects on their children's engagement in cyberbullying.

In conclusion, this study provides evidence for the decrease in parental mediation strategies with longitudinal data and informs on gender differences with regard to these strategies on cyberbullying behaviors. More research is warranted in this area as it is only in a more fine-grained understanding of change and its effects that educators and policy-makers can ensure that the dynamics of online parental mediation is adequately captured.

Acknowledgements

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Cognitive Assessment of Stroke Patients with Mobile Apps: A Controlled Study

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Abstract. Stroke is a major cause of cognitive impairments. New technologies such as virtual reality and mobile apps have opened up new possibilities of neuropsychological assessment and intervention. This paper reports a controlled study assessing cognitive functioning through a mobile virtual reality application. Fifteen stroke patients recruited from a rehabilitation hospital and 15 healthy control subjects underwent neuropsychological evaluation with traditional paper-and-pencil tests as well as with a pilot version of the Systemic Lisbon Battery (SLB). The criterion validity was the performance of stroke patients vs. healthy controls – which was lower both on the neuropsychological tests and on the SLB for patients. The pattern of correlations between neuropsychological tests and the SLB sub-tests for the respective dimensions showed overall moderate correlations in the predicted directions. We conclude that the SLB applications were able to discriminate the dimensions that they were designed to assess.

Keywords. Stroke, cognitive stimulation, assessment

Introduction

The World Health Organization estimates that every year 15 million people have a stroke, causing the death of 5 million and the permanent disability of another 5 million people [1]. Another 1/5 of stroke victims can expect to suffer cognitive impairments of some sort [2]. Stroke is responsible both for these cognitive impairments and for motor deficits resulting from brain damage, which affects more frequently the parietal, frontal, midbrain or brainstem structures and may reflect in language, attention, memory and executive dysfunctions, with a significant impact on daily-life activities [2].

A growing body of research suggests that information and communication technologies (ICT) have an increasingly important role to play in the neuropsychological rehabilitation of patients with acquired brain injury [3]. One technology has made a particularly relevant contribution: virtual reality (VR). The use of VR applications in health care has been progressing steadily and is now a well-established reality. Research on VR-based interventions on patients with mental or

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physical dysfunctions has been accumulating since the late 1990s, and the overall results of this research suggest that VR technology improves the quality of physical and mental health care while reducing its cost, and is thus both a viable and a valuable option to consider when treating mental or other physical conditions that lead to disability [4].

VR applications for cognitive training purposes have several advantages. Two of these are paramount. First, repetition and visual and auditory feedbacks can be systematically manipulated according to individual differences and needs. Second, they address the need to engage patients' motivation to perform their prescribed exercises better than conventional methods: mainly because VR is usually presented on a multimodal platform with immersive cues such as images and sounds [5], and also because training is perceived more as a game and less as a task [6].

Underlying these two advantages is the naturalistic aspect of VR environments. This aspect is also crucial when it comes to neuropsychological assessment. The validity of traditional neuropsychological assessment, namely of paper-and-pencil tests used to assess cognitive functions, is limited, as they do not effectively replicate the daily life activities in which patients' impairment is patent [7,8]. The current study tests the neuropsychological validity of an assessment approach that effectively enhances the ecological validity of tests by taking advantage of new technologies to reproduce daily-life activities in realistic settings. We developed several 3D interactive exercises in a mobile VR setting to assess the major cognitive functions in stroke patients. Thus, the main objective of this study was to assess the underlying cognitive dimensions in each of these VR exercises.

1. Method

1.1 Participants

15 stroke patients older than 18 and younger than 60 years old (9 male; *Mage* =45.5 years old; *SDage* = 12.3; 10 years of formal education) were recruited from a medical center for cognitive rehabilitation 3 to 12 months after sustaining injury, and were submitted to assessment stimulation during their inpatient stay at the hospital, and 15 age and education-matched healthy volunteer controls were recruited from the community (universities and companies) and were assessed in a university laboratory setting. Participants with prior psychiatric disorders, drug addiction, severe depression, or dementia were excluded.

1.2 Procedure

Participants were submitted to traditional neuropsychological evaluation with paper-and-pencil tests, along with a pilot version of the Systemic Lisbon Battery (SLB). The traditional tests used in neuropsychological assessment were: (1) the Wechsler Memory Scale – WMS [9] for memory ability; (2) but also the Rey Complex Figure – RCF [10] for memory and visuospatial ability; (3) Cancelation Tests – CT [11] for focused attention; (4) Frontal Assessment Battery – FAB [12], the Clock Drawing Test – CDT [13] and the Trail Making Test – TMT [14] for frontal lobe functions; (5) and the Mini-Mental State Examination – MMSE [15] for general cognitive ability. The dependent variables consisted on total scores and execution times (measured in seconds).

After this assessment, both groups trained for 10 minutes to acquire interaction familiarity with the mobile devices used for the SLB for 10 minutes, before being submitted to 60-minutes sessions of VR-based cognitive assessment with the Systemic Lisbon Battery. The SLB exercises comprised several daily life activities designed to assess cognitive functions such as: planning (i.e., Wardrobe Test), memory (i.e., Memory Test), visuospatial ability and attention (i.e., Virtual Kitchen Test), and working memory and calculation (i.e., Shopping Test). The hardware used to perform the exercises consisted of Samsung Galaxy 10.1" tablets. The applications were developed using Unity 2.5 (Unity Technologies[TM]), and their alpha and beta versions had been previously tested by a group of students, and are freely available at:

http://copelabs.ulusofona.pt/scicommons/index.php/publications/show/533

Figure 1 depicts some of the tasks that comprise the Systemic Lisbon Battery (SLB).

Figure 1. Wardrobe Test (top-left); Memory Test (top-right); Virtual Kitchen Test (bottom-left); Shopping Test (bottom-right)

2. Results

Our aim was to investigate the cognitive domains involved in each sub-test of the SLB. The criterion validity of the SLB was tested with three different parametric statistics. First, t Student tests (Table 1) showed poorer performance of stroke patients than controls on both the neuropsychological tests and the SLB ($p < .05$).

Table 1. Comparisons between patients vs. controls on neuropsychological testing

DVs	Patients	Controls	t	p
MMSE total score*	27.40(3.02)	29.87(.51)	-.3.119	.007
WMS total score*	50.93(11.86)	61.40(11.32)	-2.471	.020
FAB total score*	13.20(3.16)	16.30(3.18)	-2.531	.017
RCF total score*	23.60(9.70)	31.87(2.66)	-3.182	.004
RCF execution time (s)	196.53(94.95)	149.27(46.41)	1.729	.099
CDT execution time (s)*	77.60(33.61)	39.00(25.29)	3.554	.001
CT execution time (s)*	44.47(24.87)	22.07(9.69)	3.249	.003
TMT execution time (s)*	199.93(139.58)	82.47(50.00)	3.068	.005
SLB1 errors*	.40(.50)	.00(.00)	3.055	.005
SLB1 execution time (s)	124.5(45.60)	107.7(40.03)	1.072	.293
SLB2 errors*	10.7(5.80)	4.7(4.53)	3.135	.004
SLB2 execution time (s)	119.4(10.85)	115.0(15.93)	1.066	.295
SLB3 errors*	.93(.79)	.27(.59)	2.594	.015
SLB3 execution time (s)*	42.87(31.53)	22.13(17.60)	2.223	.034
SLB4 errors*	6.73(3.91)	1.53(1.64)	4.741	.000
SLB4 execution time (s)*	1030.67	508.37	4.168	.000

Legend: * significant at .05 alpha level. In brackets (standard deviation); SLB1 – Wardrobe sub-test; SLB2 – Memory game; SLB3 – Virtual Kitchen Test; SLB4 - Shopping

Second, the pattern of Bivariate correlations (Pearson's *r*) between neuropsychological tests and SLB sub-tests revealed systematic moderate correlations in the predicted directions. Third, a series of multiple linear regression analyses with stepwise method were run to identify the traditional tests that best predict performance on each of the SLB measures. The best unique predictors of each SLB measure are reported in Table 2 with respective standardized effect sizes (W).

Table 2. Multivariate linear regression analysis to evaluate the best predictors of each SLB sub-test

DVs	Adjusted r^2	Predictors	ß
SLB1 errors	0.47	RCF execution time	0.50
		MMSE total score	-0.48
SLB1 execution time	0.20	TMT execution time	0.47
SLB2 errors	0.33	WMS total score	-0.59
SLB2 execution time	0.24	WMS total score	0.52
SLB3 errors	0.35	CDT execution time	0.61
SLB3 execution time	0.17	CDT execution time	0.44
SLB4 errors	0.61	FAB total score	-0.46
		CT execution time	0.33
		CDT execution time	0.31
SLB4 execution time	0.77	TMT execution time	0.88

Legend: SLB1 – Wardrobe sub-test; SLB2 – Memory game; SLB3 – Virtual Kitchen Test; SLB4 - Shopping

Conclusions

Assessment of cognitive functioning through ecologically anchored and motivationally engaging tools, such as VR-based applications, is clearly advantageous. We report a study assessing the neuropsychological validity of a VR-based protocol designed to assess several sub-domains of cognitive functions: the Systematic Lisbon Battery (SLB). Overall, the SLB was able to successfully discriminate the dimensions that it was designed to assess. More specifically, the comparisons of performance in the SLB and traditional paper-and-pencil tests between stroke patients and controls, as well as

the pattern of correlations between the measures of both tests, suggest that the SLB is able to identify the same cognitive deficits in stroke patients that traditional paper-and –pencil tests identify. In sum, these preliminary data on SLB point towards the prospect of using VR tasks that replicate daily life activities as a viable alternative to the traditional paper and pencil tests.

Further studies with clinical samples of brain injury patients are however needed in order to study the application of the SLB in other contexts of cognitive impairment. For example, it will be of interest to understand if the SLB is able to differentiate between different degrees of cognitive functioning, such as those related to a focal brain injury or a more global dysfunction resulting from a neurodegenerative condition.

Other limitations in the current study need to be addressed. The main limitation was related to the concurrent neuropsychological measures used in our study to assess frontal lobe abilities. We used the CDT, the TMT and a more global test, the FAB. In subsequent studies, frontal lobe assessment should be extended to executive functions, which can be evaluated using, for example, the Wisconsin Card Sorting Test (a test of cognitive flexibility); the Tower of London (which measures planning ability); or the Iowa Gambling Task (to assess decision making).

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What Do We Mean by Social Networking Sites?

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Abstract. The purpose of this study was to explore people's conceptual understanding of Social Networking Sites (SNSs) through exploring the combined use of a range of popular SNSs, including Facebook, Twitter, Myspace, Instagram, Tumblr, LinkedIn and Google Plus. Seventy-three adults, aged 18 to 63, participated in an online survey that used open-ended questions to ask how participants define and use different SNSs. Four themes were identified, including the explicit presentation and interpretation of different selves, the love-hate relationship with SNSs, privacy and danger concerns, and limited SNS knowledge. The findings from this study suggest that researchers need to consider how people use SNSs in combination as this influences the decisions people make about which SNS accounts they use and how they present themselves on these sites.

Keywords. Social networking sites, qualitative research, definition, Facebook, Instagram, Twitter

Introduction

Users of social networking sites (SNSs) frequently have more than one SNS account. However, a limitation in the current SNS literature is the tendency to focus on Facebook as a representative SNS, while other popular SNSs such as Twitter, Instagram, Myspace, Tumblr, LinkedIn and Google Plus receive less attention from researchers despite the fact that each of these SNSs offer different opportunities to users for social interaction.

Furthermore the conceptualisation of SNSs from the users' perspective is rarely investigated by researchers. For example, when asked about SNS use, participants are commonly prompted to select options from a list of possible uses (e.g., 'to keep in touch with old and current friends', 'to post or look at photos', 'to make new friends') rather than offering their own unprompted reasons [2]. The purpose of this study was to qualitatively explore people's conceptual understanding of Social Networking Sites and investigate the entirety of an individuals' SNS experience by focusing on the combined use of a range of popular SNSs.

1. Method

1.1 Participants

The total sample consisted of 72 participants, including 49 females and 22 males (1 participants did not report their sex). Participants were aged between 18 and 63 with a median age of 24 years.

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1.2 Procedure

Participants were recruited through social media advertising and snowball sampling to complete an online survey. The online survey asked participants about how they define SNSs such as Facebook, Twitter, Myspace, Instagram, Tumblr, LinkedIn and Google Plus, if/why they use these sites, who they think these SNSs are primarily for, and basic demographics. The survey took approximately 30 minutes to complete. The survey protocol was approved by the University's Human Ethics committee.

2. Results and Discussion

A general qualitative research framework was used to analyze responses to a series of open-ended questions asking participants about which SNSs they use and how they use them. Seven SNSs were specifically investigated, namely Facebook, Twitter, Instagram, Myspace, Tumblr, LinkedIn and Google Plus.

Only 5 participants in this study did not have a Facebook account. Of these 5, one had a LinkedIn account, one had a twitter account and a Google Plus account, one had a Google Plus account and one participant did not have any of the accounts we were studying. The 67 remaining participants all had Facebook accounts. Of these, 44 also had an Instagram account, 22 had both Instagram and Twitter, 15 had Instagram and Tumblr and 10 had Instagram, Twitter and Tumblr. Only 5 users of Twitter did not also have an Instagram account. There were 25 users of LinkedIn, and all were older than the median age of 24. Of these, 10 also used Instagram, 7 also used Twitter and 3 used both. In this study, neither Myspace nor Google Plus seemed to be widely used.

When asked to define a SNS, there was consensus across all participants that SNSs were Internet based websites or applications predominantly for communication and sharing information with friends, family or acquaintances. There was an overall belief that SNSs were "*supposed to reflect your identity*" by "*showing people what you're up to*" and "*seeing what they're up to*", suggesting that participants were conscious of their SNS profile having an audience and being open to social feedback and reciprocation. There was very little mention of SNSs presenting an opportunity to meet new people, and most participants commented on knowing their online networks in areas of their offline lives. It should be noted that we did not include any popular online dating services such as RSVP and eHarmony as examples of SNSs and none of our participants suggested that such dating sites fell within their conceptualization of SNSs.

When defining SNSs, many participants referred to SNSs with concepts that would describe a physical location rather than a form of communication alone, with comments like "*a place*" or "*somewhere people go to…*". When asked why someone would use a SNS, there was a sense that participants felt that they needed these sites to stay involved with the social world with comments such as, "*I don't think you can get away with not having them*". Communication was the primary reason, followed by "*to keep in touch*" and "*stay updated*".

Second to these primary uses of communication, were comments about 'showing off' stemming from a perception that 'others' might use SNSs to "*have far more control over the way* [they] *represent* [themselves] *to others. In real life, we struggle to hide our flaws - where on the internet we choose what information to display and what to hide. We can present ourselves more favorably*". Comments such as this and "*to*

overcome self confidence issues as communicating behind a screen can sometimes be easier than a face to face conversation", might suggest that these perceptions of why other people use SNSs are also likely to be the reasons participants themselves use SNSs.

When asked to list down a range of SNSs that they knew of, while most responses included the SNSs included in this study, many also presented with confusion over what defines an SNS, with comments like, "*does that count?*", "*or is that just an app?*" and "*actually I don't know if that counts*". It is therefore quite clear that, while most people have a general idea that SNSs and social media are for social interaction, there was no consensus within this sample of what constitutes the defining and exclusionary criteria for a SNS "genre". While this might suggest a lack of knowledge about SNSs in general, the responses to questions about characteristics of individual SNSs demonstrated that many participants understood how to use these sites, but were just not sure of the "correct" terminology to use when describing them.

Theme 1: Different SNS, Different Self
Most participants explicitly acknowledged that they used each SNS differently, or for a different purpose, depending on who they considered their audience, or friendship list, to be. Participants indicated that they post different material to each SNS and use different SNSs to highlight different aspects of their life.

"Facebook represents my life as a whole, Twitter for current events, Instagram for my photos and LinkedIn is my professional side"

"I use them differently from each other. Facebook – for communicating with others, some photo sharing, Twitter – for sharing my feelings or ideas, Instagram – seeing what others are up to, photo sharing"

"I find Facebook more formal now, than Instagram. If something significant happens in my life I will update it to Facebook - as it contributes to the profile of my life that older people or employers can see when they stalk me. Instagram is more casual, everyday events that make a good picture"

Theme 2: The Love Hate Relationship with SNSs
There was ambivalence in responses when prompted to discuss SNSs in a broad sense as a lot of the responses were negative, and people openly expressed their dislike towards these sites as whole with comments such as "*a big time waster*" and "*concentrated vileness and idiocy*". Very few participants discussed these sites positively, although the continued use of these sites (median time per day on Facebook in this sample was 60 minutes) is in direct contradiction to the expressed negativity. It seemed that even though people are aware of how much they use these sites, and the extent to which they rely on these sites for communication purposes, there is widespread ambivalence about SNS use.

There was a sense in the data that participants feel a degree of social pressure to maintain an SNS presence due to a fear of missing out on events, updates, or friendships.

"I would love to cancel my accounts if it weren't for the missed parties and freelance work available"

"Life would be a lot less complicated if these sites didn't exist"

The love/hate relationship with SNSs is captured in the words of one 34-year old female participant who described SNSs as "*fun, annoying, addictive and handy*".

Theme 3: Limited SNS knowledge

Participants in this study expressed a lack of knowledge about SNSs, and comments such as "*I have no idea*" and "*I don't know*" were extremely common when asked to describe a SNS that they were a member of. Irrespective of the fact that they log on to these sites daily and are likely to upload personal information and photographs, an awareness of these sites that goes over and above a mere description of functionalities they used was absent in this participant group. These data suggest that researchers should be cautious about attributing broader social motivations to participants who use SNSs as it appears that most people do not have sophisticated mental models of SNS and social media to inform their media choices. Rather, they make pragmatic choices to use SNS functions that have immediate utility in their current social world.

