Volume 14 Year 2016
ISSN: 1554-8716

Annual Review of CyberTherapy and Telemedicine

Being Different: The Transformative Potential of Virtual Reality

Editors:

Brenda K. Wiederhold, Ph.D., MBA, BCIA

Giuseppe Riva, Ph.D., M.S., M.A.

Mark D. Wiederhold, M.D., Ph.D.

Gráinne Kirwan, Ph.D., C.Psychol.

http://www.arctt.info

Annual Review of CyberTherapy and Telemedicine

ISSN: 1554-8716

14

ANNUAL REVIEW OF CYBERTHERAPY AND TELEMEDICINE 2016

Annual Review of Cybertherapy And Telemedicine 2016

Being Different: The Transformative Potential of Virtual Reality

Edited by

Brenda K. Wiederhold
Interactive Media Institute, San Diego, CA, USA
Virtual Reality Medical Institute, Brussels, Belgium

Giuseppe Riva
Catholic University of Milano, Milan, Italy
Istituto Auxologico Italiano, Milan, Italy

Mark D. Wiederhold
Virtual Reality Medical Center, San Diego, CA, USA

and

Gráinne Kirwan
Institute of Art, Design and Technology (IADT), Dun Laoghaire, Co Dublin, Rep. of Ireland

Annual Review of CyberTherapy and Telemedicine

 Interactive Media Institute
6540 Lusk Boulevard, Suite C115
San Diego, CA 92121

ISBN: 1554-8716

Journal Web site: http://www.arctt.info
Interactive media Institute Website: http://www.interactivemediainstitute.com

Richard M. Satava MD, FACS
University of Washington

Anna Spagnolli, Ph.D.
University of Padova

Stefan Stieger, Ph.D
University of Konstanz

Ioannis Tarnanas, Ph.D.
Kozani University CATLab

David Walshe, Ph.D
University College Cork

Dave Thomas, Ph.D.
National Institute on Drug Abuse

Mark D. Wiederhold, M.D., Ph.D., CPE, FACP, FACPE
Virtual Reality Medical Center

Dennis Patrick Wood, Ph.D., ABPP, CAPT MSC USN -retired
Virtual Reality Medical Center

General Information

Annual Review of CyberTherapy and Telemedicine (ARCTT – ISSN: 1554-8716) is published annually (once per year) by the Interactive Media Institute (IMI), a 501c3 non profit organization, dedicated to incorporating interdisciplinary researchers from around the world to create, test, and develop clinical protocols for the medical and psychological community. IMI realizes that the mind and body work in concert to affect quality of life in individuals and works to develop technology that can be effectively used to improve the standards and reduce the cost of healthcare delivery.

Interactive Media Institute
6540 Lusk Boulevard, Suite C115
San Diego, CA 92121 USA
Telephone:+1 858 642 0267
E-mail: cybertherapy@vrphobia.com
Web site: http://www.interactivemediainstitute.com
Journal Web site: http://www.arctt.info

About the Journal
ARCTT is a peer-reviewed all-purpose journal covering a wide variety of topics of interest to the mental health, neuroscience, and rehabilitation communities. The mission of ARCTT is to provide systematic, periodic examinations of scholarly advances in the field of CyberTherapy and Telemedicine through original investigations in the Telemedicine and CyberTherapy areas, novel experimental clinical studies, and critical authoritative reviews. It is directed to healthcare providers and researchers who are interested in the applications of advanced media for improving the delivery and efficacy of mental healthcare and rehabilitative services.

Manuscript Proposal and Submission
Because Annual Review papers examine either novel therapeutic methods and trials or a specific clinical application in depth, they are written by experienced researchers upon invitation from our Editorial Board. The editors nevertheless welcome suggestions from our readers. Questions or comments about editorial content or policies should be directed to the editors only.

Manuscript Preparation
Manuscripts should be submitted in electronic format on CD-Rom or floppy disks as well as on 8½ x 11-in. paper (three copies), double-spaced format. Authors should prepare manuscripts according to the Publication Manual of the American Psychological Association (5th Ed.). Original, camera-ready artwork for figures is required. Original color figures can be printed in color at the editors' discretion and provided the author agrees to pay in full the associated production costs; an estimate of these costs is available from the ARCTT production office on request. ARCTT policy prohibits an author from submitting the same manuscript for concurrent consideration by two or more publications. Authors have an obligation to consult journal editors concerning prior publication of any data upon which their article depends. As this journal is a primary journal that publishes original material only, ARCTT policy prohibits as well publication of any manuscript that has already been published in whole or substantial part elsewhere, unless authorized by the journal editors.

Disclaimer
All the published papers, editorial news and comments, opinions, findings, conclusions, or recommendations in ARCTT are those of the author(s), and do not necessarily reflects or constitute the opinions of the Journal, its Publisher, and its editorial staff.

REVIEW BOARD

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

Willem-Paul Brinkman, Ph.D., Chris Fullwood, Tom Buchanan, Ph.D., Nicola Fox Hamilton, MSc, Mariano Alcañiz, Ph.D., Nathan M. Appel, Ph.D., Alison Attrill, Ph.D. Rosa M. Baños, Ph.D., Cristina Botella, Ph.D., Anthony L. Brooks, Ph.D., Stéphane Bouchard, Ph.D., Darren Chadwick, Ph.D., Irene Connolly, Ph.D. Andreas Dunser, Ph.D., Andrew Errity, Ph.D., Georgios Floros MD, Andrea Gaggioli, Ph.D., Pedro Gamito, Ph.D., Jose Gutierrez-Maldonado, Ph.D., Hunter Hoffman, Ph.D., Olivia Hurley, Ph.D., Adam Joinson, Ph.D., Linda Kaye, Ph.D., Jang-Han Lee, Ph.D., Fabrizia Mantovani, Ph.D., Elvis Mazzoni, Ph.D., John McCarthy, Ph.D., Tim McNichols, Ph.D., Gary O'Reilly, Ph.D., Marion Palmer, Ed.D., Sinisa Popovic, Ph.D., Mark Riordan, Ph.D., Brendan Rooney, Ph.D., Michael Roy, Ph.D., MPH, Richard M. Satava MD, FACS, Anna Spagnolli, Ph.D., Stefan Stieger, Ph.D, Ioannis Tarnanas, Ph.D., Dave Thomas, Ph.D., David Walshe, Ph.D, Mark D. Wiederhold, M.D., Ph.D., CPE, FACP, FACPE, Dennis Patrick Wood, Ph.D., ABPP, CAPT MSC USN

Brenda K. Wiederhold Giuseppe Riva Mark D.Wiederhold Gráinne Kirwan

PRINCIPLES of the ANNUAL REVIEW

Ethical Standards.

Authors published in the Annual Review must uphold and respect ethical standards in the preparation and realization of their research, as well as in the writing style of the papers (avoid prejudice, protect confidentiality of the patients, etc.). Research involving human subjects must have been conducted with respect to current ethical practices and after participants expressed their free and informed consent (e.g., with a signed consent form or other appropriate method). Ethical standards also apply to research that is not conducted with humans (e.g., animal protection protocol), and to publishing issues (e.g., plagiarism, research fraud, authorship misappropriation, duplication of publications).

Conflicts of Interest.

It is the position of the Annual Review that potential conflicts of interest must be made available to the readers since an author's economic and commercial interests may, even involuntarily, bias objectivity. Economic and commercial interests do not necessarily constitute a conflict of interest, and conflicts of interest do not necessarily imply biased research. But the best practice is to disclose activities and relationships that, if known to others, might be viewed as a conflict of interest.

Potential conflicts of interest include, but are not limited to: (a) funding or remuneration, including salaries and equipment, from organizations that may gain or lose financially through the publication of the paper; (b) personal financial interests, including receiving royalties or holding stocks and shares in companies that may gain or lose financially from publication; (c) holding patent and patent applications whose financial value may be affected; (d) employment by an organization that may gain or lose from publication of the paper. All contributing authors are expected to provide the Editor with a signed presenter disclosure form, and all contributing authors and reviewers are encouraged to contact the Editor at any stage in the manuscript review process if they believe that a potential conflict of interest needs to be examined.

Upholding the Annual Review's Standards.

Our publication pays careful attention to the protection of a patient's anonymity in case reports and elsewhere.

Identifying information such as names, initials and hospital numbers must be avoided. Also, authors should disguise identifying information when discussing patients' characteristics and personal history.

Preface

ARCTT is a peer-reviewed all-purpose journal covering a wide variety of topics of interest to the mental health, neuroscience, and rehabilitation communities. This mission of ARCTT is to provide systematic, periodic examinations of scholarly advances in the field of Cybertherapy and Telemedicine through original investigations in the telemedicine and cybertherapy areas, novel experimental clinical studies, and critical authoritative reviews.

Healthcare delivery systems have been evolving to rely more heavily on technology. There has been a shift in care diagnosis and treatment which has decreased the importance of traditional methods of care delivery. Technology has not only helped to extend our lifespan, but it has improved the quality of life for all citizens.

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, Giuseppe Riva, Mark D. Wiederhold, and Gráinne Kirwan about the focus of this year's 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.
7. Brief Communications: These chapters include brief papers reporting preliminary data on-going research work and/or new developments.

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 Silvia Serinofrom Istituto Auxologico Italiano 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
Mark D. Wiederhold
Gráinne Kirwan

Contents

Section IV. Original Research

Section V. Clinical Observations

Section VI. Work In Progress

Section VII. Brief Communication

SECTION I

EDITORIAL

This introductory text expresses the position of the Editors – Brenda K. Wiederhold, Giuseppe Riva, Mark D. Wiederhold and Gráinne Kirwan - the focus of this year's issue.

B. K Wiederhold, G. Riva, M. D. Wiederhold & G.Kirwan

Being Different: The Transformative Potential of Virtual Reality

Giuseppe RIVA [a,b], Brenda K. WIEDERHOLD [c], Andrea GAGGIOLI [a,b]

[a] *Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy*
[b] *Applied Technology for Neuro-Psychology Lab. Istituto Auxologico Italiano, Milan, Italy*
[c] *Interactive Media Institute, San Diego, CA, USA*

Abstract. The first attempts at using virtual reality (VR) to support clinical change are now more than twenty years old: in the early 90s different group of researchers used VR to counter different anxiety disorders, from acrophobia to fear of flying, from spider phobia to acrophobia. Since then, different researchers have embraced VR to integrate and extend actual assessment tool and treatments in behavioral health: VR has been successfully used in anxiety disorders, stress related disorders. obesity and eating disorders. and pain management. Nevetheless, VR technology is advancing quickly. Both Oculus Rift (http://www.oculus.com) and HTC (https://www.htcvive.com/) are showcasing high-quality VR experiences at reasonable price points – less than $2000 for a fully configured system - that are now widely available to consumers. This new situation is opening a new research area – Transformative Technology – that is trying to use the potential of virtuality for enhancing the process of personal change: by completely replacing the real environment – and even the real body - with a virtual one, it induces a high level of emotional engagement and sense of presence that can improve our chances of being different.