Interestingly, many of the comments by participants aged over 25 years referred to SNSs as sites for "*young people*" or "*teenagers*". It was also the older participants that were more dismissive of their own heavy usage of SNSs and justified their lack of knowledge about SNSs by saying that these sites were for younger people. Usage data captured in this study, however, did not see great amounts of difference in SNS usage between the younger or older participants.

"I really don't understand these sites at all!"

"I don't know much about social networking sites, just the fact that you are able to share personal information about yourself and have the ability to talk to people at your own leisure"

Theme 4: Privacy Concerns/Danger Awareness

The participants in this study responded to the questions asked with many references to the potential these sites or applications had to being dangerous, with many participants citing the example of cyber-bullying.

"They are popular amongst the younger generations and have the potential to be dangerous"

"Social networking has also become a large risk/danger in damaging teens and young adults' mental state and self-confidence due to cyber bullying"

Also many participants were concerned about privacy and usage of their personal information making claims such as *"Facebook owns everything",* but despite the perceptions of risks relating to danger and privacy, this did not appear to stop their involvement with SNSs. In fact, concerns of danger tended to be expressed as concerns for younger people, suggesting that the participants themselves did not feel personally vulnerable to SNS danger, but were more aware of potential damage to their own privacy.

Conclusion

The purpose of this study was to qualitatively explore participants' conceptual understanding of SNSs and to investigate the combination of different SNS use. The findings from this study suggest that currently, while Facebook is indeed the quintessential SNS, most of the participants in this research also use other SNSs in combination with their Facebook account. This is an important finding given the recent anecdotal evidence of people turning away from Facebook and deleting their accounts [3]. In this study, Instagram, Twitter, LinkedIn and Tumblr followed as the next popular SNSs, with Myspace (originally targeted at teenagers, and now rebranded as a music band site) and Google Plus (targeted at more technically-sophisticated user base) hardly being used.

When asked to define SNSs, most participants listed specific functionalities of the sites they already used rather than providing a more generic, conceptually-based definition. Communication was the primary focus of answers to all of the generic SNS questions, suggesting that this is the main reason people rely on these sites so heavily. The participants in this study explicitly acknowledged and were aware that they used each of these sites slightly differently and tailored the material they uploaded on their SNS accounts, depending on who they were considering to be their audience, suggesting implicit awareness of identity management of their online presence. The data suggested that within this sample, participants use Facebook as a primary method of communication with people known in their offline lives, Instagram as a photo-sharing tool of events happening in their every-day lives, Twitter as a news-source (be it news conceptualized as world events, celebrity news or personal news) and Tumblr as a blogging site that is less restricted in content type than the other SNSs studied.

It was concluded that the adult participants in this study tended to use multiple SNSs and display different material or aspects of their lives on each site, depending on their awareness of who it was they were interacting with. Despite an ambivalence towards SNSs, participants expressed concerns about privacy and risks to young people using SNSs, but these concerns did not appear to deter them from ongoing SNS. The next phase of our research will be to examine the conceptualization and use of SNSs by adolescents.

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Online Perspective-Taking as an Intervention Tool Against Cyberbullying

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Abstract. This study will examine the use of an online role-playing experiment as a cyberbullying intervention tool. The study will be carried out among 14 – to 18-year old adolescents (*N* = 200). Respondents will be assigned a fictitious character and a role (perpetrator, victim or bystander) in a cyberbullying situation. They will be asked to identify with this character and act accordingly in an initiated mock, but realistic online bullying situation. We expect, based on role playing literature and bullying prevention programs, a positive change in the adolescents' behavioral intentions (e.g. defending a victim).

Keywords. Cyberbullying, intervention, role-play, behavioral intentions, Empathy

Introduction

Nowadays, cyberbullying, or bullying through electronic devices and digital platforms, is a common form of bullying amongst adolescents (12-18 year olds) [1]. Cyberbullying has potential harmful implications for victims. It can result, amongst others, in depression, low self-image and even suicidal behavior [2]. Bullies, in turn, have a higher chance of showing delinquent behavior at a later age. Exploring efficient ways to prevent this kind of digital harassment is therefore vital and can benefit all parties involved: victims, bystanders and bullies.

The recently initiated 'AMiCA' project (Automatic Monitoring for Cyberspace Applications, http://www.amicaproject.be) aims at detecting possible threatening situations on social networking sites (SNS) by means of automatic text and image analysis. The target group of this project is the adolescent population of secondary schools (12-18 year olds). The present study will be conducted as part of the AMiCA project and includes a role-playing experiment in which adolescents will be asked to adopt a specific role in a mock, but realistic, cyberbullying situation. The objective of the current study is twofold. First, the role-playing experiment will be used as a tool for gathering (examples of) language use in cyberbullying situations, which in turn will be used for machine-learning purposes. Second, the potential of the role-playing experiment as an intervention tool against cyberbullying will be investigated. In particular, we set out to explore whether playing one of the three most common roles in cyberbullying situations, victim, perpetrator or bystander, in a mock, 'as if', but realistic setting, affects the behavioral intentions of adolescents towards cyberbullying.

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In this paper we only describe the second objective of the study and aim to answer the following central research question:

CRQ: How does an online role-play experiment influence the behavioral intentions of the adolescent towards cyberbullying?

1.1. The role-playing experiment

Role-playing is an intervention method similar to perspective-taking. The definition of role-playing was given in 1968 by Aronson and Carlsmith [3, p. 26]: "An 'as-if' experiment in which the subject is asked to behave as if he were a particular person in a particular situation." Taking on perspectives of others can lead to an increase in overlap between the self and the other and forces people to watch and evaluate their own behavior through the eyes of someone else. Whether the other is a real person or a fictitious character, perspective-taking can lead to changes in behavior [4]. Various psychosocial experiments conducted by Jeremy Bailenson, amongst others, implement role-playing experiments in a virtual setting, whereby the respondents have to empathize with an avatar and act like this character in a given situation [4]. Bailenson reports that even an imposed, brief, role-playing experiment can affect a person's behavior related to certain phenomena (e.g. pro-environmental behavior, pro-social behavior and the reduction of negative social stereotyping) [4].

The implementation of role-playing experiments is a method that has already been applied successfully in traditional bullying studies and bullying intervention programs (e.g. the well-known KiVA-program) in order to change the behavioral intentions of children and youngsters towards bullying [5]. This study will apply this approved method to the context of cyberbullying. In particular, we will investigate whether the act of empathizing with the actors in a cyberbullying situation, by means of role-play, changes the behavioral intentions of adolescents in order to prevent/reduce cyberbullying and increase victim-defending behavior.

1.2. Roles in Cyberbullying Situations

Within the context of cyberbullying, actors can adopt the role of perpetrator, victim and bystander [1, 2]. Bystanders can be either active or passive. The latter participate actively in cyberbullying situations, through either supporting the perpetrator or defending the victim. Since textual input is a requisite for analysis in the present study, all bystanders will be asked to actively participate in terms of replies, likes and status updates. Depending which communication tool (e.g. status update, direct chat) used, cyberbullying situations on a SNS are often visible to a broad audience. Thus, bystanders are a large group in a given cyberbullying situation. Furthermore, the reactions of bystanders might influence the actions and reactions of the perpetrator, victim and other bystanders, in both positive and negative sense [1].

1.3. Different Types of Cyberbullying

The characteristics of cyberbullying are closely related to those of traditional bullying. Generally, three key features define cyberbullying: power imbalance, intention to harm and repetition of negative online actions [1]. The focus of the present study will be on the act of cyberbullying in a direct manner (i.e. the victim is directly involved) and in

the presence of bystanders. Vandebosch and Van Cleemput [7] describe four different forms of direct cyberbullying: threatening, insulting, hindering and ridiculing someone. The different cyberbullying scenarios in the pre-test will be designed according to these four categories.

2. Method

The study will consist of a role-playing experiment on an online social networking platform. A mock social networking platform is created and will be monitored by the experiment leader. Prior to the experiment, each respondent will receive a character sheet and will be asked to closely read the character description and identify with the described character. The study will be carried out in groups of six adolescents, consisting of a single perpetrator and victim and four bystanders. Afterwards, the respondents will be asked to log in into the mock social networking platform with their character's account and react and behave accordingly to his or her character. Two cyberbullying situations, varying in perceived severity, will be initiated through an automated status update by one of the characters. The status updates initiating the role-play will be derived from literature [1, 8] and real-life examples. In addition, they will be evaluated in a pre-test in which the scenarios will be assessed in terms of realism and perceived severity. Thus, two groups of scenarios will be discerned: cyberbullying situations with low- and high-perceived severity.

2.1. Materials

SNS accounts of fictitious characters will be used. The fictitious characters will have an identifiable account (i.e. not anonymous) on the SNS. Thus, all messages sent by the characters will be traceable to the character, but not to the respondent. The assignment of characters among adolescents will not be concealed to the adolescents during and after the experiment. This way, potential cyberbullying of the respondents instead of the characters is prevented.

Figure 1 shows an example of a character sheet that will be presented to the respondents at the start of the experiment. We choose to work with avatars instead of real photos. Bailenson suggests that the use of avatars can be strategically important, in order to suppress certain features and non-verbal signals [4]. Moreover, the use of avatars prevents emotional reactions of the respondent towards the appearance of their character. The characters will correspond to the respondents' age and gender. The character sheet will show various objective user data, for example residence, school and name. Apart from those factual characteristics, a summary of the (recent) events in the life of the character will be provided, as well as a description of the relationship the character has with the other characters in the experiment. The character sheet will also show the role of the character in the cyberbullying situation (perpetrator, victim, bystander supporting the victim, bystander supporting the perpetrator) and the log in details for the SNS. Prior to the experiment, the respondents will be given sufficient time to read, study and empathize with their character. The character sheet will remain with the respondent throughout the experiment and thus can be revisited at any time.

The social media platform is specifically designed for the experiment and will run on a private server with all the functionalities of the most popular SNS 'Facebook'. The platform will be given the 'look and feel' of Facebook, by using the same color palette

and fonts. This way, we hope to create a sense of familiarity and make the adolescents feel at ease on the platform (See Figure 1).

Figure 1. Example of a character sheet and a conversation on the SNS.

Several precautions will be taken in order to prevent unintended harm caused by playing and experiencing a cyberbullying scenario. We will actively cooperate with the school to select non-cyberbullying victims as respondents for the study, a 'Quit Experiment'-button will be added to the platform and a direct chat-channel with the experiment leader will be provided to the respondents. This study received ethical approval from the Ethical Review Board of the University of Antwerp (Belgium) on 07/02/2014 (reference: SHW_13_11_03).

2.2. Respondents

The experiment will be carried out among 200 adolescents, aged 14 to 18 years old. According to the developmental psychologist Selman [6], at the age of 14, people are fully developed in terms of perspective taking. Variation in region and in educational level will be taken into account.

2.3. Measures

We will measure dependent variables, personal characteristics, and demographics. The respondents will be asked to fill out a survey twice; before and after the experiment. Before the actual role-playing experiment we will collect the following measures: (1) the individual trait 'empathy' and (2) behavioral intentions as a bystander in a cyberbullying situation [5, 11]. Behavioral intentions as a bystander will be measured by presenting a screenshot of a pretested high- and low severity cyberbullying situation to the respondent. Three possible bystander actions are assessed based on the theory of planned behavior: doing nothing, supporting the perpetrator and defending the victim. Respondents will be asked to rate these actions in terms of behavioral beliefs, normative beliefs, control beliefs and behavioral intentions [11]. After both role-playing experiments, respondents will complete a survey that assesses the perceived severity of the experienced cyberbullying scenario and to which degree they found it easy to empathize with the character and the situation.

Following the second and last role-playing experiment, behavioral intention as a bystander of a cyberbullying situation is measured a second time. A different set of two pre-tested cyberbullying situations will be shown. The order in which the two sets of

screenshots will be presented is randomized. Also the emotional reaction of the respondents towards the high-perceived severity role-playing exercise will be assessed through SAM-scales and open-ended questions. Finally, the respondents' real-life experience with the roles of perpetrator, victim and bystander in cyberbullying situations will be assessed both in terms of expressed reactions as a bystander and frequency of adopting the particular role. The questionnaires will be carried out on a PC and will employ validated self-report scales.

2.4. Analyses and expected results

The experiment will be carried out early 2014. Data and results will be available at the time of the conference.

With this study, we aim to explore the online role-playing experiment as a potential, strong intervention tool against cyberbullying through investigating changes in behavioral intentions towards direct cyberbullying on SNS. The impact of the role-playing experiment on the results will be measured in terms of perceived realism and ease to empathize. Finally, prior experience with cyberbullying, demographic factors and the individual trait 'empathy' will be taken into account.

We expect that the role-playing experiment can positively change the adolescents' behavioral intentions with respect to possible future cyberbullying incidents. This positive behavioral modification can be expressed by a decrease in the intention to perform cyberbullying behavior and/or an increase in the intention to defend the victim.

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Grief Support Groups in Second Life

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Abstract. Online grief support groups serve as an avenue of support for the bereaved. In the past, facilitators have criticized the ability to provide group participants with a sense of therapeutic support, given the lack of face-to-face interaction in online groups. However, with the growing technological advances, 3-D virtual worlds, such as Second Life, may increase a participant's sense of presence and improve their group experience. A web-based survey was utilized to explore facilitator attitudes towards grief support groups in Second Life.

Keywords. Grief, online support groups, Internet-based group, Second Life

Introduction

The importance of social support is well-documented in helping individuals cope with physical and mental health related stressors [1-3]. Support groups are commonly offered interventions aimed to provide education and positive coping strategies to several individuals at once. The format of support groups can differ greatly, as groups vary in their structure, length, facilitator role, and participant demographics. A recent trend in the field of mental health is to offer support groups online, using the Internet as a platform to increase their presence and availability. Specifically online support groups have been provided for individuals with HIV/AIDS [4], those with eating disorders [5], cancer [6, 7], caregivers [8], psychological problems [9], and the bereaved [10].

Research has found that computer mediated social networking sites can improve an individuals' overall well-being [11]. When examining their effectiveness, several studies have found that message board postings are supportive, however, this research has often just focused on the content of the communications, and did not focus on clinical outcomes of group participants [4, 5, 7]. Despite this, when research studies have compared online interventions to their face-to-face counterparts, successful short-term and long-term clinical improvements from online therapies have been demonstrated [12, 13]. Other research on this topic has explored how information is exchanged online [14], and also examined what individual variables may influence participants to join an online support group [15]. Research on this topic explores various concepts, yet little has focused on attitudes and barriers regarding professional facilitation of such groups. In Nimrod's [15] research of online depression communities, it was found that only 1% of participants in online depression support groups were referred to these online communities by their therapists. Another survey

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found that mental health professionals were hesitant to use online services but were interested in more information about them [16].

A present limitation in professionals' attitudes may be the tendency of providers to group all online services together, despite their varying types and functional capabilities. Barak, Klein, and Proudfoot [17] identify four general types of online based interventions: web-based interventions, online counseling and therapy, Internet operated therapeutic software, and other online activities that can serve alone as interventions or serve as supplements to face-to-face interventions (such as online support groups, personal blogs, and podcasts). Each of these categories have different strengths and limitations, and can provide a different level of therapeutic care. Some types involve a greater sense of presence (3-D virtual worlds), where others involve increased participant convenience (self-guided web-based message boards). Second Life is an online 3-D virtual world where individuals can create avatars and interact with other users. In 2003 the use of Second Life was made available for the public, and in 2009 there were a reported 15.15 million registered users in Second Life. Past assessments indicate that approximately 150 support groups were being conducted with over 10,000 participants [18]. Second Life has been an available platform for over 10 years, and although professionals have utilized it for some therapeutic and public health interventions [19], it has not had the impact it was expected to have. 3-D virtual worlds can increase feelings of social presence [20] while providing anonymous care [18], and this may be appealing for both participants and facilitators of clinical support groups.

In the field of grief and loss, support groups are commonly utilized therapeutic approach for the bereaved. Face-to-face groups are widely offered across hospices, counseling centers and non-profit organizations, yet it is also not uncommon to find online bereavement support groups, and individuals who have participated in online groups have reported benefits of such [21, 22]. However, the Internet based groups that exist today are often monitored message boards that utilize asynchronous communication. Despite the technological advances of online interactions, in the arena of grief support, asynchronous communication continues to be the primary means of online interactions. Little attention has been paid to the general awareness and attitudes of grief group facilitators towards online support groups, and enhanced virtual environments, such as Second Life. This study begins to explore grief professionals' awareness and acceptance towards the use of Second Life to expand upon online grief services. Second Life was chosen because it is believed to be the most recognizable platform of an online virtual environment.

1. Method

A purposive sampling approach was utilized to contact grief group facilitators across the United States to offer a link to a self-created web-based survey. Sampling took place through two ways. First, a link to the online survey was made available in the Association for Death Educators and Counselors' (ADEC) online monthly newsletter. ADEC is a multidisciplinary professional organization for death educators, and bereavement counselors. Second, 100 emails were sent out to grief and loss centers, hospices, and individuals who advertised as facilitating grief support groups (identification was conducted through an Internet search). Emails were sent to agencies or individuals in all 50 states. The Old Dominion University Human Subjects Review Board approved the survey prior to any data collection.