Keywords. Virtual Reality, health care, cardboard, smartphones, anxiety disorders, medical simulation, experiential interface

1. Virtual Reality 2.0

The first attempts at using virtual reality (VR) to support clinical change are now more than twenty years old [1; 2]: in the early 90s different group of researchers used VR to counter different anxiety disorders, from acrophobia to fear of flying, from spider phobia to acrophobia

Since then, different researchers have embraced VR to integrate and extend actual assessment tool and treatments in behavioral health.

However, for a long time the research in this area was limited by the technology required, costing up to $114,000 [3]. More, the field was dominated by academic research and development, with almost no technologies companies translating this research into clinical VR applications.

Nevetheless, VR technology is advancing quickly. Both Oculus Rift (http://www.oculus.com) and HTC (https://www.htcvive.com/) are showcasing high-quality VR experiences at reasonable price points – less than $2000 for a fully configured system - that are now widely available to consumers [3]. In Table 1 are summarized prices and characteristics of commercially available fully immersive VR systems.This new situation is opening a new research area – Transformative Technology [4; 5] – that is trying to use the potential of virtuality for enhancing the process of personal change.

Fully Immersive VR Systems					
	PC Based		Mobile Based		
System	***Oculus Rift***	***HTC Vive***	***Samsung Gear VR***	***Google Cardboard***	***Google Daydream***
Cost	599 US$	799 US$	99 US$	10-50 US$	69-149 US$
Hardware Requirements	High End PC (>1000 US$)	High End PC (>1000 US$)	High End Samsung Phone (>600 US$)	Middle-High end Android phone or iPhone (>299 US$)	High End Android Phone (>499 US$)
Resolution	2160x1200	2160x1200	2560x1440	Depends from the phone (minimum 1024x768)	Depends from the phone (minimum 1920x1080)
Field of View	110 degrees	110 degrees	101 degrees	from 70 degrees	96 degrees
Body Tracking	Medium/High: head tracking (rotation) and positional tracking (forward-backward)	High: head tracking (rotation) and volumetric tracking (full room size – 15ft x15ft - movemen)	Medium: head tracking (rotation)	Medium: head tracking (rotation)	Medium: head tracking (rotation)
User Interaction with VR	High (using a joystick or controllers)	High (using controller)	Medium (using gaze, a built in pad or joystick)	Low (using gaze or a button)	Medium (using gaze or joystick)

2. VR as Transformative Technology

As discussed by Riva and colleagues in their recent paper [5] changing is difficult:

- Personal change requires a reduction in the distance between self and reality (conflict);
- It is achieved through: a) an intense focus on the particular experience creating the conflict; b) an internal or external reorganization of this experience;
- It can be the outcome of either a sudden transformative experience or a progression through a series of different stages.

On one side, it is impossible to progress in the different stages required to reduce the distance betweem self and reality without *self-reflectiveness*: an intense focus on the particular instance or experience creating the conflict [6]. By exploring this experience as thoroughly as possible, the individual can relive and identify all of the significant elements associated with it (i.e., conceptual, emotional, motivational, and behavioral) and make them available for reorganization [7].

On the other side, one-shot transformative experiences – providing a new knowledge that is epistemically inaccessible to the individuals until they have that experience - cannot be planned in advance but happen suddenly in individuals' lives, without a prior control on their contents and their effects [4].

However, VR can play a significant role in these processes: by completely replacing the real environment – and even the real body [8; 9]- with a virtual one, it induces a high level of emotional engagement and sense of presence that can support self-reflectiveness and personal efficacy.

3. Being Different: Open Opportunities and Challlenges

In the last twenty years VR has been used in the treatment of anxiety disorders [10; 11], stress related disorders [12], obesity and eating disorders [13], and pain management [14; 15].

In most pathologies VR is used as simulative tool for controlled exposure to critical/fearful situations. The possibility of presenting realistic controlled stimuli and, simultaneously, of monitoring the responses generated by the user offers a considerable advantage over real experiences. More, the possibility of designing targeted VR experiences with different difficulty levels - from easy performances to very difficult ones – offers an important source of personal efficacy [5].

Nevertheless, VR can also be used as an embodied technology able to alter our experience of the body and space. If most VR applications to date have been used to simulate external reality, it is also possible to use VR for the simulation of our internal reality, including the way we perceive our body, control it and affectively react to what happens to it [5].

The final outcome may be a new generation of transformative experiences that provide knowledge that is epistemically inaccessible to the individual until he or she has that experience, while at the same time transforming the individual's worldview [4]. More, it may offer a scientific path to improve the level of well-being in non-clinical subjects – from children to frail elderly - by inducing positive emotions, improving attitudes and helping individuals in understanding and controlling the signals of their body [16].

However, to exploit the full potential of this evolving situation the development of future presence-inducing media will require multi-disciplinary teams of engineers, computer programmers, and therapists working in concert to treat specific clinical problems. Hopefully, by bringing this community of experts together, further interest from granting agencies and companies will be stimulated.

4. Acknowledgments

This paper was supported by the Università Cattolica del Sacro Cuore, Milan, Italy through its Progetto d'Ateneo D3.2 2014 "Tecnologia Positiva e Healthy Ageing".

References

[1] D. Knox, C. Schacht, and J. Turner, Virtual reality: A proposal for treating test anxiety in college students, *College Student Journal* **27** (1993), 294-296.

[2] B.O. Rothbaum, L.F. Hodges, R. Kooper, D. Opdyke, J.S. Williford, and M. North, Effectiveness of computer-generated (virtual reality) graded exposure in the treatment of acrophobia, *Am J Psychiatry* **152** (1995), 626-628.

[3] D. Castelvecchi, Low-cost headsets boost virtual reality's lab appeal, *Nature* **533** (2016), 153-154.

[4] A. Gaggioli, Transformative Experience Design, in: *Human Computer Confluence: Transforming Human Experience Through Symbiotic Technologies,* A. Gaggioli, A. Ferscha, G. Riva, S. Dunne, and I. Viaud-Delmon, eds., De Gruyter Open, Warsaw, 2015, pp. 97-121.

[5] G. Riva, R.M. Baños, C. Botella, F. Mantovani, and A. Gaggioli, Transforming Experience: The Potential of Augmented Reality and Virtual Reality for Enhancing Personal and Clinical Change, *Frontiers in Psychiatry* **7** (2016).

[6] B.E. Wolfe, The Role of Lived Experience in Self- and Relational Observation: A Commentary on Horowitz (2002), *Journal of Psychotherapy Integration* **12** (2002), 147-153.

[7] G. Riva, Phenomenology of Positive Change: Personal Growth, in: *Enabling Positive Change. Flow and Complexity in Daily Experience,* P. Inghilleri, G. Riva, and E. Riva, eds., De Gruyter, Berlin, 2014, pp. 15-28.

[8] V.I. Petkova and H.H. Ehrsson, If I were you: perceptual illusion of body swapping, *PLoS One* **3** (2008), e3832.
[9] S. Serino, E. Pedroli, A. Keizer, S. Triberti, A. Dakanalis, F. Pallavicini, A. Chirico, and G. Riva, Virtual Reality Body Swapping: A Tool for Modifying the Allocentric Memory of the Body, *Cyberpsychol Behav Soc Netw* **19** (2016), 127-133.
[10] A. Gorini and G. Riva, Virtual reality in anxiety disorders: the past and the future, *Expert Rev Neurother* **8** (2008), 215-233.
[11] B.K. Wiederhold and M.D. Wiederhold, *Virtual Reality Therapy for Anxiety Disorders: Advances in Evaluation and Treatment*, American Psychological Association, Washington, DC, 2005.
[12] A. Gaggioli, F. Pallavicini, L. Morganti, S. Serino, C. Scaratti, M. Briguglio, G. Crifaci, N. Vetrano, A. Giulintano, G. Bernava, G. Tartarisco, G. Pioggia, S. Raspelli, P. Cipresso, C. Vigna, A. Grassi, M. Baruffi, B. Wiederhold, and G. Riva, Experiential virtual scenarios with real-time monitoring (interreality) for the management of psychological stress: a block randomized controlled trial, *J Med Internet Res* **16** (2014), e167.
[13] G. Riva, J. Gutierrez-Maldonado, and B.K. Wiederhold, Virtual Worlds versus Real Body: Virtual Reality Meets Eating and Weight Disorders, *Cyberpsychol Behav Soc Netw* **19** (2016), 63-66.
[14] B.K. Wiederhold, A. Soomro, G. Riva, and M.D. Wiederhold, Future directions: advances and implications of virtual environments designed for pain management, *Cyberpsychol Behav Soc Netw* **17** (2014), 414-422.
[15] B.K. Wiederhold, K. Gao, C. Sulea, and M.D. Wiederhold, Virtual reality as a distraction technique in chronic pain patients, *Cyberpsychol Behav Soc Netw* **17** (2014), 346-352.
[16] G. Riva, R.M. Banos, C. Botella, B.K. Wiederhold, and A. Gaggioli, Positive technology: using interactive technologies to promote positive functioning, *CYBERPSYCHOLOGY, BEHAVIOR AND SOCIAL NETWORKING* **15** (2012), 69-77.

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 limita-tions.

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, rehabilita-tion and therapy in clinical psychology and neuroscience.

Wiederhold & Riva, 2004

The Game Transfer Phenomena framework: Investigating altered perceptions, automatic mental processes and behaviors induced by virtual immersion

Angelica B. ORTIZ DE GORTARI[a,1]
[a] *Nottingham Trent University; University of Hertfordshire*

Abstract. An increasing number of studies have examined the effects of video game contents (e.g. violence) or excessive playing (e.g. addiction). Recently, a multimodal and holistic framework was developed, the Game Transfer Phenomena (GTP) framework. It investigates the relation between in-game elements (e.g. structural characteristics, in-game phenomena) involved in everyday involuntary phenomena or intrusions with game contents, and the subsequent implications of these phenomena on gamers' well-being. This paper aims to overview research on GTP for explaining the development of the framework and discuss its potential applications. The GTP framework was developed based on studies conducted with over 3,500 gamers collected via interviews, online forums and surveys. Confirmatory factor analysis confirmed the factorial structure and demonstrated good reliability and validity of the items in the scale used for assessing GTP. The GTP experiences were classified in three main modalities: (i) altered sensorial perceptions comprising perceptions and/or sensations in all sensorial channels, cross-sensory or multisensory. These were further subdivided into: altered visual perceptions (e.g. visual hallucinations), altered auditory perceptions (e.g. auditory imagery), and altered body/other perceptions (e.g. illusion of body motion). (ii) Automatic mental processes comprising thoughts, urges and automatic mental actions, and (iii) behaviors and actions comprising simple actions or more elaborate behaviors (e.g. verbal outburst). The GTP framework can assist in identifying an underlying mechanism of the virtual immersion either for reducing potential unwanted effects or for promoting desirable cognitions and behaviors with educative, therapeutic and entertainment means.