2. Results

The sample consisted of 64 respondents from 31 states. Most (55, 87%) were women, educated with a master's degree (50, 78%), and licensed mental health professionals (39, 61%). The sample reported an average of 12 years of grief experience, and a medium to high level of computer knowledge (61, 95%). The data collected was part of a larger survey that explored additional demographic variables, and grief facilitator attitudes towards online grief support groups [23].   Four questions that pertained to Second Life were analyzed for this paper. After participants were asked about their awareness of Second Life, they were provided with a brief description and picture of the 3-D virtual world, to help them answer the additional questions.

Table 1. Attitudes towards Second Life and online support groups from grief group facilitators' perspectives. Percentages come from all completed responses.

Survey Question	% of "yes" responses, n	% of "no" responses, n
1. Do you know what Second Life is?	10%, 6	90%, 56
2. Have you ever run a group in Second life?	0%, 0	100%, 58
3. Would you run a group in Second life?	17%, 10	83%, 48
4. Do you think Second Life could offer greater clinical benefits than more traditional online groups due to avatar interaction?	30%, 16	70%, 38

3. Discussion

Despite the potential advantages of Second Life, the growth of available professional services in the virtual world has not continued with the advancing technology. Nor has awareness of it.   In the results of this survey, grief facilitators had a very low knowledge of Second Life, as only 10% of respondents demonstrated any awareness of the platform.   Then, even after respondents read an explanation of the environment, only 1/3 acknowledged the potential for increased clinical benefits. Less than 20% of the sample stated that they would be willing to run a grief support group in Second Life.

The findings of this study demonstrate a low knowledge of Second Life among the sample of grief facilitators, and points toward the need for increased education on the interactive capabilities of 3-D virtual worlds and their potential role in online support groups.   There are several advantages to online support groups such as providing services to many individuals at once [24], increased access to services for consumers with remote physical access [25], and protected confidentiality in treatment seeking services which may support those hesitant to seek out services in traditional settings due to stigma [21]. Specifically in the field of grief, bereaved individuals express the need for help [26] but also report a difficult time finding support groups [27], suggesting the need for increased access to care. Despite their presence, little research has focused on professional facilitation of online support groups and facilitator's attitudes, but a recent survey found that grief facilitators were hesitant to offer online support groups, but were willing to refer participants to such [23], indicating some acceptance towards the online format. This finding is similar to a larger survey which found mental health professionals to be hesitant to offer online services, but were interested in more information about them [16]. Professionals cite lack of training and discomfort as variables that reduce their willingness to offer online services [16].

Important next steps involve further education and training for mental health professionals in utilizing Internet-based interventions. The addition of technology education in mental health training grounds (such as social work schools and graduate level counseling curriculums), availability of continuing education courses for current providers, and increased collaboration between technology developers and providers would all be useful avenues in improving provider comfort level and awareness.

The limitations of our survey findings are also important to discuss. Although the creation of this survey involved inter-professional collaboration from the research team, the results are from a self-created survey of which measures of reliability and validity were not calculated. In addition to this, Second Life was chosen as the most identifiable 3-D virtual environment to explore with professionals, but it may have been limiting to just explore one specific platform. We should also address that a potential bias of our findings could be related to the distribution of the survey. A web-based survey was used to collect data, and this could lead to a bias in respondents and allow for a sampling of grief facilitators who are more comfortable with the technology. This may explain why the participant's technology experience was reported as moderate or high for 95% of the sample. However, in the context of these findings, it is interesting to note that respondents were still not overly favorable of online groups even though they rated themselves as experienced with technology. Finally, the survey results were analyzed from a small sample (n=64), which could impact the significance of the findings, and results of this study should not be generalized.

Conclusion

As the concept of online interventions are constantly changing and evolving, it is unclear whether professionals are even aware of the improving online capabilities today and how this can impact the distribution and quality of mental health services. Results from this survey indicate that despite respondents reporting a medium and high level of computer knowledge, very few were aware of Second Life, and none had experience facilitating a group in Second Life. Despite research demonstrating the clinical efficacy of Internet-based interventions [28] it is not uncommon for online interventions to be criticized for lacking therapeutic interaction between the client and therapist. Yet, little attention has been paid to whether enhanced virtual environments could serve as a more efficient way of providing support, in the sense of offering in-person support groups formats in an online setting. Increasing facilitator awareness and engagement of such technology is an important first step.

Acknowledgment

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How Do Client and Therapists in Online Text Therapy Experience Their Exchanges and Relationship?

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Abstract. The impact of online therapy text exchanges and the client-therapist alliance was compared to previously published means and standard deviations on face-to-face therapy using an aggregate benchmarking strategy. Further, the moderating effects of 4 participant factors found significant in the face-to-face therapy literature was investigated using mixed modeling analytic techniques. Thirty therapists and 30 clients visited an online site to report weekly to complete session impact and therapeutic alliance measures for a minimum of six weeks, which allowed for a naturalistic and nuanced examination of the process of online text psychotherapy. The impact of exchanges and client-therapist alliance in text therapy were similar to but in some respects more positive than previous evaluations of face-to-face therapy. A notable exception was substantially lower *Arousal* scores replicating the previously-observed *online calming effect*. The significance of participant factors previously found to influence impact and alliance in face-to-face therapy was not replicated except that therapists with the more symptomatic clients rated their text exchanges as less smooth and comfortable.

Keywords. Alliance, session impact, online text therapy, psychotherapy process, online calming effect

Introduction

Currently, only anecdotal reports have investigated the process of online therapy. These reports have suggested that clients and therapists may perceive text therapy as similar to traditional therapy. For example, Fenichel and his colleagues [1] noted the "… similarity between a text-based transcript and a comparable office session" and more specifically on "…the expressiveness and depth of the text-based communication." (¶ 26). Thus, there is a need to examine differences in processes between online therapy and face-to-face therapy [2].

This study focused on session impact and alliance in the two different modalities of text-based online therapy, e-mail and text chat. Session impact encompasses participants' evaluations of their session but also participants' postsession affective state [3]. The alliance is widely regarded as a vehicle for conveying therapy's active ingredients [4] and perhaps a key active ingredient itself [5].

A search of the face-to-face therapy literature for significant participant factors that could potentially influence text therapists and text clients impact and alliance ratings

supported the use of the following: client presession distress, therapist theoretical orientation, therapist face-to-face experience, and client social support.

Among the few studies that have attempted to compare the evaluations of internet and face-to-face therapy, online clients experienced their sessions as less *Arousing* when compared to their face-to-face counterparts [6].

1. Research Questions

I expected that participants using online therapy would have similar session impacts and therapeutic alliances as to participants in face-to-face therapy. This expectation was a generalization of the common factors notion that similar outcomes are found for the various theoretical orientations (e.g., [7]) because of similar processes, including alliance and session impact (cf. [8]). In addition, I anticipated that participant factors previously found influential in face-to-face therapy would play a role in clients' and therapists' evaluations of their exchanges and the therapeutic relationship. Therapists of more symptomatic clients would report lower *Smoothness* during their exchanges, more experienced therapist would report higher *Partnership* [9], less experienced therapists would evaluate their exchanges as *Deeper* [10], and clients with more social support would report higher overall alliance ratings [11]. I also expected to find a calming influence resulting from the participants experiencing the online environment as more comfortable and less threatening than the face-to-face milieu. That is, I expected that clients and therapists engaged in online therapy would report exchanges as less *Arousing* than did corresponding clients and therapists engaged in face-to-face therapy [6; 12].

2. Method

2.1. Participants

Participants were 30 therapists and 30 clients engaged in online therapy. Therapists each saw either 1 or 2 clients (*mode* = 1 client) for a total of 394 therapist-rated weeks of exchanges. Clients (N = 30) contributed a total of 475 client-rated weeks of exchanges. The therapists were women (70 percent), Caucasian (90 percent), aged 28–62 years (*Mdn* = 48), and 67 percent were married/partnered. They used either e-mail (n = 17 therapists) or text chat (n = 10 therapists), were predominately licensed in the United States (n = 20 therapists), and a plurality worked from a cognitive/behavioral perspective (33 percent). The 30 clients' ages ranged from 19 to 55 (*Mdn* = 43) with 83 percent women, 73 percent Caucasian, and 40 percent married/ partnered. Their most common self-reported presenting problems were depression (12 clients) and anxiety (5).

2.2. Measures

2.2.1. Session Evaluation Questionnaire (SEQ)

The SEQ (Form 5;[13]), which assesses session impact, consists of 21 seven-point bipolar adjective items with the first 11 session evaluation items (five Depth subscale

items and five Smoothness subscale items) and the second 10 postsession mood items (five Positivity subscale items and five Arousal subscale items).

2.2.2. Agnew Relationship Measure (ARM-12)

The ARM-12, which assesses alliance, is a 12-item short form [14] of the 28- item ARM [15]. It includes four subscales: Bond, Partnership, Confidence, and Openness.

2.3. Procedure

Therapists interested in participating were given the option to invite current clients to take part as well. Interested participants were asked to independently visit the online site after their next week of therapy exchanges to complete the registration and the online SEQ and ARM forms. A weekly e-mail with an embedded link to the login screen was sent on Mondays to all participants who had yet to complete the forms for the previous week. When they logged in, participants entered either the number of weekly text chat exchanges or the number of e-mails that they sent and received. They then completed the ARM and SEQ.

2.4. Data Analysis Strategy

To assess the similarity of online process with face-to-face process, we compared the distributions of online therapy scale scores with distributions of face-to-face therapy values obtained in previously published studies. This comparison represents an aggregate benchmarking strategy used previously in psychotherapy outcome studies [16].

To assess the influence of the participant factors, we employed linear mixed-modeling analytic techniques [17]. Separate analyses were performed on therapists' ratings and clients' ratings for each of the four impact and alliance subscales.

We estimated two parameters for the therapists' and clients' raw weekly ratings. The intercept (the subscale scores estimated for the participant reported start date of their online exchanges) and the slope (the estimated mean change in subscale scores per day) were averaged across therapists and then clients (i.e., one average for therapists and another average for clients). The estimated intercept and slope for the average client and average therapist provided the basis for the population-level effects.

3. Results

3.1.Reliability

The alpha coefficients showed that the 5 item SEQ indexes were generally reliable with the exception of *Arousal* (.45 for therapists and .46 for clients).

3.2. Comparing Online Session Impact Averages with Face-to-Face Averages

I compared the online therapists' and clients' means for the SEQ with the same measure as completed by face-to-face therapists and clients in previous published studies. Online therapist SEQ scores were greater than those of face-to-face therapists,

with the notable exception of *Arousal* scores. Similarly, online clients' SEQ scores were comparable to or greater than those of their face-to-face counterparts.

3.3. Population-level Participants' Intercepts and Slopes

Using the obtained scores and the reported session dates, we estimated an intercept for each participant on each scale at their reported treatment start date. These intercepts for therapist and client ratings on session impact subscales averaged near but mostly above the midpoint of each subscale. Specifically, therapists' estimated population-level *Arousal* intercepts were low and clients' estimated population-level *Arousal* intercepts were especially low (i.e., 4.30 and 3.92, respectively) given that therapists and clients session evaluation subscales' estimated intercepts were generally between 4.0 and 5.5. Average therapists' and clients' slope or rates of change per day ranged from -0.0002 to 0.0010 units of session impact per day with none significantly increasing or decreasing. Specifically, therapists' population-level *Arousal* slopes were negative, indicating that their *Arousal* tended to decrease across sessions.

3.4. Participant Factors Influencing Therapists' and Clients' Ratings

I used population-level effects analyses to examine whether therapists' average ratings of the qualities of their online text exchanges and their therapeutic relationship with their clients were influenced by four participant factors. Therapists with more symptomatic clients experienced their text exchanges as slightly, but significantly, less *Smooth* and *Positive*, $t(387) = 3.03$, $p < 0.01$ and $t(387) = 2.23$, $p < 0.05$, respectively, and their relationship as having slightly, but significantly, less *Bond/Partnership*, $t(387) = 2.45$, $p < 0.05$. Cognitive/Behavioral therapists perceived their clients as having significantly more *Confidence*, $t(387) = 2.24$, $p < 0.05$.

In assessing the influence of participant factors on clients' ratings of session impact and therapeutic alliance, we considered clients' perceived social support. Clients with more perceived social supports evaluated their weekly text-based exchanges with their therapists as significantly more *Smooth* than did clients with less-perceived social supports, $t(472) = 2.28$, $p < 0.05$.

4. Discussion

Online clients and therapists rated their session impacts as equally or more *Deep*, *Smooth*, and *Positive* than therapists and clients in studies of face-to-face therapy. We hasten to acknowledge that these comparisons were not based on random assignment, and there were many potentially confounding differences.

The common factors account of therapy effectiveness suggest that similar outcomes are found for the various theoretical orientations in face-to-face therapy (e.g., [7]) because similar processes mediate outcome despite the technical differences among orientations. If session impact is a common factor, then in order for online text therapy to be effective, clients and therapists should experience session impacts similarly to their face-to-face counterparts. Results for SEQ *Depth*, *Smoothness*, and *Positivity* were consistent with this account.

The previously-observed *online calming effect*, manifested in the modestly and substantially lower *Arousal* ratings of online therapists and clients (respectively)

relative to their face-to-face counterparts, was replicated [6; 12]. Given the very low reliability of the *Arousal* findings, readers are asked to consider the *online calming effect* as speculative.

Our study also replicated the widely reported finding that therapists who worked with less-symptomatic clients rated their respective online therapeutic exchanges as *Smoother* than did therapists who worked with more-symptomatic clients. The latter may have experienced their online exchanges as more challenging, tense, and uncomfortable as a result of the difficulty in emotionally connecting and working together with their more symptomatic clients (e.g., [18]).

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Exploring Identity Motives
in Twitter Usage in Saudi Arabia and the UK

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Abstract. This study explores identity motives for using a microblogging site (Twitter) among Internet users in Saudi Arabia and the UK. The former boasts the world's highest per capita use of Twitter, which provides a forum in which users have more opportunity for self-expression than they do in the offline world, and is not subject to the heavy censorship which the Saudi government imposes on other Internet content [1]. Approximately 5000 tweets from the period April-May 2013 were coded and analyzed, using Motivated Identity Construction Theory as a conceptual framework [2]. This theory proposes six universal identity motives of meaning, belonging, continuity, distinctiveness, efficacy, and self-esteem. We consider these motives in turn, and examine their relative prominence in an online context. Support was found for all six universal motives, but the relative prominence of motives and the ways in which they were pursued appeared to depend on the affordances of both the OSN in question, Twitter and the cultural context in which the user was posting: Saudi users appeared to seek distinctiveness, whereas for British users, belonging was a more salient motive. Themes related to meaning, efficacy, and self-esteem were detected frequently, whereas themes related to continuity were less apparent.

Keywords. Micro-blogging, twitter, thematic analysis, identity motives, culture

Introduction

The rising popularity of the Internet, and in particular of online social networks (OSNs), has offered many people a chance to experiment with their identities [3-4]. Many terms have been used to refer to the phenomenon of the online identity, including digital identity, online personality, virtual identity, avatar, and online persona [5].

Several features of online communication facilitate the creation of distinct online identities. First, when communicating online, the user may conceal, change, or emphasize certain aspects of self, because of reduced visual and auditory cues [6]. Second, the user has the option to remain anonymous, which allows for greater freedom in cultivating an online persona. This might mean fabricating elements of their biography or, conversely, reduced inhibition for disclosing certain aspects of their real self [7]. Thirdly, the Internet provides the opportunity to communicate with people from all over the world, including those with whom one might be prevented from conversing due to social rules or cultural norms. This study will explore identity construction and self-presentation on the micro-blogging website Twitter, in two different cultural contexts: Saudi Arabia and the United Kingdom.

Current literature on micro-blogging in general, and on Twitter in particular, is still nascent, which reflects the relative novelty of these sites. What studies do exist are

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concerned either with general motivations for using Twitter [e.g. 8-9] or with the ways in which users engage with specific technical features [e.g. 10] There is, at present, a lack of literature relating to identity motives as pursued on Twitter, a situation that this study aims to redress.

Selim and Long (2013) explored motives among British and Saudi Arabian participants for using online social networks. Among the findings were that users seek self-affirmation and self-expression online, through strategies such as self-disclosure [11]. The extent to which these motives can be pursued is tempered by considerations of cultural conformity, and concerns about online security. Security strategies employed by participants in that study included the use of pseudonyms and false profile pictures (by Saudi participants), and ensuring that one's profile was not accessible by strangers (for UK participants) or family members (for Saudi participants).

The current study builds on Vignoles' (2011) Motivated Identity Construction Theory [2], which proposes that identity processes are guided by at least six discrete motives. The *self-esteem* motive entails that people are motivated to think of themselves positively. The *continuity* motive means that people are motivated to see their identity as persisting over time. The *distinctiveness* motive proposes that people seek to distinguish themselves in some sense from others. The *meaning* motive relates to the drive that people feel to see their lives as meaningful. The *efficacy* motive refers to the desire to believe that one is competent and capable of influencing one's environment. The *belonging* motive relates to the need to feel that one is accepted by significant others.

1. Method

The research method chosen for this study was thematic analysis (TA) [12], which has already been used in a study of retweet behavior by Purohit et al. (2013) [13]. In that study, the authors analyzed more than one million tweets pertaining to three topical events. In collecting data for the current study, topical events were not considered key to the understanding of identity motives, although such events naturally arose within the dataset. Events that were significant for UK and Saudi Twitter users during the period of data collection included the death of former British Prime Minister Margaret Thatcher (April 8), the Boston marathon bombings and subsequent hunt for the perpetrators (April 15-19), the murder of a British soldier by two religious extremists (May 22), Gay marriage votes in the USA and France (April-May), civil unrest in Egypt (May), and the ongoing civil war in Syria (April-May).