Keywords. Game Transfer Phenomena, non-volitional phenomena, implicit cognitions, effects of playing video games

[1] Corresponding author, angelica.ortizdegortari@gametransferphenomena.com

1. Introduction

Besides the numerous benefits of playing video games [1], adverse effects have been observed [2]. As a result, an increasing volume of research has examined the psychosocial and psychophysiological effects of the virtual immersion in three related but distinctive areas of research: (i) studies focusing on understanding the effects of video game content (e.g. violence), (ii) studies focusing on the effects of excessive playing (e.g. gaming addiction), and (iii) studies focusing on the psychophysiological effects of the immersion using highly immersive technologies such as VR and simulators. This last area has mainly been confined to therapeutic and military settings, but the recent mass-market introduction of VR devices may broaden the research in this area [3]. Recently, the Game Transfer Phenomena (GTP) framework, a holistic and multimodal framework, was developed to investigate the psychosocial and health effects of video game playing [4]. The GTP framework was based on the analysis of experiences of over 3,500 gamers collected via interviews, online forums and surveys. Research in this area is not limited to particular video game content or genre, platform, online/offline gaming, excessive use or psychophysiological markers. This paper aims to overview the research on GTP for explaining the development of the GTP framework and discuss its potential applications.

2. Overview of research on GTP

No gender differences have been found between those that have and have not experienced GTP [5], or between those that experienced different levels of GTP (mild, moderate and severe levels) [6]. GTP have been reported with new and old video games and in over 400 unique titles [4]. In most of the cases those that reported GTP did not suffer from any underlying medical condition, had never consumed drugs or been under the influence of some substance when GTP occurred [5, 7]. Sensorial experiences occurred either triggered by external cues or not, while spontaneous thoughts and behaviors appear to be mainly triggered by game-related cues [8-10].

The first GTP study consisted in interviews with 15- to 21-year-old Swedish frequent gamers (n=42). It investigated the influence of video games on gamers' fantasies, dreams, perceptions of the real world and behaviors. In that study the gamers reported seeing video game images with open eyes (e.g. seeing power bars above people's heads) and approaching objects simulated in the game without awareness [11]. Follow-up qualitative studies analyzed 1,681 gamers' experiences from 1,244 gamers on 60 online video game forums [8-10]. The aim of these studies was to identify, classify and operationally define the experiences in different modalities (sensory perceptions, mental processes and behaviors), (see Figure 1 for the main GTP modalities/sub-modalities) [8]. Analysis of an online survey with a self-selected sample (n=2,362) provided the following insights:

Prevalence of GTP – Almost all (97%) of the participants reported having experienced GTP at some point in their lives. Most had experienced GTP more than once (95%). The GTP types with highest percentages were: (i) visualized/seen video game images with closed eyes, (ii) heard the music from a video game when not

playing, (iii) felt bodily sensations of movement as if being in a video game, (iv) wanted or felt the urge to do something in real life triggered by a game-related cue, and (v) sang, shouted or said something from a video game unintentionally [7].

GTP characteristics – Most GTP were short-lived (seconds/minutes) but occurred recurrently and more likely as post-play phenomena (directly after playing/hours after playing) and usually when doing daily chores rather than as nighttime phenomena (e.g. falling asleep).

Factors associated with GTP – The factors significantly associated comprised: (i) having a pre-existing medical condition, (ii) session length, and (iii) motivations that implied focusing on the game world and elements in the game such as immersion, exploration, customization and escaping from the real world rather than motivations for socializing while playing [5].

Severity levels of GTP – The majority (58%) of the participants had mild levels of GTP. Those with severe levels of GTP (i.e. experience GTP frequently and various types) were significantly more likely to (i) be students and be 18- to 22-years-old, (ii) have played sessions of 6 hours, or more (iii) played to escape, (iv) have a sleeping disorder, and (v) considered themselves as having dysfunctional gaming. Lastly, more than half in the severe level experienced distress or dysfunction due to GTP compared to the other levels. The predictors for the severity levels of GTP were: session length and frequent playing, distress due to GTP, positive appraisal of GTP, and a tendency to recall dreams [6].

3. Theories and perspectives related to GTP

Different theoretical models have been applied to understand the transfer of effects of cognitions and behaviors, and these have been used in research with video games. Some of the most relevant to GTP are: (i) *Pavlovian conditioning* – where responses given to certain stimulus can be generalized to another stimulus via conditioning, (ii) *priming effect* – where the previous exposure to certain information or stimulus affects the interpretation of a subsequent stimulus, (iii) *schema theory* – where prior knowledge schemas or templates are activated on response to environmental input which provide context for interpreting experience and assimilating new knowledge, (iv) *social learning/social cognitive theory* – which posits that social behavior is acquired by watching the behavior of another person (vicarious learning), (v) *cultivation theory* – which posits that media constantly portray an unrealistic picture of the real world which over time influences the perception of the real world. Hypnagogic images have been induced by playing video games in a few experimental studies for understanding the continuity between awake and sleep states [12-14]. Also, a variety of research has investigated attentional biases in gaming addiction via cognitive tasks [15]. However, studies on involuntary phenomena with game content in non-laboratory settings are rare. Only a few studies have investigated the transfer of experiences from a learning oriented perspective [16, 17] while others have investigated dreams, associations and game-biased perceptions in a Massively Multiplayer Online Role-Playing Game [18].

4. Framing Game Transfer Phenomena

Research concerning GTP is interested in examining involuntary phenomena or intrusions (e.g. earworms, mind popping, slips of the tongue, hallucinations), which arise spontaneously, without control and that manifest as sensorial perceptions, cognitions or behaviors, and in understanding the subsequent effects of these phenomena on gamers' well-being. However, research on GTP also pays attention to cognitions and behaviors deliberatively initiated by gamers. This is done in order to establish differences between voluntary and involuntary phenomena, endogenous and exogenous phenomena and, self-generated and non-self-generated phenomena since research suggests that the psychological and potential risks of the GTP depend thereupon [8, 9].

The GTP framework proposed examines the relation between structural characteristics of the game world and phenomena inherent to the virtual immersion that lead to GTP in different modalities (altered sensorial perceptions, mental processes and behaviors). Four core elements of the virtual world have been suggested to be related to GTP: (i) sensory stimulation (e.g. sensorial effects – visual, aural, and haptic, monotonous play, sensorial discrepancies), (ii) high cognitive load (e.g. pairing between stimuli, repetitive problem-solving), (iii) dissociative states (e.g. immersion, subjective sense of presence facilitated by sensory realism, simulation of body movements), and (iv) high emotional engagement (e.g. rewarding and punitive features) [19]. Research on GTP relies on the premise that previous experiences influence – at least temporarily and to a certain degree – the way we perceive, interpret and respond to the world around us. A theoretically eclectic approach is taken to explain the interplay of physiological, perceptual, and cognitive mechanisms involved in GTP, mainly informed by cognitive and behavioral theories. The term "Game Transfer Phenomenon/a" (GTP) was initially used by Ortiz de Gortari [20] to describe dreams, automatic thoughts, altered sensory perceptions and automatic behaviors transferred from the video game world to real life context, paying particular attention to associations established between video game elements and real life stimuli that acted as triggers of GTP. Game-related cues as triggers are central to most GTP, but they are not always present or they are not always identified, therefore GTP have been re-defined as following: GTP are involuntary phenomena manifesting as altered sensorial perceptions, automatic mental processes, actions and behaviors as a result of the transfer of experiences from the virtual to the real world.

The main theory-driven modalities proposed were the following: (i) altered sensorial perceptions, (ii) automatic mental processes, and (iii) behaviors and actions.

- **Altered sensorial perceptions modality.** This comprises perceptions and/or sensations in all sensorial channels, cross-sensory or multisensory (daytime or nighttime phenomena). This modality was further subdivided to investigate the manifestation of GTP in different sensory channels into: altered visual perceptions sub-modality (e.g. visual hallucinations) [9], altered auditory perceptions sub-modality (e.g. auditory imagery) [10], and altered body and other altered perceptions sub-modality (e.g. body motion, time distortion) [9].
- **Automatic mental processes modality.** This comprises thoughts, urges and automatic mental actions. Cognitions are elaborated and in some cases lead to behaviors [8].
- **Behaviors and actions modality.** This comprises both simple actions and more elaborate behaviors (e.g. verbal outbursts, reactivity toward game-

- related cues that end up in actions such as involuntary movements of limbs) [8] (See Figure 1 for a full overview of the GTP framework).

Confirmatory factor analysis was conducted to examine 20 items in the modalities/sub-modalities of GTP to develop the GTP Scale [21]. The analysis confirmed the factorial structure of the five factors investigated and demonstrated good reliability and validity [21]. The GTP items were categorized based on how gamers experienced GTP, as perceptions, thoughts or behaviors, independently of the evident interplay between physiological, perceptual and cognitive mechanisms involved in the variety of GTP.