In all, data from 54 Twitter users were analyzed, with a mean of 101.72 codable tweets for each user. The analysis itself was carried out at a latent or interpretative level, as opposed to a semantic level [12]. The difference between the two approaches is that the latter focuses on what the participant has said or written, and does not attempt to search beneath the surface meaning, while the former attempts to identify the underlying meaning of the data. Given that motivations are often obscured even from the person who is subject to them [2], this was considered appropriate to the aims of the research project.

2. Results and Discussion

We found tweets that were interpretably related to all six motivations mentioned in Motivated Identity Construction Theory [2], among both Saudi and UK users. However,

when comparing the two groups of users, it was found that motivations were pursued to different degrees and in different ways. For instance, among Saudi users, distinctiveness was more prominent as an identity motive, while for UK users, belonging was pursued more frequently. This does not mean, necessarily, that the motivations differ in importance to the two groups, but rather that the interaction between cultural background and the opportunities afforded by the particular OSN under consideration, Twitter, impact on the ways people construct and maintain an online identity. The six identity motives are discussed below.

2.1 Self-esteem

One way in which OSN users boost their self-esteem is to invite positive feedback from others, and the 'gold standard' of this in the context of Twitter is the retweet, which brings extra kudos if the retweet comes from a celebrity: 'Hi @piersmorgan I've written a book about Jack Wilshere's #ArsenalDNA. Could I get a RT?' Such is the perceived importance of the retweet that we came across criticism of those who fail to do this sufficiently: 'They have no idea what the Re-Tweet button is! #Some_Twitterers'.

A key strategy for satisfying the self-esteem motive is to share one's achievements. For UK users, these achievements tended to be measurable on an external level: 'Overheard a lady say to her son 'If I was in my twenties I'd retrain as a doctor'. Resisted the urge to shout 'that's what I'm doing!', while Saudis focused more on internal qualities: 'inside of me a wild horse that my dad gambled on, and he won.. My dad taught me how to ride it with dignity, her name is vigor.' This latter user prides her autonomy ('wild horse'), but also hints at social duty ('dignity'), balancing the two dimensions of self-esteem discussed by Becker et al. (2014) [14]

2.2 Continuity

Continuity was less prominent as an identity motive, which is perhaps because Twitter, unlike other OSNs such as Facebook, does not facilitate the presentation of a persisting identity over time. Despite the 'here and now' focus of Twitter, some tweets discussed identity over time, such as the following tweet from a Saudi user: 'Keep your precious memories hidden in memory's boxes. If they come back, you will find those heroes now do not deserve your nostalgia… it is just memories that are beautiful.'

We also found evidence that users seek to cultivate a coherent and consistent profile on Twitter. For instance, a user who presents herself as humorous and fun in her Twitter profile supported this self-presentation by posting humorous tweets ('Try to treat me like a vase I'll treat you like a door!!!'), while another whose profile presents a serious personality was preoccupied with social issues and personal values ('#Campaign_Count_your_country's_pros Social relationships, compassion and great communication and respect ... Rare to find these things, but they are basic values here'). This echoes Selim and Long's (2013) finding that OSN users place high value on presenting a 'true' self online. [11]

2.3 Distinctiveness

Distinctiveness was more prominent as an identity motive for Saudi users than for UK users. A possible explanation is the offline context: in conservative Saudi Arabia, it is

more difficult to achieve distinctiveness, especially if one is a woman. Two important strategies for presenting a distinctive identity were expressions of autonomy ('I don't like to live by life's rules, I like to live life through my rules') and an emphasis on one's social position, which Becker et al. (2012) note is particularly prominent within collectivistic cultures [15] (one user posted a photo of an expensive watch, accompanied by the comment 'you are the reason for my happiness, thank you my family…'). UK users were generally more playful in their expressions of distinctiveness: 'Might get a haircut like Kim Jung Un'. Self-deprecatory humor was common among the UK tweets we analyzed, perhaps due to posters' desire to avoid boasting – as noted in Selim and Long (2013) [11].

2.4 Meaning

At the most basic level, users pursued meaning through statements of what that particular user was doing at that moment. Popularly thought to be banal and meaningless, such posts in fact serve the function of self-affirmation. As Murthy (2013) [16] puts it, in sharing the everyday details of their lives, OSN users are saying, 'I exist!' Notably, posts of this kind within our study often made reference to common cultural reference points, such as television quiz shows among UK users ('Watching *Pointless* always turns into a competition in my house') and food among Arabic users ('I would love to get Kunafah but [the] shops are closed').

Elsewhere, the latter user referenced a positive social interaction in order to affirm her Arabic identity: 'Because I am Arabic I've got a free coffee. This waiter made my day.' Contextual considerations influence how meaning is sought via Twitter. In this case, the user was travelling in Europe, where her cultural identity may have been particularly salient.

2.5 Efficacy

A major aspect of the efficacy motive is the desire to influence others. The features of Twitter, particularly the hashtag function that allows for ideas to spread quickly across the web, are suited to this. Both UK and Saudi users employed the hashtag to impart socially or politically significant messages: 'Come on folks.. You know you want to! "The new target is half a million sigs on the #IainDuncanSmith petition'; '#Twitter_trial A new approach to suppressing and hiding the truth.'

There was also evidence that Twitter users seek to influence the behavior of others *on* Twitter, and an emergent code of conduct seemed particularly noticeable among tweets by Saudi users: 'Replying to tweets where there is abuse of others is a kind of gossiping!'

2.6 Belonging

Just as the hashtag facilitates efficacy, the @ function of Twitter, which allows the user to send private messages or to message another user publicly, promotes a sense of belonging. This UK user comments on her perceived relation to other Twitter users: '@Gr******ey I've just become the average twitter user. Doubt it will last for long, but I thought you'd like to be kept in the loop ;-)' Nevertheless, although the user comments that she has become the 'average twitter user', she distances herself from

this position in two ways: Firstly, by her expressed doubt that this situation will last, and secondly by her very awareness of the notion of the 'average twitter user'.

Conclusion

We found that online identity motives differ from offline motives mainly in the ways in which they are pursued, and according to users' opportunities to pursue the same motivations offline (i.e. a user will turn to OSNs to satisfy those needs that are frustrated by cultural or other considerations in an offline context). Motivated Identity Construction Theory was valuable for interpreting identity motives in an online context. However, for more understanding of online identity and the way that OSN users pursue their identity goals, we need to consider the way that users present themselves when they interact with other users, taking into account type of OSN, and online behavior in general within their cultural context.

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The Impact of Cyberstalking: The Lived Experience - A Thematic Analysis

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Abstract. Cyberstalking (CS) can have major psychosocial impacts on individuals. Victims report a number of serious consequences of victimization such as increased suicidal ideation, fear, anger, depression, and post traumatic stress disorder (PTSD) symptomology. Research is largely limited to quantitative outcome research. This study examines the diversity of experiences reported by people who define themselves as having been cyberstalked. Thematic analysis was used to explore 100 CS victim narratives, gathered by means of an online survey questionnaire designed to capture structured text responses. Five emergent themes were evident in the data: control and intimidation; determined offender; development of harassment; negative consequences; and lack of support. Findings identify similarities and differences to traditional stalking, along with the necessity of support for victims and illustration of the negative impacts this form of harassment produces.

Keywords. Cyberstalking, harassment, deviant online behaviors

Introduction

Stalking is defined as a pattern of intrusions and harassment upon a person in a manner which would cause a reasonable person anxiety or fear [1]. The Internet has facilitated new means of harassment. CS is defined as the repeated use of the Internet or digital electronic communication devices to harass or threaten a specific individual or group of individuals [2]. The characteristics of CS and 'offline-stalking' both consist of repeated harassing behaviors that are intrusive and negatively impact upon the victim [3]. However it has been argued that the electronic methods used by offenders may provide different processes and outcomes yet to be identified [2]. Increasing technological reliance exposes individuals to new means of intrusion and surveillance [4]. Furthermore, the speed of Internet familiarity has created misperceptions of privacy, permanency of information and personal safety [5].

Estimates of the prevalence of offline-stalking in the U.K. range between 12% and 32% among women and 4% and 17% among men [6]. Prevalence rates for CS have not yet been reliably identified however, estimates suggest that 26% of victims experiencing traditional stalking also report receiving electronic harassment [7].

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The majority of contact stalking offenders are male [4, 8]. Over half are current or ex-partners of the victim [9] while 10-13% are strangers [10]. It is not clear whether these proportions are equivalent in CS or if they differ due to characteristics that technology may provide. For example, anonymity and physical distance may encourage a different population to harass. Little research has been conducted on CS perpetrators and it is not known what motivates them to harass victims online rather than in person. Additionally, contact stalking research has focused on the impact of stalking on victims. The most commonly reported outcome is fear. Significant distress is identified in terms of paranoia, distrust of others, feelings of helplessness, cases of suicide are also documented [11]. Serious physical harm and murder have also been identified in cases of both stalking and CS [12].

The general aim of this study was to qualitatively expand understanding. The study also aimed to identify similarities and differences between stalking and CS where possible. In addition, the work aimed to identify actions made by victims that were effective in managing the cyber interaction effectively.

1. Method

A self-selected sample of 100 anonymous participants defining themselves as victims of CS. Participants were aged 15-68 yrs (M=38.93, SD=11.42). Relationships between the offender and victim were: acquaintance (25.53%), stranger (24.47%), someone dated casually (13.83%), lived with/was married to/have children with (11.70%), unknown (9.57%), work colleague (6.38%), close friend (4.26%), partners ex (2.13%), pupil (1.06%) and relative (1.06%).

The data was gathered by means of an online survey. The qualitative questions were developed iteratively by stalking professionals and researchers. Participants typed a maximum of 500 words in a box provided for each of the following questions: *1.* How did it all begin? When did you realize that this was becoming a problem? *2.* Provide examples of each of the harassment behaviours experienced. *3.* Did any actions improve the situation? *4.* Did any actions make the situation worse? *5.* Are there any actions that you feel would have protected you better if they had been available to you? *6.* What else could have helped improve the situation?

Thematic analysis was applied to identify recurrent themes in the data. The analysis was used across questions, rather than for each open-ended question individually, in order to identify themes across the data as a whole. Furthermore, the context identified as crucial in stalking [8] was not lost. An essentialist and semantic approach served as the basis for the thematic analysis [13]. Codes were inductively formed due to limited theory on CS, therefore the codes had to be drawn solely from the raw data without the use of any theoretical framework [14]. Analysis was guided by a six-step approach to thematic analysis [13]. Direct quotes were extracted from the data providing a clear illustration of each theme in the participant's own words. Inter-rater reliability provided a coefficient of 0.71.

2. Analysis

Five overarching themes emerged: control and intimidation (online [direct and indirect] and offline); the determined offender; development of the harassment; negative consequences; and lack of support. Control and intimidation occurred either solely

online or as combined methods that intruded into the victim's life and privacy both online and offline. CS was divided into two sub-themes, direct and indirect harassment.

Direct harassment included making threats: "*eventually the chat threads started becomming* [sic] *threatening, to me personally and to my family, in one instance someone anonymously wrote they wanted to kill me.*" (participant 8, page 22, line 7-9); making false accusations: "*The person would make up channels saying I was a pedophile, woman abuser, dog molester* [sic]*, drug addict.*" (34,12,3-4); hacking the victim's email; sending viruses; and posting intimate photographs: "*setting up a facebook account of me with intimate photos he'd refused to delet* [sic]*.*" (78,3,20-22). Complex behaviors included tricking the victim into talking to the offender by creating new identities online: "*He created a fake journal and tried to become my friend*" (75,35,7); changing the victim's passwords; or threatening suicide: "*sent text messages indicating that he would commit suicide if I did not respond to him*" (79,5,21-22); and accusing the victim of being the perpetrator: "*she set me up to look like I'd stalked her by posting her email to the bulletin board.*" (77,2,4-5).

Indirect methods were: talking to the victim's contacts: "*through her Facebook site…She contacted my daughter three times, some of the things said to my daughter were both vile and completely untrue.*" (44,25,7-9); impersonating the victim and harassing their contacts: "*impersonated me online sending out emails*" (5,8,3); posting the victim's personal information online: "*my address being posted in chat rooms*" (12,15,10); encouraging others to harass the victim; following the victim's activities online and gathering information on the victim to use at a later date: "*My stalker and her friends compiled information on where I worked, who my friends were, any new relationships*" (42,21,8-9).

Many participants also experienced offline harassment; being followed in person, confrontation, letters, damage to property and assault. Offline behaviors were used either: as a precursor to CS; or in combination with CS*:"he started calling at all hours on the landline…[and] the mobile…[and] after he started using pay phones…He [then] overpowered and raped me, and continued calling and IM'ing me after that"* (67,23,24); or post CS: "*He posted aggressive and insulting messages on my myspace profile it escalated pretty quickly until one night he followed me home and tried to get into my house"* (15,18,4-6).

The theme of determined offender brought together a number of features. Most participants described harassment as constant, occurring all day and for long periods of time: "*the texts and calls were relentless. At every work breaktime she'd phone over and over again and send text after text of nonsense. These could amount to over 30 a day.*" (40,18,l8-20); "*went on for 3 to 5 years from the same person*" (37,15,4-5). The offender was often unyielding, creating new ways to maliciously attack the victim if a method was blocked: "*Each time I shut down a means of communication from her she would find another way to harrass me"* (59,12,34-35).

The motivation of the offenders was diverse, ranging from intimacy seeking: "*He kept calling and calling (and calling, and...), trying to get me to go out with him"* (67,23,8-10); "*he declared his love for me*" (63,3,26-27); anger: "*She was very angry and the harassment has continued ever since"* (7, 9,1-4); revenge: "*A friend's ex-wife blamed me for their divorce so started stalking my husband and myself"* (41,20,1-2); "*I … stood up to them, they then embarked on a long campaign of harassment*" (13,16,5-7). However motivation was often unclear: "*I started by getting a friend request on Facebook from someone I didn't know, then they started sending me facebook messages and it spiralled* [sic] *from there"*(11,14,1-3).

Negative consequences were experienced psychologically, physically and socially. Psychological harm included fear: "*My whole life stopped because I was in so much fear!*" (19,24,29); paranoia: "*I get paranoyed* [sic] *very easily and reluctant to trust indirect communications*" (54,4,24-27); and anger: "*I am not so much scared by this, just really.. angry, fear plays little part in it for me*" (13,16,11-12). Psychological symptoms included panic attacks, flash backs and PTSD. Participants stated: "*I still have flashbacks and experience anxiety when going to my inbox. My health has not been the same since*" (81,8,18-20); "*I became very ill… and now suffer complex PTSD/depression as a result of the harassment and abuse*" (93,29,37-39); "*all the trauma and stress suffered from the stalking resulted in me miscarrying our child*" (5,7,29-30). Social effects included: damaged reputation, damaged family relations or loss of work either directly or indirectly as a result of the harassment and a damaged reputation; the cyberstalker "*impersonated me online sending out emails and status upates that ruined my reputation*" (5,5,3); "*I have been unable to work properly, as I have felt sullied, damaged, and abused.*" (86,18,11-12); "*the stalking behavior caused irrevocable dmage* [sic] *to family relations*" (5,8, 4-5).

Some participants expressed helplessness and lowered perceptions of control "*He will follow me for the rest of my life and I can do nothing.*" (2,2,12). Another said "*impotence at how little I can do is the main emotion I fee[l].*" (13,16,12-13). It seems as the offender increases control, the victim's perceived level of control decreases. This is supported by quotes such as "*you are made to feel with less control of your life.*" (54,6,19-20). The development of harassment was considered by some to be affected by their response to it**,** altering in severity or frequency dependent on their actions. The action that most reduced harassment was to ignore the offender: "*Ignoring him was probably the best response as any response from me appeared to either inflame him or make him happy!*" (64,19,25-26). "*It took a period of about two years for this to work, but it did work in the end.*" (24,34,36). This idea was supported by statements that the opposite effect occurred after responding to the offender: "*it is worse because i responded*" (96,34,6); "*contacting these attackers directly .. made the attacks worse - they seemed to enjoy knowing that they were getting to me.*" (52,2,12-14); and "*Responding did not help. He just learned that the price for talking to me was calling 30+ times in a row.*" (67,24,11-13).

The majority of participants had little support: "*I completely despair at times of finding someone who will take this seriously.*" (7,9,22); "*My mother did not take this seriously at first, suggested I go out with him, and gave him my e-mail address*" (67,23,21-22). A lack of support was exacerbated if the victim was blamed for the harassment: "*the Police ... said it was my fault for putting the information online in the first place.*" (80,7,30-31); "*The police made us feel like we were almost to blame or that it was trivial*" (20,27,41-42).

3. Discussion

Cyberstalkers emerge as determined offenders exerting control to intimidate by either online means or by combined methods. Consistent with previous research perpetrators are presented as unrelenting in their harassment, whereby the persistent offender exhibits an enduring pattern of harassment [8]. Other CS behaviors identified were similar to offline stalking such as: threats, following the victim, contacting victim's family and friends, false accusations, threatening suicide and manipulation [15]. This suggests similarities between offline and online stalking. No distinct motivations of CS

were identified. This may be as the identity and motivations of the offender are more easily hidden from the victim than in offline stalking. As well as similarities, there were distinct differences in behaviors, arising from the different channels used. Online methods allow technical invasions of privacy whereas offline methods facilitate physical invasions such as violence. Another contrast was the dispersion of the relationship type between the offender and victim. While current or ex-partners are the most common relationship in offline stalking, acquaintance was the most common relationship found, with similar numbers of current or ex-partners and strangers. There are many possible explanations, but one may be due to the enabling features online methods provide, such as anonymity, low cost, ease of use and speed [4]. There may also be a perceived lack of legislation enforcement compared to contact stalking making CS the more attractive option [3, 4].