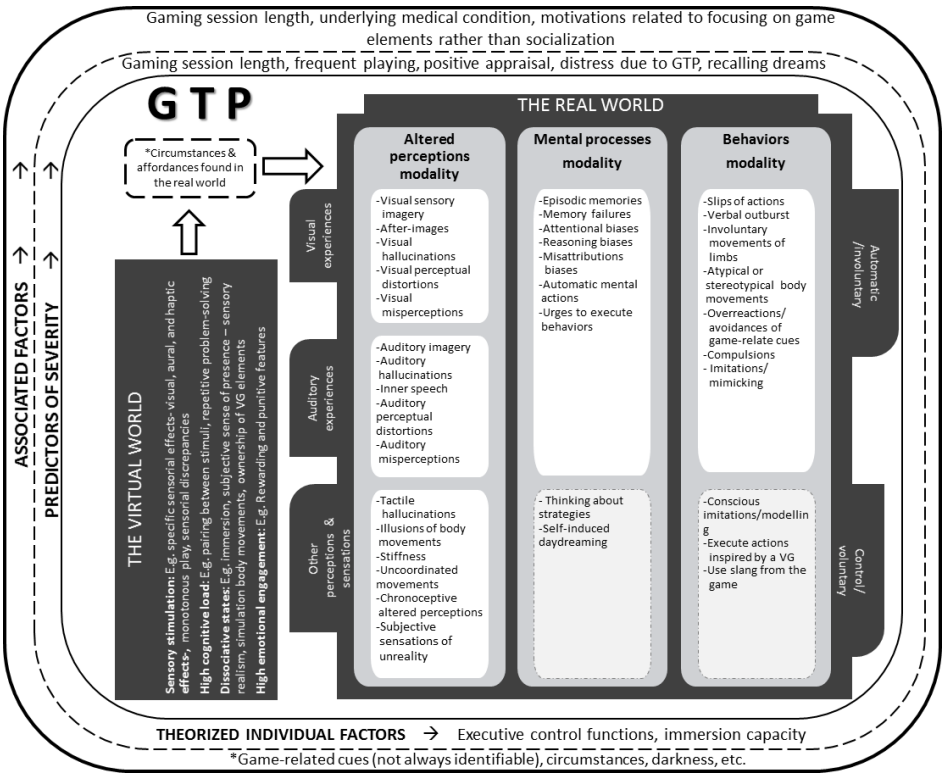


Figure 1. Initial descriptive framework of GTP. It shows the core elements of the virtual world (e.g. sensory stimulation) and the transfers of experiences identified in the GTP modalities. (Based on Ortiz de Gortari, 2015).

5. Conclusions and implications

The GTP framework has been developed based on mixed method studies with over 3,500 participants, and although still being under development it has demonstrated its effectiveness for examining involuntary phenomena provoked by virtual immersion. Potential applications of the GTP framework:

- *Identify potential risks of the use of virtual technologies* – Assess the effects of virtual features/ in-game phenomena on users' everyday lives.

- *Promote desirable behaviors* – Identify what and how game elements are transferred. Useful for therapeutic, educative and entertainment means.
- *Understand symptoms of medical conditions* – mimicking pathological states in the non-clinical population for understanding underlying mechanism of symptoms.
- *Provide a tool in therapeutic interventions* – Evaluate the effects of the intervention in the everyday life of the patient for enhancing the treatment,

- identifying factors that hinder their efficacy or for avoiding unwanted effects derived from interventions using virtual tasks or technologies.
- *Understand the brain choreography by inducing GTP* - since playing video games activate multiple sensorial channels at once and induce trance states.
- *Assist with dysfunctional gaming* – understanding its underlying mechanism.

Being aware of the impact of virtual elements on perceptions, cognitions and behaviors can help in taking informed decisions on their use in virtual products either to promote education, health or entertainment, or to avoid unwanted effects. This has become even more crucial due to the recent commercialization of VR technologies that may lead to more and stronger impact of GTP.

References

[1] T.M. Connolly., et al., A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, **59** (2012), 661-686.

[2] G.S. Brunborg, R.A. Mentzoni, and L.R. Frøyland, Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *Journal of Behavioral Addictions* **3** (2014), 27-32.

[3] R.B. Welch, Adapting to Virtual Enviroments. In: K.M. Stanney, editor, Handbook of virtual environments: Design, Implementation and Applications, Lawrence Erlbaum Associates: Mahwah, N.J., 2002.

[4] A.B. Ortiz de Gortari, Exploring Game Transfer Phenomena: A multimodal research approach for investigating video games' effects. Doctoral dissertation, Nottingham Trent University: Nottingham, UK, (2015).

[5] A.B. Ortiz de Gortari, and M.D. Griffiths, Game Transfer Phenomena and its associated factors: An exploratory empirical online survey study. **Computers in Human Behavior**, **51** (2015), 195-202.

[6] A.B. Ortiz de Gortari, M.D. Griffiths, and B. Oldfield, An empirical examination of factors associated with Game Transfer Phenomena severity. Manuscript under revision, (2016).

[7] A.B. Ortiz de Gortari, and M.D. Griffiths, Prevalence and characteristics of Game Transfer Phenomena: A descriptive survey study. *International Journal of Human-Computer Interaction*, doi: 10.1080/10447318.2016.1164430 (2016).

[8] A.B. Ortiz de Gortari, and M.D. Griffiths, Automatic mental processes, automatic actions and behaviours in Game Transfer Phenomena: An empirical self-report study using online forum data. International Journal of Mental Health and Addiction, **12** (2014), 432-452.

[9] A.B. Ortiz de Gortari, and M.D. Griffiths, Altered visual perception in Game Transfer Phenomena: An empirical self-report study. International Journal of Human-Computer Interaction, **30** (2014), 95-105.

[10] A.B. Ortiz de Gortari, and M.D. Griffiths, Auditory experiences in Game Transfer Phenomena: An empirical self-report study. *International Journal of Cyber Behavior, Psychology and Learning,* **4** (2014), 59-75.

[11] A.B. Ortiz de Gortari, K. Aronsson, and M.D. Griffiths, Game Transfer Phenomena in video game playing: A qualitative interview study. *International Journal of Cyber Behavior, Psychology and Learning*, **1**(2011), 5-33.

[12] E.J. Wamsley, et al., Cognitive replay of visuomotor learning at sleep onset: Temporal dynamics and relationship to task performance. *Sleep*, **1** (2010), 59-68.