CS has negative social and psychological effects consistent with previous research in contact stalking [4]. There are indications that stalkers' conduct is affected by the victims' actions, notably by not responding to the cyberstalker. However it seems a considerable period of harassment must be endured before it becomes effective. Victims experience a lack of support and understanding of their ordeal. CS is a crime where control is exerted over the victim. If the victim is further disempowered by a lack of support, the cyberstalker becomes more enabled and the effects upon the victim greater.

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SECTION V

CLINICAL OBSERVATIONS

Cybertherapy is a field that is growing rapidly due to today's technology and information boom.

Virtual reality and advanced technologies have been used successfully to in a variety of healthcare issues, including treatment of anxiety disorders and phobias, treatment of eating and body dysmorphic disorders, neuropsychological assessment and rehabilitation and distraction during painful or unpleasant medical procedures.

The novel applications of these technologies yield many advantages over traditional treatment modalities, and the disadvantages that accompanied the first trials of virtual reality are quickly being addressed and eliminated.

Virtual reality peripherals such as data gloves, physiological monitoring and Internet worlds are swiftly demonstrating their usefulness in cybertherapy applications.

Wiederhold & Wiederhold, 2004

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Virtual Reality Graded Exposure Therapy with Arousal Control for the Treatment of Combat Related Posttraumatic Stress Disorder: A Follow Up Case Series

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Abstract: Important challenges confronting DOD/military medical care are that of maintaining or increasing quality of care and increasing the effectiveness of treatments for warriors diagnosed with Posttraumatic Stress Disorder (PTSD) secondary to their combat deployments to Iraq and/or Afghanistan. Virtual Reality Graded Exposure Therapy with Arousal Control (VR-GET) has demonstrated a positive treatment effectiveness resulting in significant reductions of PTSD symptom severity. This positive treatment effectiveness has been maintained for up to 22 weeks after VR-GET therapy was completed. A robust methodology for the assessment of Virtual Reality efficacy suggests that the ideal time for follow-up begins at twelve months. Others have suggested that follow-up should occur between two and four years post treatment. In this report we describe the outcome of VR-GET for the treatment of combat-related PTSD with three warriors between five and seven years following their having completed treatment.

Keywords: Virtual Reality Graded Exposure Therapy (VR-GET), Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), Posttraumatic Stress Disorder (PTSD),

Introduction

A Department of Defense Task Force report concluded that 11 - 25% of OIF and/or OEF veterans have been diagnosed with Posttraumatic Stress Disorder (PTSD) and this report recommended that DOD should aggressively develop effective PTSD treatment

programs [1]. A recently published meta-analysis of studies published between 2001 and 2010 reported that the PTSD prevalence was 13.2% in operational infantry units and increased to 25% to 30% in infantry units with the highest level of direct combat [2]. In spite of the variance in the exact percentage of service members diagnosed with PTSD, studies have documented the PTSD is a severe problem [3]. Several reports have recommended that the Department of Defense (DoD) and the Veterans Administration (VA) should aggressively develop early intervention strategies and treatments for preventing and treating PTSD [1, 3 – 6]. More recently, Hoge [7] has suggested that the VA adopt a number of strategies to improve the mental health care engagement and treatment for veterans needing services for PTSD. These strategies are designed to increase the focus of treatment on patient-centered care and include but are not limited to the improved access to care, improved responsiveness to patient preferences for care and careful coordination of care, improved understanding what motivates a veteran's willingness to engage in or to continue with care, establishing ongoing measures of patient feedback, and providing a wide range of treatment options [7].

Figure 1. Three computer configuration for VR-GET with Biofeedback being calculated on the laptop computer. Simulated patient is holding a hand-held controller that he is using to "move" through the combat environment. A Head Mounted Display and Headphones facilitate the immersion in the VR-GET simulated combat environment.

Virtual Reality Graded Exposure Therapy with arousal control (VR-GET) is a promising intervention that has been evaluated in active-duty service members [8 – 11]. VR-GET is a type of exposure therapy in which a patient takes on fears related to his or her combat-traumas in a controlled, simulated environment which is generated using virtual reality (VR). VR-GET differs from other forms of VR exposure therapy, such as Virtual Reality Exposure Therapy (VRET) [12], in that rather than adding VR to a traditional session of prolonged exposure, VR-GET combines graded VR exposure with meditation and attention control (e.g., noticing distractions, letting them go and refocusing on the task at hand) in combination with autonomic control using the J & J Engineering Biofeedback system. VR-GET has resulted in 70% of participants being able to reduce their PTSD severity by 30% or greater [11].

Figure 2. What the VR-GET participant sees while immersed in the VR-GET combat environment titled, "Fallugiah".

Of note, VR-GET participants received follow-up evaluations between 10 and 22 weeks after treatment completion with the follow-up results indicating that the reduction in PTSD severity had been maintained [8 - 11]. In September 2009, the Virtual Reality Medical Center, Naval Medical Center San Diego and Navy Hospital Camp Pendleton VR-GET research project was concluded with there being no provision to re-evaluate the participants who had completed VR-GET.

Table 1. Age, sex, military status and other demographic information of the former VR-GET patients.

Patient	Age	Sex	Service	Military Status	Marital Status	School Completed Since VRGET	Employment Status
1	34	Male	USMC	Active	Married with 2 children	Various military schools	Active Military
2	40	Male	USN	Medically Retired	Divorced, no children	2 years technical college	Not working
3	32	Female	USN	Medically Retired	Married with 2 children	Junior college	Stay-at-home mother

A robust follow-up methodology following PTSD treatment includes a follow-up assessment that begins at twelve months [13]. Other PTSD research has suggested that robust follow-up methodology can occur between 2 and 4 years following the termination of treatment [14, 15]. However, there is a dearth of research that reports follow-up outcomes for PTSD treatment in the military beyond 6 months. Hence, recently we contacted three of the participants who had completed VR-GET to assess

not only the severity of their current difficulties with PTSD, but we also obtain information concerning their current quality of life including the status of their current interpersonal relationships, employment, schooling completed and status of military service.

1. Method

Three of twenty-two participants who had completed VR-GET between 2006 and 2009 were contacted by the therapist who previously provided them VR-GET during the studies and they were asked to participate in the VR-GET follow-up project. Utilizing the patient assessment previously employed with these participants while they were involved in the VR-GET pilot or randomization study [8 -11], these three former participants agreed to complete a structured psychiatric interview, the Posttraumatic Stress Disorder Checklist-Military (PCL-M), the Patient Health Questionnaire-9 item (PHQ-9), and the Beck Anxiety Inventory (BAI).

2. Results

Our results will be presented during the CYPSY19 Conference in June 2014.

Conclusions

Our findings and conclusions, while limited to a small percentage of participants who completed VR-GET, will address not only the importance of long-term follow-up with patients treated with VR-GET for combat-related PTSD but also insights regarding VR-GET, gained from our discussion with our previous participants, will be presented.

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Validation of VR-based Software for Binge Eating Treatment: Preliminary Data

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Abstract. This study shows preliminary data on the validity of a new virtual reality-based application for cue-exposure treatment of binge eating in bulimia nervosa and binge eating disorder. Thirty-eight undergraduate students without eating disorders were exposed to several virtual environments with different foods in four different contexts (kitchen, dining-room, bedroom, and bakery/café). Participants were asked to indicate the level of food craving experienced in each situation. They also completed the Spanish version of the State and Trait Food Cravings Questionnaires. The results suggest that virtual reality is an effective technology for eliciting food craving, especially in the case of participants with high reactivity to food cues, and those who were hungry or experienced strong desire to eat during the experiment.

Keywords: Virtual reality, cue-exposure therapy, food craving, non-clinical sample

Introduction

Binge eating is a central feature in bulimia nervosa (BN) and binge eating disorder (BED). Food cue-exposure therapy (CET) has been proposed as an effective treatment for binge eating [1]. However, logistical impairments and a lack of ecological validity have prevented the use of this intervention as part of usual cognitive-behavioral therapy (CBT) protocols. Indeed, in vivo CET conducted in the therapist's office requires the patient to bring enough food to the session, which may be inconvenient. Moreover, the generalization of food craving extinction to everyday life situations can be difficult. If food exposure is conducted in the real environment where patients usually binge, the therapist must change location.

VR technology may be a good alternative for implementing cue-exposure therapy with response prevention of bingeing. VR allows the simulation of everyday life situations and, thus, maintains good ecological validity even when exposure is conducted in the therapist's office. Furthermore, VR allows therapists to control different parameters of the situation and adapt the exposure environment to the needs of each patient at each stage of the treatment. VR also allows therapists to include both contextual and proximal exposure cues. Therefore, the use of VR environments may solve the logistic and generalization problems related with cue-exposure therapy in

response prevention of bingeing. VR cue exposure has also been shown to be effective for eliciting anxiety and negative emotions [2,3,4] and provoking changes in body image disturbance [5,6] in patients with ED, which suggests that VR cue-exposure treatment may be an effective procedure for reducing food craving related with binge eating episodes.

This study presents preliminary data about the validity of virtual reality (VR)-based software for CET.

Bakery/cafe

Kitchen

Bedroom

Living-room
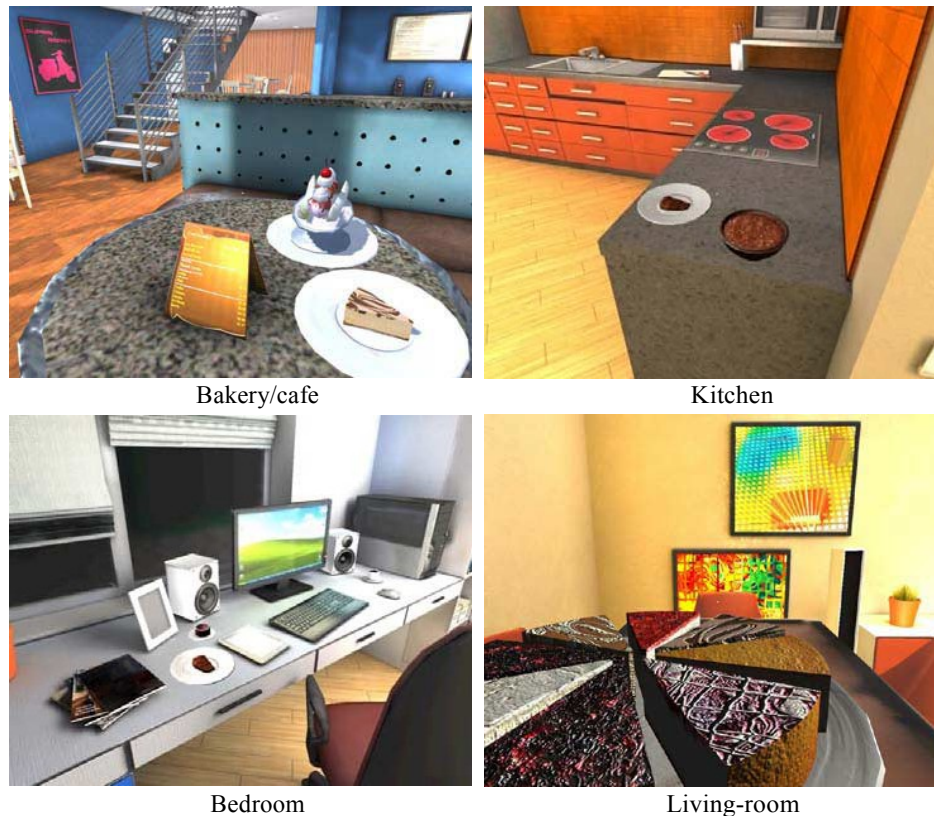
Figure 1. Images of the virtual environments

The computer program consists of four VR environments simulating real-life situations in which patients with ED tend to experience food craving, and a library of 30 foods that are frequently ingested during binge episodes. Both the situations and the foods were selected on the basis of the results of a questionnaire developed *ad hoc* for assessing bingeing precipitants in a sample of 101 BN and BED patients. First, users are exposed to the list of 30 foods and to the four situations, and are asked to indicate the level of food craving elicited for each one of them on a visual analogic scale (0-100). With this information, the software creates an exposure hierarchy. In the first steps of the hierarchy, patients are exposed to the foods that provoke less food craving and in the last steps of the hierarchy they are exposed to the foods that elicit higher food craving levels. The software is proposed for CET in BN and BED treatment.

However, before it is used for therapeutic purposes, it is necessary to assess the capability of the VR environments to provoke food craving.

1. Methods

Thirty-eight undergraduate students without eating disorders (eight men and 30 women) participated in the study. All of them were exposed to the VR-based software developed for CET in binge eating. In the first instance, participants were asked to indicate the level of food craving elicited by 30 foods and four contexts (kitchen, dining-room, bedroom and bakery/café). In the second instance, participants were exposed, for 20 seconds, to 40 VR environments that were the result of combining the four assessed contexts and the 10 foods with the highest levels of food craving. In each environment, participants were asked to indicate the level of food craving experienced on a visual analog scale from 0 to 100.

Participants also completed the Spanish version of the State and Trait Food Cravings Questionnaires (FCQ-T and FCQ-S) [7]. The FCQ-T contains 37 items grouped on nine scales: (1) Having intentions and plans to consume food, (2) Anticipation of positive reinforcement that may result from eating, (3) Anticipation of relief from negative states and feelings as a result of eating, (4) Lack of control over eating, (5) Thoughts or preoccupation with food, (6) Craving as a physiological state, (7) Emotions that may be experienced before or during food cravings or eating, (8) Cues that may trigger food cravings, and (9) Guilt from craving and/or giving in to cravings. Participants are asked to indicate how frequently each statement "*would be true for you in general*", using a six-point Likert scale that ranges from "*Never/Not Applicable*" to "*Always*".

The FCQ-S contains 15 items grouped in five scales: (1) An intense desire to eat, (2) Anticipation of positive reinforcement that may result from eating, (3) Anticipation of relief from negative states and feelings as a result of eating, (4) Lack of control over eating, and (5) Craving as a physiological state. Participants are asked to indicate the extent to which they agree with each statement "*Right now, at this very moment*" using a five-point Likert scale that ranges from "*Strongly agree*" to "*Strongly disagree*".

2. Results

Correlation analysis was conducted to assess the association between mean food craving experienced in each of the four VR situations (kitchen, dining-room, bedroom and bakery/café) and the different scales of the FCQ-T and the FCQ-S. The results showed a significant correlation between craving in the kitchen and the scales "Having intentions and plans to consume food" (r=0.349, p=.032) and "Cues that may trigger food cravings" (r=0.363, p=.025) of the FCQ-T; between craving in the dining-room and the scale "Cues that may trigger food cravings" (r=0.340, p=.037) of the FCQ-T; between craving in the bedroom and the scales "Having intentions and plans to consume food" (r=0.426, p=.008), "Anticipation of relief from negative states and feelings as a result of eating" (r=0.343, p=.035), "Craving as a physiological state" (r=0.339, p=.037), "Cues that may trigger food cravings" (r=0.422, p=.008) of the FCQ-T; and between craving in the bakery/café and the scales "Having intentions and

plans to consume food" (r=0.419, p=.009), "Lack of control over eating" (r=0.381, p=.018), and "Cues that may trigger food cravings" (r=0.420, p=.009) of the FCQ-T.

The results also showed a significant correlation between craving in the kitchen and the scales "An intense desire to eat" (r=0.365, p=.024) and "Craving as a physiological state" (r=0.350, p=.031) of the FCQ-S; between craving in the bedroom and the scales "An intense desire to eat" (r=0.407, p=.011) and "Craving as a physiological state" (r=0.365, p=.024) of the FCQ-S; and between craving in the bakery/café and the scales "An intense desire to eat" (r=0.400, p=.013), "Anticipation of relief from negative states and feelings as a result of eating" (r=0.340, p=.037), and "Craving as a physiological state" (r=0.335, p=.040) of the FCQ-S.

Once we had identified which FQC-T/S factors were correlated with the food craving experienced in each VR environment, we carried out multiple regression analyses to assess which percentage of variance explained the models containing these factors, and which of them made the greatest contribution to the model.

Table 1. Summary of multiple regression analyses for FCQ-T and FQT-S variables predicting craving for food in each virtual environment.

	Predictor	Beta	t	p	R2	R2 adj.	F	p
Kitchen								
T	"Having intentions and plans to consume food"	.097	.487	.630	.269	**.180**	3.034	.031
	"Cues that may trigger food cravings"	**.288**	1.581	.123				
S	"An intense desire to eat"	.133	.591	.559				
	"Craving as a physiological state"	.234	1.115	.273				
Dining-room								
T	"Cues that may trigger food cravings"	**.340**	2.166	.037	.115	**.091**	4.692	.037
Bedroom								
	"Having intentions and plans to consume food"	.165	.794	.433	.345	**.218**	2.722	.031
T	"Anticipation of relief from negative states ..."	.012	.069	.945				
	"Craving as a physiological state"	-.074	-.377	.709				
	"Cues that may trigger food cravings"	**.333**	1.768	0.87				
S	"An intense desire to eat"	.177	.780	.441				
	"Craving as a physiological state"	.231	1.098	.280				
Bakery/Cafe								
	"Having intentions and plans to consume food"	-.113	-.403	0.690	.363	**.239**	2.940	.022
T	"Lack of control over eating"	**.317**	1.306	.201				
	"Cues that may trigger food cravings"	.277	1.535	.135				
	"An intense desire to eat"	.310	1.308	.201				
S	"Craving as a physiological state"	.178	.719	.477				
	"Anticipation of relief from negative states…"	-.064	-.321	.750				

As Table 1 shows, "Cues that may trigger food cravings" (FCQ-T) is the factor that makes the strongest unique contribution to explaining the presence of food craving

in the kitchen, the dining-room and the bedroom. On the other hand, the factor "Lack of control over eating" (FCQ-T) makes the strongest unique contribution to explaining the presence of food craving in the bakery/café.

Participants with the highest levels of food craving trait and food craving state, assessed with the FCQ-T/S, also showed higher levels of craving when exposed to the VR environments. However, differences between students with a high (n=19) and low (n=19) food craving trait and state were not statistically significant.

Conclusions

VR seems to be an effective technology for eliciting food craving, especially in the case of participants with higher scores on the FCQ-T and the FCQ-S. Food craving experienced in the different virtual situations is mainly associated with high reactivity to food cues (the scale "Cues that may trigger food cravings" of the FCQ-T), strong desire to eat at this very moment (the scale "An intense desire to eat" of the FCQ-S), and being hungry right now (the scale "Craving as a physiological state" of the FCQ-S). However, food craving specifically experienced in the bakery/café is related with difficulties in controlling intake (the scale "Lack of control over eating" of the FCQ-T).

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SECTION VI

WORK IN PROGRESS

It is important to emphasize the importance of developing technological strategies (such as artificial intelligence or augmented reality) that can provide either new enhanced experiences or technological systems also nurtured by artificial intelligence techniques developed by humans.

These new mixed ICT tools might evolve into experts in "helping others," with the objective of making our net-shared experience increasingly more competitive, creative, and capable in the task of helping others. Of course, this has significant ethical implications, which will also need to be explored at greater depth.

Botella, Riva, Gaggioli, Wiederhold, Alcaniz, and Banos, 2012

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Assessing the Mental Frame Syncing in the Elderly: A Virtual Reality Protocol

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Abstract. Decline in spatial memory in the elderly is often underestimated, and it is crucial to fully investigate the cognitive underpinnings of early spatial impairment. A virtual reality-based procedure was developed to assess deficit in the "mental frame syncing", namely the cognitive ability that allows an effective orientation by synchronizing the allocentric view-point independent representation with the allocentric view-point dependent representation. A pilot study was carried out to evaluate abilities in the mental frame syncing in a sample of 16 elderly participants. Preliminary results indicated that the general cognitive functioning was associated with the ability in the synchronization between these two allocentric references frames.

Keywords: Virtual Reality, allocentric, elderly, mental frame syncing

Introduction

Decline in spatial memory in the elderly is often underestimated, probably because this impairment is more insidious as compared to the decline in other cognitive abilities. Elderly subjects with impaired spatial orientation and navigation can develop different strategies to reduce their tendency to get lost, which is a symptom of a strong deterioration of spatial memory [1-2].

Spatial memory has been defined as the ability to encode, store, and retrieve spatial information in order to build an internal representation of the environment (namely, a ''cognitive map'') [3]. It has been described as a high-level cognitive process based on two different frames of reference: an egocentric frame, in which object locations are represented relative to the individual's orientation; and an allocentric frame, in which object locations are represented irrespective of the individual's orientation [4]. According to Burgess and colleagues [5], an effective spatial orientation in the surrounding environment requires a translation from a long-term allocentric hippocampal representation to an egocentric parietal one. Specifically, within the hippocampus, the CA3 region, receiving input from the entorhinal cortex, constitutes a cognitive model of the scene to which the individual orients (namely, an allocentric view-point dependent representation), while the CA1 neurons, receiving input from the CA3 via Schaffer's collaterals, quickly encoding abstract object-to-object information (namely, an allocentric view-point dependent representation) [6-7]. Starting from Burgess and colleagues' model, Serino and Riva have proposed that for an effective
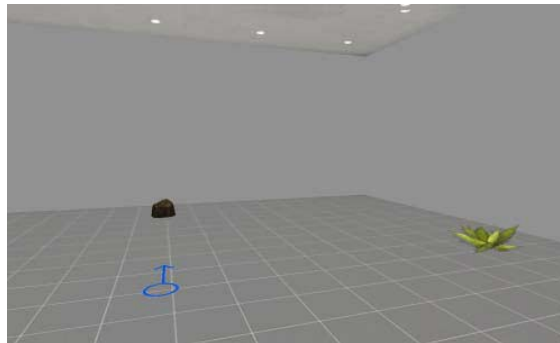
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spatial orientation it is crucial that allocentric view-point independent representation has to be synced with the allocentric view-point dependent representation [8-9]. The "mental frame syncing" may be defined as a cognitive process that allows an effective spatial orientation thanks to the continuous synchronization between these two kinds of allocentric representation. If the "mental frame syncing" stops, it is difficult to reconstruct a coherent cognitive map for navigating in the surrounding environment.

Description of VR procedure for assessing the ability in the "mental frame syncing"

To assess the ability in the "mental frame syncing" between the allocentric view-point dependent representation and the allocentric view-point independent representation, we designed and developed a Virtual Reality (VR) procedure (Figure 1).   First, the participant is asked to navigate in a virtual room including two objects (*encoding phase*): starting from the center of the room, he/she has to memorize the position of two objects. Next, she/he is asked to indicate the position of one object on a real map (*allocentric representation task*). Finally, she/he is asked to enter in an empty version of the same virtual room. The participant has to indicate position of the object, starting from the position of the other object (*mental frame syncing task*). In both tasks, the correct answer is the dependent variable.

Figure 1. A screenshot of the virtual room used for assessing ability in the "mental frame syncing" between the allocentric view-point dependent representation and the allocentric view-point independent representation

1.   Methods & Materials

1.1. Participants

In order to investigate the feasibility of this procedure, we carried out a pilot study involving a sample of 16 healthy elderly individuals, 6 men and 10 women. The mean age of the sample was 77.62 ± 7.55, with a mean of years of education of 10.81 ± 3.94.

All participants were screened to exclude neurological or major psychiatric illness. All participants had good visual acuity, no vestibular disorders, plus absence of alcohol or drug use. None of the participants reported prior experience computer games or virtual environments. Mini-Mental State Examination (MMSE) scores indicate that the sample is almost in the normal range (mean score = 26.8; S.D. =1.79).

1.2. Procedure

Before starting the experimental procedure each participant was provided with written information about the study and was invited to give written consent for the inclusion. Then, each participant was submitted to the Mini Mental State Examination [10]. At the start of the experimental session, participants were seated at a desk in front of a computer monitor. The virtual environments was rendered using a portable computer (ACER ASPIRE with CPU Intel® Core™i5 and graphic processor Nvidia GeForce GT 540M). Participants also had a gamepad (Logitech Rumble F510), which allowed them to explore and to interact with the environment. All virtual environments were created with the software NeuroVR 2.0 (http://www.neurovr.org) [11] a free virtual reality platform based on open source elements for the neuropsychological assessment and rehabilitation.

After an initial training in virtual reality technology, all participants were asked to complete the VR-based procedure for assessing abilities in the "mental frame syncing". There was no time limit. Both in the allocentric task and in the mental frame syncing task, the correct answer is the identification of the correct position of object location.

1.3. Data Analysis

The responses on our VR-based procedure, both on the allocentric task and on the mental frame syncing task, are measured on an ordinal scale (from 0 = no correct answer; to 3 = all correct answers).

The association between the overall cognitive functioning (measured with MMSE) and the scores on both the allocentric task and the mental frame syncing task was quantified using an ordinal regression analysis, which allows for the regression of continuous, ordinal or nominal variables on an ordinal dependent variable. Analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 18, IBM, Armonk, NY).

1.4 Results

The general cognitive functioning has been examined in association with the abilities in storing an allocentric representation and in the "mental frame syncing" by using two ordinal regression analyses. The first ordinal regression analysis revealed a signficant association between the general cognitive functioning (measured by MMSE) and the ability in the mental frame syncing (Pseudo-R Square: .331; Wald x}= 5.815, p<0.05). This model presented a good fit (x}= 6.54; p<0.05).

In Figure 2, it is possible to observe how an increase in the scores of MMSE corresponds to an increase in the scores on the mental frame syncing" task.
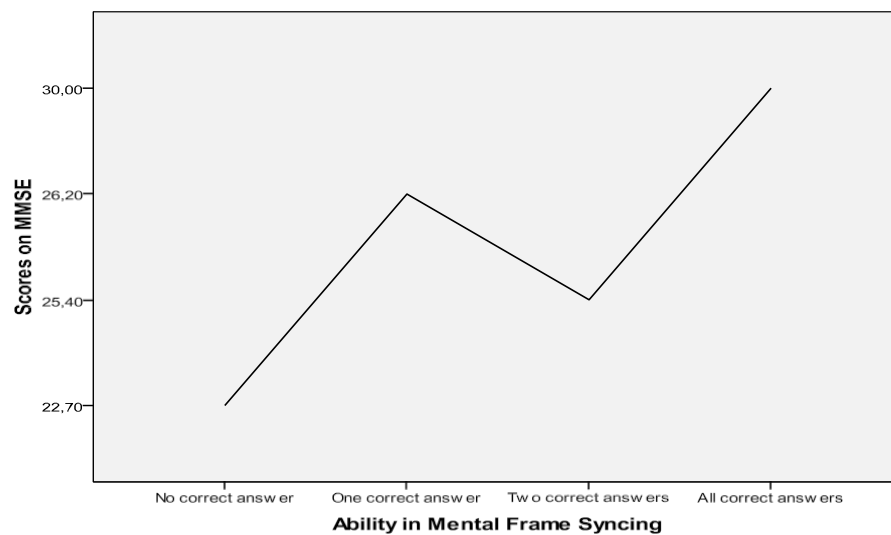
Figure 2. The association between the general cognitive functioning (measured with MMSE) and the ability in the "mental frame syncing"

Conversely, the second ordinal regression analysis showed that the ability in storing a long-term allocentric representation was not associated with the cognitive functioning (Pseudo-R Square: .025; Wald x}= .460, p=.497).

Conclusions

A critical challenge for cognitive psychology and neuropsychology is to find new methodologies to better evaluate, understand, and predict the cognitive decline in elderly. For example, besides the well-known episodic memory impairment, a decline in spatial memory is one of the earliest clinical manifestations of Alzheimer's Disease (for a review, see [13]).

To evaluate spatial abilities in elderly, we have created a new VR-based procedure for assessing the "mental frame syncing", namely a cognitive ability that allows an effective spatial orientation thanks to the continuous synchronization between the allocentric view-point dependent representation and the allocentric view-point independent representation. In general, VR appears to be a suitable medium that offers several requirements for an effective cognitive assessment of spatial cognition: repetitive stimuli, feedback about performance, controlled, secure and ecological environments [13-16]. Specifically, it is possible to control and manipulate the egocentric point of view for investigating the ability in the synchronization between different spatial representations.

Our VR-based procedure was well-accepted by elderly participants: the comprehension of the task and execution compliance were satisfactory. As regards VR technology, we found that it is appropriate for the target population after an initial familiarization with the joystick use.

As concerns the relationship between the cognitive status and the ability both in storing an allocentric representation and in the "mental frame syncing", results showed

that our VR-based procedure seems to be enough accurate to distinguish between two different spatial skills. More precisely, the ability in the "mental frame syncing" appears to be associated to the general cognitive functioning. Instead, the ability in storing a long-term allocentric representation was not related to the overall cognitive status.

Albeit preliminary, these observations indicated the potential feasibility of this VR procedure for investigating the cognitive underpinnings of spatial orientation in elderly population. New research studies are required to further explore the link between the ability in the synchronization between different spatial representations in both healthy and neurodegenerative population.

Acknowledgements

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Intersubjectivity in Video Interview

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Abstract. The concept of relationship has rapidly evolved over the past few years, since the emergence of the internet network and the development of remote communication and exchanges. The emergence of cyberculture with the development of the internet has led to a new representation of the social link, in which communication never stops. In this context, computer mediated intersubjective relationships represent a main line of thinking and research. Thus, can we consider for example that relationship is only composed of an informational exchange? Would there be other dimensions possibly missing in computer mediated relationships? In this case, how could we re-introduce these aspects, "re-humanize" the remote relationships?

New practices in psychology emerge with the ICT usage, both in the fields of research and for therapeutic purposes. Some fields like medicine already use remote health platforms that have proven useful in certain situations.

In the field of remote clinical psychology, different media are used that contribute to the framework definition of the remote clinical interview, where the concept of relation holds a central place. Videoconference enables the introduction of an important element from the point of view of sensoriality: the body image, which engages the subjects' interaction in a different way than in a written or verbal exchange. But is the use of videoconference sufficient to establish a clinical framework comparable to the traditional one? How can the computer-mediated relationship enable and establish a potential object relation, rather than a mirrored one?

Thinking through an online adaptation of the clinical interview framework led to the elaboration of a specific tool dedicated to this purpose and to research into the access to intersubjectivity in clinical video interview. This study's encouraging results have fostered the pursuit of this experience in the form of a platform dedicated to the conduction of clinical interviews through videoconferencing for psychotherapists and patients at large. A methodological analysis accompanies this research work, in order to continuously observe this specific clinical practice, which can be used in different fields of psychology and different psychotherapeutic methods.

Keywords. Video-interview, intersubjectivity, body image, platform, psychotherapy.

Introduction

ICT uses are multiple nowadays, in the post-modern societies and the Cyberculture context in which we are living. Different comments emerge from the observations of these uses in human sciences. Some of these observations are questioning the notion of social link, which has changed a lot with remote communications made possible by the internet since the end of the 90's [1-3].

Considering these changes, even the notion of relationship could be re-defined, with its different dimensions. Friendships, work relationships, love relationships are nowadays influenced by the new medias available. They also represent an exchange of

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information and interactions involving emotional and affective factors, which may influence physical factors.

Thus, it seems important to remember the initial conception of the computer, made by Von Neumann [4], which influenced Wiener [5], founder of the cybernetic theory, at the origin of the Cyberculture. It is interesting to note that the explicit model that permitted to design computer was the human brain. Human reasoning was then considered as the result of an informational treatment at a neuronal level, and understanding this treatment modalities would permit to build an "artificial brain", comparable in its performances to a "natural" human brain.

However, in our research work based on the exchange between two human beings via a computer in a clinical interview, it appeared obvious that the emotional dimension was also an essential element to consider that could be related to the body dimension observable in video-interviews.

It is probable that the type of media used to communicate influences the quality of the relation, whereby the body image can be more or less visible. In a written chat communication, no facial or body expressions can be taken into consideration, contrarily to a video interview communication. This is why we promoted the use of videoconference instead of other media to realize the clinical interviews.

In the health field more generally, the use of ICT has produced changes in the therapeutic relationship between patients and the medical staff and has proven to be sometimes as much, or even more efficient than classical care. Telemedicine tends today to develop more and more and presents proven advantages on classical care frameworks. In the field of psychology, many researches and therapeutic protocols already include different uses of ICT.

In the psychotherapeutic field, these uses are often found in the framework of digital mediations. Different kinds of mediation can be found, such as the use of a screen to play video game with patients [6], or to observe them playing [7]. Other types of mediation use simulation in 3D virtual environments [8], where the body contribution is differently solicited, in particular with the "presence" phenomenon [9].

Our initial approach was to consider how we could adapt the clinical interview framework online, defined in a psychodynamic approach [10]. This question led us to create a specific tool, dedicated to videoconference interviews and facilitating the access to the intersubjective dimension [11], [12]. Different dimensions of the interactions [13] could be observable and usable for a clinical psychotherapeutic work, using this specific tool, such as a remote transfer-countertransferencial relationship.

1. Problem

How can we adapt some founding elements of the clinical psychotherapeutic framework, at a distance, using the ICT, in order to allow subjectivity to emerge during the video interviews and to observe and analyze the transference and counter-transference dimensions, in a psychodynamic perspective?

In our research framework in video interview, the notion of relation holds a central place: our point is to consider the principal elements of a clinical interview with a psychotherapeutic purpose, and to adapt them online. In "videocounseling", the computer-mediated relation between two human beings cannot be reduced only to an informational exchange, since the affective, emotional and intersubjective factors are essential in it.

Compared to a written exchange (chat) or a verbal one (phone), videoconferencing brings more "bodiness" in the communication. Thus, from a sensorial perspective, while only the voice is used on the telephone, videoconferencing also brings the visual perception of the bodies interacting during the session.

We suppose that this "bodiness"-reinforced interaction can "re-humanize" the communication at a distance compared to other medias, and help both patient and psychotherapist to find an interview framework similar to a regular one. An object relationship development might thus be preferred to a mirror relationship.

According to Lebovici [13], the interactive schemas, derived from mother-baby observations, illustrate different levels of interactions: behavioral interactions, affective interactions and fantasy interactions. The behavioral interaction is visible on three main levels: bodily, visual and vocal. The bodily level refers to the physical and mental *holding* of Winnicott [14]. The visual level corresponds to the eye-to-eye dialogue, or to eyes meeting and refers to what Winnicott [15] describes in reference to the mother's look as the mirror for the mental subject constitution through the first object relation. The affective interaction [13] derives from the emotional climate. Finally, the fantasy interaction [13] relates to the reciprocal influence of the mother's life development and of her baby's, both through their imaginary, conscious aspects, and their fantasized, unconscious ones. It gives meaning to the behavioral interaction.

In "videocounseling", we have used these references to analyze the interviews and observe the various levels of interaction, to see if we could observe the three of them and then get as close as possible to a "classical" clinical relationship.

2. Method/Tools

The created online tool is named iPSY[2] : it is a web site including different options that are adaptations of the clinical interview framework, such as options allowing the psychotherapist to handle the matters of confidentiality of the exchanges, of time (moment, frequency, length of the interview), money, and the good progress of the interview, from the beginning to the end.

This tool was first created as a prototype and used in a PhD research[3] by one psychotherapist, with 2 groups of 4 subjects, during 64 video interviews over a 3-year period. One group was composed of 4 subjects who had been previously met in a classical framework and whom we introduced to the website, and the other comprised 4 subjects who used the web site from the onset to meet with us.

In respect of the ethical research framework in psychology, all the subjects signed an agreement form and all users signed the website General Conditions of Use, which also include ethical and legal elements.

Ethical rules were particular critical with the data security issue. Thus, it became critical to use a dedicated private server and not software such as Skype, which do not offer sufficient security features in regards to data storage and exchange.

Differentiated spaces are proposed on the site, such as the waiting room and the "videocounseling" practice room, to help the therapist stay in control of the framework, by guiding the patient through these spaces. This laying out, in the context of a remote

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appointment with a professional, has facilitated the implication of participants in a manner similar to a classical practice session.

In addition, the use of videoconferencing has enabled us to take into consideration the importance of the look and of sensorial interactions, involving the analyst's and the patient's bodies, for example through the "mirror option". This option, available in all videoconferencing software, is proposed on iPSY, giving the patient the possibility to see his own image during the interview, the psychotherapist being notified by the system.

The analysis of the transfer and counter-transfer in such conditions was a pre-requisite to first evaluate the system, before using it for clinical and therapeutic purposes.

3. Results

Global results validated the hypothesis of a possible clinical encounter in video interview, comparable to the classical framework, without being totally identical to it.

According to each subject's problem, the video interviews enabled the continuity of the follow-up, in different circumstances.

During the video interviews with the subjects, different elements emerged and led us to think that we were in a remote transfer-countertransferencial relationship. This leads us to think that the "bodiness" dimension within the framework proposed on iPSY website, has enabled a practice similar to the classical clinical interview framework [10-12].

Thus the use of the system enabled a detailed analysis of the notable relational modalities during remote interviews. A theme-based grid including the interactive schemas defined by Lebovici [13] supported the analysis of the interviews. Thus, in videocounseling, the access to the interactions fantasy level has brought light onto the emergence of the patient's subjectivity and onto the transfer / counter-transfer expressions during the sessions. Through these clinical elements, it thus appears that videocounseling, as a digital mediation with therapeutic purposes, seems to correspond to the creation of a third space, which facilitates the passage towards intersubjectivity.

Conclusion

After we finished this first study, the results convinced us to carry on the research with a new platform, designed to host many professionals and patients.

The design and the development work of this new platform are today completed, and we reworked completely the first web site to achieve a more complete and practical use of this tool.

We now need to explore further the specificities of these uses, from the patients' side and from the psychotherapists' side as well, in order to define methodological landmarks of this clinical framework. This has started with the opening of the new platform to independent professionals trained to different specialties in psychotherapy, and with some institutional research projects that will focus more on specific aspects within the psychopathological field, such as the care of patients suffering from the psychological consequences of trauma.

The research aspect is constantly kept in perspective and data are collected to improve the knowledge about specificities and "sameness" in this clinical type of meeting.

All of this research project aspects bring up new questions and answers about the concept of relationship and how it could be re-defined considering the ICT uses in video interview. Another point concerns the impact of physical distance on the relationship, and the ways to find a "good enough" [14] psychological distance for a clinical interview. Finally, this research allows us to think about the topic of the opposition frequently met in literature between virtuality and reality. From this perspective, the video interview framework addresses more a psychological reality rather than a virtual one.

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NIRS Study of the Effects of Computerized Brain Training Games for Cognitive Rehabilitation of Major Depressive Disorder Patients in Remission: A Pilot Study

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Abstract. We used functional Near-Infrared Spectroscopy (fNIRS) to estimate brain activity in Major Depressive Disorder (MDD) patients (in remission), while they played a computerized brain training games for cognitive rehabilitation. MDD is characterized by marked deterioration in affect as well as significant impairment in cognitive function. It was found, that depressed patients showed long-lasting impaired cognitive performance on cognitive demanding tasks despite significant improvement in the depression symptoms. Previous studies have shown that video games can improve cognitive functions. But assessment was made only with cognitive tests. The main objective of this research was to study the effects of brain training games on cognitive functions of MDD patients in remission with objective instrumental NIRS method. Tissue oxygen saturation (StO2) and absolute concentrations of oxyhemoglobin ([O2Hb]), deoxyhemoglobin ([HHb]) and total hemoglobin ([tHb]) were measured by functional near-infrared spectroscopy (fNIRS) - Oxyprem (BORL, Zurich, Switzerland). Preliminary results are discussed.

Keywords. Non-invasive physiological monitoring device, functional Near-Infrared Spectroscopy (fNIRS), Depressive disorders, Cognitive function, Computer Games

Introduction

Major depressive disorder (MDD) is a common disorder, which is usually associated with severe and persistent symptoms leading to important social role impairment and increased mortality [1,2]. MDD is characterized by marked deterioration in affect as well as significant impairment in cognitive function [3, 4]. A common understanding early in the literature and in clinical practice has been that cognitive impairment restores as depression heals. Of the longitudinal studies existing in this field several indicates that cognitive impairment seen during episodes of illness, also persists during episodes of symptom reduction [5] and even in remission [6,7,8], although some studies report no such findings

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[9,10]. The association between cognitive function and MDD in a long-term perspective has seldom been investigated, thus longitudinal studies on this topic are few and results are divergent. It is found that depressed patients showed long-lasting impaired cognitive performance on cognitive demanding tasks despite significant improvement in the depression symptoms [5]. Cognitive training and rehabilitation could prove important in treating depression in the long-term course, and help prevent relapse.

1. Brain Training in Cognitive Rehabilitation

Brain training games have emerged as new treatment approaches in cognitive rehabilitation. Mental exercises show protective effect against dementia, purposeful, scientifically reasonable cognitive training program shall be even more the useful [11]. Investigations on the effects of computer & video games on regional cerebral blood volume have shown that video games increase brain activity [12,13,14]. There are many researches devoted to changes of circulation of the blood in brain during performance cognitive tasks. Choosing the right brain training program was based on the following criterions: game developers must be scientists -neuropsychologist, this game programs must be published in peer-reviewed scientific papers. Lumosity's (Lumos Labs, Inc., San Francisco, CA USA) exercises are based on the latest findings n neuroscience. Several researchers are currently investigating the benefits of "Lumosity" training for cognitive impairments associated with: ADD/ADHD, Mild Cognitive Impairment (MCI), Multiple Sclerosis, PTSD, TBI, Personality Disorders, Schizophrenia, Cancer (including "Chemo Fog" and "Chemo Brain"), HIV [15]. The program involved game-like exercises that allowed participants to practice cognitive flexibility skills: Speed, Memory, Flexibility, Attention, Problem Solving.

2. NIRS in Estimation Game Effects

Improvement of cognitive functions in previous studies was confirmed by cognitive tests. Near Infra-Red Spectroscopy (NIRS) will be used for examination of hemodynamics and neural activation in our reseach. Mental activity increases the flow of blood, oxygen and nutrients to the brain. This was used to monitor the task effect. NIRS is non-invasive method of measuring the relative change in the concentrations of oxygenated and deoxygenated hemoglobin ($\blacklozenge$ [Oxy-Hb]) and $\blacklozenge$[DeOxy-Hb], respectively), which are closely correlated to the neural activity of the brain. NIRS has shown a multiplicity of evoked cerebral blood oxygenation (CBO) changes during cognitive performance [6].

3. Materials-Methods/Tools

5 MDD patients (in remission) participated in Pilot study. Inclusion Criteria: MMD patients in remission, patients without intracranial pathology, Mini-Mental State Examination (MMSE) score 26 or greater, normal vision and hearing, consent of

being part of the investigation. Exclusion Criteria: Diagnosis of dementia, planned move from study area, inability to complete study activities, scores lower than inclusion criteria requirements. Estimation of psychic state   was done by MMSE (Mini-Mental_State-Examination) (> 25±1), estimation Cognitive function by Monreal Scale (detection of Mild Cognitive impairment).

Approbation of the NIRS methodology   to monitoring computer game effects for cognitive rehabilitation preserved:

 - validation NIRS Oxyprem experiment (test to check properly functioning Oxyprem and collect biological data);

 - conducting experiments with NIRS Oxyprem measurement   during game play;
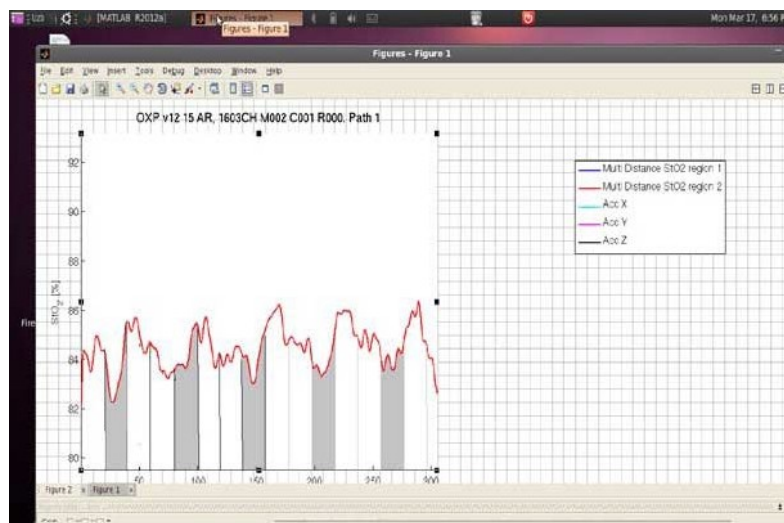
4. NIRS Recordings

NIRS recordings were performed using   OxyPrem (BORL, Zurich Hospital University, Switzerland).

Two simultaneous values of StO_2 are calculated – one for each detector.   A head shell mounted on the scalp overlying mainly the prefrontal area. Brain activity was assessed with NIRS rest time and during game play.

## 5. Validation of Experiments

The first experiment was a breath holding experiment. The test was used as a validation experiment in order to ensure that   system worked correctly and could collect biological data. To validate that the system was functioning as expected, a breath holding experiment was performed on patients. The result was compared with a lab method [16]. Test subjects were asked to rest for 20 seconds, then to hold their breath for 20 seconds, and there after exhale and breathe normally for 20 seconds. The trial for each test subject lasted for 300 seconds. We performed 5 breath holding trials (Fig.1).

Figure 1. An example of data obtained during a breath holding trial. The graph shows that StO2 increased during the breath holding

6. Cognitive Tasks for NIRS Recordings

Prefrontal activities were recorded by NIRS during the Lumosity game play. The trial consisted of a 60s pre-task baseline period, a 90 s task period, and a 60 s post-task rest. Participants were asked to perform Mental Arithmetic (MA) task.
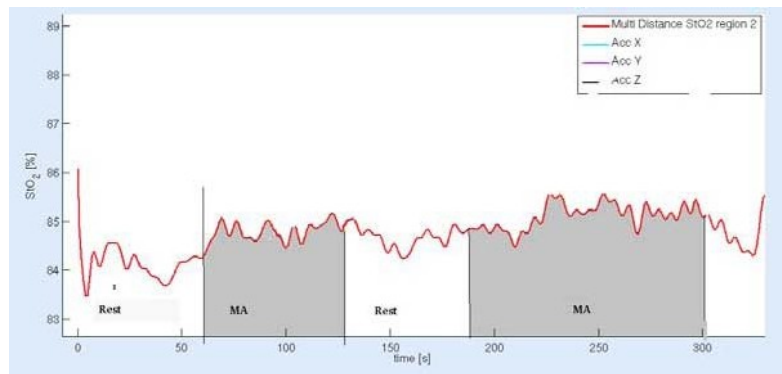
Figure 2. Changing StO2 (ratio of Oxygenated Hemoglobin to Total) Concentration as a percent during Rest time and Arithmetic (MA) task playing. StO2 increased during stimulation period.

7. Results

Preliminary results show that patients had significantly improved their performance on all tests of the brain training. The graph (Fig.1) shows that StO2 increases during the breath holding. This periodic changing of oxygen consumption is in accordance with experiments [16]. This result indicate reliability of NIRS measurements and its possible application for patient testing during game training. We speculate that increasing of oxygenation level during the exercise period is connected with the increasing demand of oxygen in right forehead area responsible for brain cognitive function. As we can see during second exercise period we observe considerable more oxygenation level what is connected with increasing of exercise complexity. So we can come to conclusion that NIRS measurements may be useful tool to instrumental and quantity characterize cognitive function of patients in rest and exercise. Future research is required of the calculation statistics for difference between selected period during stimulation and rest time in 15 trials. We will find significant differences in some of the locations and to see an activation.

Conclusion

We suggest that NIRS technology can be used as an efficient instrumental, noninvasive and objective tool to monitor cognitive functions of patients during the rehabilitation period. Results suggest that a program of computerized cognitive exercises can be successfully implemented and serve elaborate new treatment and rehabilitation programs for MDD patients, aimed at cognitive improvement.

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Usability Assessment of the Virtual Multitasking Test (V-MT) for Elderly People

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Abstract. In the last decades an increasing number of psychological researches have used Virtual Reality (VR) technology in different fields. Nevertheless, few studies used Virtual Environments (VEs) with a sample of older users. The aim of the present study is to assess the usability of the Virtual Multitasking Test (V-MT), which consists in a virtual apartment created to assess cognitive functions in elderly people. This study reports the preliminary results to support the development of a VE in which elderly people feel present and fully immersed.

Keywords. Virtual reality, usability, virtual multitasking test, presence, elderly

Introduction

In the last few decades an increasing number of psychological researches have used Virtual Reality (VR) technology in different fields. For instance, Virtual Environments (VEs) have been involved in the treatment of anxiety disorders, in the study of cognitive process and in the rehabilitation to home environments [1, 2].

Few studies have used VEs with sample of older users [3, 4]. With aging, the abilities of the subject to notice, comprehend, encode, take attention and interact with technologies could be affected by age-related deficits that are part of the natural aging process or caused by different diseases (e.g., Alzheimer syndrome or head trauma) [5]. In order to design a VE in which the subject could feel present and fully immersed, usability studies have to be conducted to address the specific needs of the elderly population. The aim of the present study is to assess the usability of the Virtual Multitasking Test (V-MT), which consists in a virtual apartment designed to assess cognitive functions in elderly people. The purpose is to understand what are the strengths and weakness of using V-MT in order to individuate and modify the elements that prevent an intuitive interaction between users and the technology. The usability of V-MT is assessed in term of efficacy, efficiency and satisfaction (ISO 1998, 9241-11; D1). This exploratory study has two hypotheses. First, it is expected that the usability of VMT will be: directly proportional to number of tasks completed (efficacy), inversely proportional to time occurred to complete tasks (efficiency) and directly

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proportional to the grade of pleasantness (satisfaction). Second, it is expected that the VMT usability will be directly proportional to familiarity with technologies.

1. Method

1.1. Participants

This study has involved a sample of ten elderly subjects (6 males and 5 females,;: 60 years old) without any diagnosis of cognitive impairment.

1.2. The Virtual Multitasking Test (V-MT)

The present usability study targets the Virtual Multitasking Test (V-MT) which consists in a virtual apartment designed to assess cognitive functions of elderly people. It is used both with a Head Mounted Display (HMD) technology, which has been used in the present study, as well as with CAVE-like technologies. The HMD technology [6, 7] is composed of a virtual reality helmet (z800 from eMagin) that provides a monoscopic display and a motion tracking equipment (IS-300 from Intersense) which reacts to the head and hand movements of the subject. The tracker allows the computer to adapt the 3D set according to the user's movement [6]. Through the use of a Wand the participant could move forward into the VE, perform actions, and pick up or drop the objects.

1.3. Assessment tools

> Descriptive: Mini Mental State Examination (MMSE) [7], Familiarity with technology questionnaire (built ad hoc, open and closed questions 5-point Likert Scale), and Simulator Sickness Questionnaire (SSQ, pre- and post-immersion) [8]
> Usability assessment: System Usability Scale [9] (SUS, adapted to the VR, 10 items, 5-point Likert Scale), Think Aloud technique, and Semi-structured interview (built ad hoc)
> Hypotheses: bivariate correlations (Rho of Spearman) between the SUS scores and: number of tasks completed (efficacy), number of tentative (efficiency), level of pleasantness (satisfaction), and familiarity with technologies [2]

1.4. Protocol

All the subjects have participated to the three parts of the research. During the first part of the experiment, participants have answered three questionnaires. First, the Mini Mental State Examination (MMSE) has been administered in order to assess the participant cognitive functions. Subjects with score about 26 points have been excluded from the study. Second, the participant's health status has been documented before the immersive experience with the Simulator Sickness Questionnaire (SSQ). The third questionnaire has assessed the subject familiarity with technology. During the second stage, the sample has participated to a VR training, during which the subjects were became use to the VR technologies with the VR apartment. Then, during the

experimental session, the participants have to achieve the 8 tasks of the V-MT (i.e. take a phone message, set the items of the grocery store, send a fax, etc.). While completing the tasks, the subjects have shared their level of satisfaction using the Think Aloud Technique. In the last part of the study, participants have answered to the SSQ in order to collect information about potential negative side effects induced by the immersion in VR and to the adapted version of the System Usability Scale (SUS) which has allowed collecting data about the general subject perception of usability of the V-MT. Finally, the participants have answered to a semi-structured interview designed to collect informations about the subject perception of usability of each specific task.

2. Results

In the first section the results will provide information to describe the sample. The second section will report on the comments on the immersion experience of the participants and the last section will expose the results of the exploratory hypotheses.

First section: descriptive results - The mean MMSE average of the sample was 29 (range: 27-30; sd= .94). The familiarity with technology questionnaire shows that the participants own on average 1.9 (sd= .74) communication media (i.e. personal computer, tablet, and smartphone), which they use a mean of once a week (M= 3.4, sd= 1.17), and alone, without the help of a second person. Moreover, the subjects think that these are simple to use (M= 3.9, sd= 1.29) for the most reported activities (i.e. email, research information, calling, news, playing games). At the end of the VE training, only 3 subjects out of 10 report 2 or less error during the assessment of the level of familiarity with the apartment. Otherwise, only 1 subject out of 10 has been able to repeat immediately the general and specific instruction that he/she has to respect during the following experimental session. One subject had asked to interrupt the immersive experience after the training. A Paired-Sample T-Test has been done on the data collected through the SSQ, and it has shown that there was a significant change of the level of symptoms reported PRE and POST (Total raw score PRE: M= 1.2, ds= 1.4; Total raw score POST: M= 10.9, sd= 8.82) the VR experience [$t_{(9)}$= -2.83 9, *pl* .05]. Data collected by the semi-structured interview have confirmed the participant health status after the immersive experience.
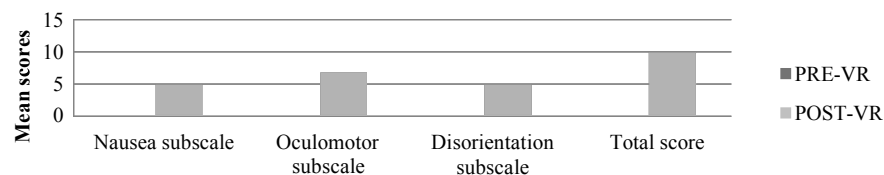

Figure 1. SSQ- Virtual reality side effects pre- and- post-VR

The symptoms that have been more reported are: nausea, general discomfort, disorientation, and headache. One of the participants had to stop the immersion due to side effects.

Second section: usability assessment- None of the participants has fully completed all the tasks. Each subjects has completed on average 5 tasks out of 8 (M= 4.75, sd= 3.8),

partially completed 1 of the 8 tasks (M= 1.2, sd= 1.3) and no completed 2 tasks out of 8 (M= 2.1, sd= 2.7). Data from the SUS have revealed that the usability of the V-MT has been located between the marginal acceptability ranges (M= 69,17, sd= 8.2). These results have been confirmed also by the data collected through the semi structured interview which have additionally shown: 60% of participants have evaluated negatively the use of the pointing method of the wand (i.e. "difficult to use", "frustrating", and "imprecise"); 5 subjects on 10 have evaluated positively the use of the HMD (i.e. "comfortable"); contrariwise, the other 50% of subjects have assessed negatively the experience with the VR helmet (i.e. "uncomfortable", "confusing", "heavy to wear"; "it turns off regularly"); the totality of the sample have evaluated positively the training phase, suggesting that the elderly need to do more practice in order to become familiar with the VR technology; 5 subjects of 10 have evaluated positively the general and specific instructions for the tasks; otherwise, the other 50% of the sample have assessed negatively these rules (i.e. "difficult to remember", "it is not clear what I am supposed to do"). The realism of VR objects, on average, has been evaluated as "sufficient" due to the difficulties bounded to the identification of some items (i.e. grocery store items). The realism of the environments and of the sounds (voice, electronic sounds), on average, has been evaluated as "good". Nevertheless, 3 subjects on 10 have assessed the graphic of the environment as "old" and the colors "too bright". The realism of the movements has been assessed as "sufficient". Specifically, the sample has reported difficulties when they had to "pick up the items" (i.e. telephone, grocery store items), "open the doors", "pointing" the target on the items (i.e. "frustrating"), to "move around", and to "turn" to the different directions. 3 subjects who were wearing bifocal glasses during the VR experience have reported difficulties to identify the items.

Third section: exploratory hypotheses –The bivariate correlations (Spearman Rho) between the SUS scores and the number of tasks completed (efficacy) result not significant (r= -.23, ns), as well as the number of tentative (efficiency) (r= .46, ns), and the level of pleasantness (satisfaction) (r=.-05, ns). The bivariate correlation (Spearman Rho) between the SUS scores and the Familiarity with technologies results not significant (r= .28, ns).

3. Discussion and Conclusions

The aim of the present study was to assess the usability of the Virtual Multitasking Test (V-MT) in order to detect and modify the elements that prevent an intuitive interaction between elderly users and the technology. The results have shown three main different factors which negatively have influenced the performance of the sample. Firstly, some issues related to the tasks were identified, as the nature and number of the instructions and of the tasks (i.e. "too much grocery store items to set in the right place", "the instruction was not clear"), which have generated confusion and frustration among the participants. In this case, it could be recommended to revise the instructions and the tasks considering the abilities and the characteristic of the specific sample. However, modifying the difficulty of the task must take into account the need to discriminate various levels of functioning in order to assess the full range of cognitive functioning. Secondly, we identified some issues linked to the use of the wand: it has been evaluated as too difficult to use to perform movements, and imprecise to perform

actions (i.e. "pick up the telephone", "open the door"). A solution could be to try to modify the pointing method of the Wand, in order to allow a better precision of the instrument. Thirdly, there were some problems bounded to the HMD. Specifically, the low perception of the realism of the objects and of the movements and the difficulties observed to identify the items could be attributed to the technical characteristic of the HMD (i.e. "the colors too bright", "it turns off automatically"). These are important points which require improvement because they prevent an intuitive use of the technology. In fact, the imprecision of the instruments lead the participants to focus their attention on "how to use" the VR instruments. In order to foster a more intuitive interaction, it could be recommended to dedicate more time to the training session. By doing this, the subject could internalize the motor operations and allow the subject to intuitively achieve the task. Re-designing the tasks and the instructions, providing a longer training session, and resolving the technical problems bounded to the technology, could also reduce the incidence of the side effects of the VR. The results of the bivariate correlations analysis are not significant. Only the correlation between the SUS scores and the number of tentative was high enough to deserve attention. The positive relationship between good usability and number of tentative to succeed at the task was counterintuitive and may express sustained motivation in participants who find the V-MT easy to use. Due to the small sample size, these results should be considered preliminary. In fact, employing larger groups of elderly people could provide additional information which could support the assessment process of the use of the V-MT with old-age sample.

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Addressing Cultural Contexts in the Management of Stress via Narrative and Mobile Technology

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Abstract. In developing applications for stress management and mental health, developers have largely ignored cultural context in design, opting instead to produce apps for a general audience. However, apps designed without a specific population in mind actually have limited reach. Generally stress trackers and so-called "therapists in your pocket", tend to be lost among a jungle of other generic apps that appeal only to the quantified self population and those already predisposed to help-seeking behavior. To reach a broader audience, designing for a specific population may have appeal. The AppHappy Project's *Journey to the West* is a mobile app being developed by a multidisciplinary group of students at the University of Pennsylvania. The objective is to promote better stress management and mental health among Asian international college students and facilitate their social integration with the general student population. With a prevalence of depression twice that of domestic college students, a reluctance to engage in help-seeking behavior due to stigma, and the challenge of cultural integration, creating interventions for this population requires a different approach to app-mediated therapy. *Journey to the West* packages bite-sized pieces of Cognitive Behavioral Therapy techniques within the framework of a role-playing game. Every element of its design--from its characters to its art style, from its narrative to its mechanics to its approach to community features—is rooted in a culturally appropriate context. An avatar serves as a surrogate of self while experiencing externalized stressors. Each quest blends therapeutic elements into gameplay with the goal of building resilience towards stressful events.

Keywords. Narrative therapy, mobile app, stress management, mental health, cognitive-behavioral therapy

Introduction

Research has shown that the factors preventing individuals from seeking psychological treatment can be clustered into four categories: cognitive, affective, physical, and cultural. The first three of these are well understood, with cognitive factors accepted as being a lack of knowledge concerning the nature and cause of mental illness, affective factors as related to the stigma associated with health seeking, and physical involving a lack of access due to cost, location, or other barriers. Cultural factors, however, vary by population. To date, most interventions to increase access to care have focused on cognitive or physical factors preventing populations from seeking care, but research has shown that among the populations most vulnerable, such as international college students or the LGBTIQ (lesbian/gay/bisexual/transgender/intersexed/questioning) community, factors linked to depression and impaired help-seeking behavior tend to be cultural in nature. In particular, the stress of social isolation, both actual and perceived, due to cultural concerns has often been referenced in the literature as a primary

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contributor to depression [1]. With respect to international students, which this paper largely focuses on due to a lack of confounding factors from physical or financial lack of access, a 2010 dissertation study by Zehua at the University of Pennsylvania found that international students had a 12-month prevalence rate of depression of 22.6%, approximately twice that of domestic students in the United States (11.3%), with an independent 2013 study finding that domestic students in China had a prevalence rate of 11.7%, by comparison [2]. And in recent years, surveys of international students at 4-year universities in the United States have consistently listed cultural integration as the leading concern among international students, with students commenting that they had few opportunities for engagement, whether in or out of class, that they did not fit in with the community, and that there were significant barriers to connection, whether due to language, lack of information, or a perceived cultural gulf [3].

Perhaps due to this, international students are both less aware of and less likely to utilize on-campus mental health resources due to social isolation and stigma related to cultural factors. With this high level of stress and depression coupled with a historical lack of help-seeking behavior, unique approaches to managing the mental health of this population are needed.

Weiley, Sommers, and Bryce (2004) of the University of Newcastle, Australia, offer a partial solution, making a case for reducing loneliness in this population through the use of online platforms which allow some measure of anonymity, arguing that this will build a sense of community and allow them to engage in safe, comfortable discussions while developing the social confidence to pursue real world friendships [4]. This is consistent with a community ecology approach to cultural competence, and has been shown to be positively correlated with social adjustment in international students - but unfortunately still puts the onus for engagement on the international student [5].

An alternative which has been demonstrated to have substantial positive short and long term effects is computerized Cognitive-Behavioral Therapy (CBT), a digital twist on a long-proven intervention with an >80% adherence rate once initiated [6]. Yet the problem of how to initiate treatment remains, as current implementations do not effectively address the aversion of international students to formal modes of therapy [1].

A brief survey of what is currently marketed on the mobile market as mental health aids finds that available products tend to be either stress trackers or so-called "therapists in your pocket", which - aside from those already seeking help - only appeal to the quantified health population. Studies of consumer behavior and spending further reveal how little money is invested in anything besides mobile gaming, with gaming apps responsible for 50% of all mobile spending and 70% of all downloads in 2011 alone, with a top rated criteria of being fun to play [7].

What innovation there has been with outreach and engagement tends to be found in apps tightly targeted towards the treatment of specific disorders, such as depression or anxiety. Among the latest are interventions such as SPARX, a fantasy role-playing game (RPG) designed to deliver CBT for the treatment of clinically significant depression in adolescents, and gNAT Island, a game which focuses on concretizing the CBT intervention of identifying gloomy Negative Automatic Thoughts (gNATs) to make it accessible to children [8, 9]. Both of these have been shown to be clinically effective, providing a generalizable proof of concept that therapy can be delivered through the context of game-driven narrative. However, these games are ill suited for treating stress in the general population, because of the long play sessions required to experience each game, lack of generalizable appeal, and their framing as therapeutic.

As the latest research into serious games from innovation lab *tiltfactor* shows, the stigma associated with framing can drastically limits interest in a game, with only 20% of a given audience willing to play a game labeled as "educational" or "health promoting", while 95% of that audience would play the very same game if relabeled as an action-adventure title [10]. For some, there is an active avoidance of the game due to not believing there is a need for it; for others, the avoidance is due to fear of how they will be perceived if discovered to be using a therapeutic game. Given that the purpose of creating a game-based intervention was to limit stigma, a focus on therapy first is thus self-defeating in the realm of mental health.

The AppHappy project, a multidisciplinary team of students from the Schools of Nursing, Engineering, and Business at the University of Pennsylvania, was formed to address these concerns by investigating how to best engage with uniquely vulnerable populations - beginning with international students. Like others before it, it aims to help individuals build resilience through evidence-backed treatments, but without inspiring the defensiveness and avoidance that often results from overplaying the therapeutic angle. To do so, members of the project study what behaviors such populations are already engaged in, and what the most effective channels to deliver an intervention might be. In the case of international students, the vast majority of which possess smartphones and use them for entertainment purposes, the ideal medium was found to be a mobile game. Specifically, we chose a mobile RPG, a genre uniquely suited for interventions, with player avatars interacting readily with problem stories.

1. Methodology

1.1. Game Design

Journey to the West, named for the famous 16th century Chinese novel concerning a journey of enlightenment, is a mobile RPG being developed by the AppHappy project. It seeks to engage with the cultural factors surrounding stress and depression using the theoretical framework of Salutogenesis, a model that focuses on supporting health and well-being, as opposed to simply treating disease. It does so through the mediation stylized visuals in an open world, creative mechanics, avatar advancement and the narrative possibilities of quests. These elements, developed from Rolston's Four Pillars of RPG design (exploration, combat, advancement, and narrative), lay out a structure for an immersive gaming experience that contextualizes interventions and makes them a cohesive part of the game, allowing them to be seen as nonthreatening, even fun [11].

As an example, one of the core mechanics - and concepts - underlying combat and interaction with the world is "breath." In an early module, the player is taught the proper rate and rhythm to breathe in order to connect the inner and outer worlds, enabling the player to work "magic" and change the visual landscape through active movement mechanics reminiscent of the Celestial Brush techniques in the critically acclaimed art adventure game Okami [12]. In lieu of buttons and other artifacts often found in mobile-ported RPGs, players simply direct their characters by moving them across the screen, select by tapping, and invoke abilities by tracing patterns on the screen and thus changing the world, making exploration and gameplay more organic. This helps to build a feeling of connection between the player and the game world, reinforced each time a player uses a breath technique, consistent with the traditions of East Asia, in which breath (often referred to as Qi or natural energy), connects all things and forms the basis for traditional medicine, martial arts, magic and more.

contributor to depression [1]. With respect to international students, which this paper elected to use a 2D art style reminiscent of East Asian inkwash and watercolor techniques, making changes to the setting feel more natural (as per report of an early focus group). This consistency is important due to the principle of narrative externalization, made possible through a player avatar's role in recentering and fictional subjectivity - wherein the virtual is experienced as the real [13]. This recentering allows a mapping of real world common stressors and situations into the game space, and conversely allows coping strategies learned in the game space to be treated as "real." In this sense, player avatars serve as surrogates of self in exploring and advancing through the world, encountering new vistas, gaining cosmetic equipment and skills as one progresses, directly acting upon both other characters and the world around them. Advancement and progression, bound up in narrative and mechanics, reinforce a user's sense of growth, allowing the world to feel comprehensible, manageable, and meaningful. These are the components of coherence, the prime salutogenic determinant of whether stress will be harmful - or whether it will instead be motivating and conducive to growth.

As an additional layer to build confidence for social (out of game) interactions, we intend to add vetted community features, including a semi-anonymous forum seeded with mentors (domestic students) from the University of Pennsylvania to foster a sense of community and trust among users, and to coordinate offline event planning.

1.2. Experimental Design

Journey to the West is slated to undergo a randomized, prospective, pilot trial at the Center for Injury Research and Prevention (CIRP) at the Children's Hospital of Philadelphia (CHOP) to test the game's feasibility, efficacy and acceptability as a culturally sensitive stress-management technique. Feasibility is defined here as the ability of the user to create an avatar and go through the modules, efficacy as any change in mood, and acceptability in terms of user satisfaction. It will be conducted in three phases: 1) Screening and Enrollment; 2) Treatment; and 3) Follow-up.

In Phase 1, potential subjects will be screened using the protocol inclusion criteria of being East Asian International Students aged 18+, who own either a smartphone or tablet, and who are not currently diagnosed with a mental disorder. Subjects who meet the criteria will be recruited at International Center, through graduate student groups, or verbally over the phone, stopping after enrolling two cohorts of 15 (producing 24 evaluable subjects in total). At recruitment, they will be given a pre-survey to assess mood, stress, and coping based on the Dundee Stress State Questionnaire.

In Phase 2, Subjects from both cohorts will be given a link to download the game, and asked to go through one module each day over the course of a month. Each module is designed to take between 5-10 minutes, about the average length of a mobile play session. Data concerning frequency and duration of use - as well as in-game events and built in measures of stress (breath rate and skin capacitance) - will be logged and synchronized with the test server for review by investigators. As a key difference, only one cohort will have access to the online forum/mentor system, so that its effectiveness can be assessed independently from that of other interventions in *Journey to the West*.

In Phase 3, following the completion of a month of clinical modules, participants will complete an online questionnaire to determine their level of satisfaction and current level of perceived stress and mood, with log data analyzed.

2. Discussion

To date, most research with serious games and mental health has focused on a disease treatment modality, limiting potential audiences and returns on investment, with universities and companies expending effort in creating apps that few will use - or even desire to use. To our knowledge, *Journey to the West* is the first "serious game" that has rigorously applied user-centered design principles in every area of development - from narrative to game mechanics, from therapeutic modality to how it is promoted and presented. In studying the literature, it becomes apparent that should serious games wish to be taken seriously by the general public - or by vulnerable target populations - then they must not be approached as therapy first, but as whatever is best suited to promoting engagement in the target population without compromising clinical efficacy.

Acknowledgements

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