[13] R. Stickgold, et al., Replaying the Game: Hypnagogic images in normals and amnesics. *Science*, **290**(2000), 350-353.

[14] C. Kusse, et al., Experience-dependent induction of hypnagogic images during daytime naps: A combined behavioural and EEG study. *Journal of Sleep Research*, **21** (2012), 10-20.
[15] H.M. Ahn, H.J. Chung, and S.H. Kim, Altered Brain Reactivity to Game Cues After Gaming Experience. *Cyberpsychology, Behavior, and Social Networking,* **18** (2015), 474-479.
[16] B. Bigl, If the game goes on. Perceived transfer effects from virtual game worlds into everyday life. In: B. Bigl, and S. Stoppe, editors, Playing with Virtuality, Theories and Methods of Computer Game Studies, Peter Lanng, Frankfurt am Main, 2013.
[17] J. Fritz, How Virtual Worlds Affect Us: On the Structure of Transfers from the Media World to the Real World. In: G. Buurman, editor, Total Interaction, Birkhäuser, Basel, 2005.
[18] K. Poels, W.A. Ijsselsteijn, and Y. de Kort, World of Warcraft, the aftermath: How game elements transfer into perceptions, associations and (day)dreams in the everyday life of massively multiplayer online role-playing game players. *New Media & Society*, **16** (2014), 1-17.
[19] A.B. Ortiz de Gortari, and M.D. Griffiths, Game Transfer Phenomena: Beyond the boundaries of the game: The Interplay Between In-game Phenomena and Game Transfer Phenomena. Manuscript under revision, (2016).
[20] A.B. Ortiz de Gortari, Targeting the real life impact of virtual interactions: The game transfer phenomenon: 42 video games players' experiences. Master dissertation. Retrieved from Digitala Vetenskapliga Arkivet database (No. 425850), Stockholm University, Stockholm, 2010.
[21] A.B. Ortiz de Gortari, H. Pontes, and M.D. Griffiths, The Game Transfer Phenomena Scale: An instrument for investigating the non-volitional effects of video game playing. *Cyberpsychology, Behavior, and Social Networking*, **18** (2015), 588-594.

Online Behavior: Interdisciplinary Perspectives for Cyberpsychology

Alexander VOISKOUNSKY[a,1]
[a] *Psychology Department, Moscow Lomonosov State University*

Abstract. Online behavior is studied interdisciplinary, with cyberpsychology contributing with dozens of neighboring disciplines. Cyberpsychological knowledge is dispersed within almost every area of psychology, thus cyberpsychology is not a separate area of psychology. The reasons for this dispersion are discussed in the paper; some possible steps towards integration of cyberpsychology into a separate area of psychology are suggested. It is stated that numerous themes of current and possibly future studies within cyberpsychology can be classified by a short list of the meaningful classification points. The suggested classification points include: immersion, anonymity, leveling up reputation, distributed behavior, mobility, and hybrid behavior. These classification points are based on the author's experience and analysis of the published works in cyberpsychology.

Keywords. virtuality, online behavior, cyberpsychology, psychology, networking, gaming, blogging, classification, immersion, hybrid behavior, mobility, anonymity, leveling up reputation, distributed behavior

1. Introduction

During the last decades, online behavior has been studied within a full range of academic and applied scientific research branches, including (but not restricted to) communication science, anthropology, economics, psychology, computer science, law, education, medicine, neuroscience, philosophy, linguistics, marketing, politics, sociology, big data and data mining studies, ethics, etc. Take for example psychology, which is the author's area of competence: one can easily make sure that online behavior is being studied within its every field, including both the traditional ones – such as social, developmental, cognitive, clinical, differential, industrial and organizational, educational psychology, neuropsychology, and the newer psychological fields such as ethnic, gender, legal and forensic, culture, mathematical, sport, media psychology, as well as psycholinguistics, ergonomics/usability and web design, counseling psychology, etc. Thus, the range of online behavior studies is quite broad. To the better or to the worth, but numerous studies of online behavior are centered neither within a certain scientific branch (such as for example psychology), nor within a specific institution (such as a specialized Association) or any entitled journal. For scholars it might have been easier to follow a short list of sources, be these sources respectful journals (such as for example *Cyberpsychology, Behavior and Social Networking* or *Computers and Human Behavior*), proceedings of just several conferences (such as for example *Human-Computer Interaction* or *International Communication Association Conference*) or a possibly encyclopedic blog (such as for example John Suler's *The*

[1] Corresponding author, vaemsu@gmail.com

Psychology of Cyberspace). Instead, the current development of online behavior studies is progressing within various scientific branches, as mentioned above.

2.Development of cyberpsychology as a particular problem area within the online behavior field

One of the main reasons for the online behavior studies to progress as a multidisciplinary area of studies is the fact that this development is closely following a rapid progress in computer and web applications. Particular research areas often emerge and develop before some new applications become habitual. For example, the earliest studies were mostly affiliated with educational and developmental applications [1; 2], social grouping [3; 4] and mediated interactions [5; 6]. Mid-1990s are marked with the emergence of the problem area called Internet addiction disorder [7] – this area of studies is up to now rapidly and steadily developing under diverse titles and headings [8], alongside interest to online linguistics [6; 9], to new-born communities and to political perspectives of the newest web applications [10]. 21st century is marked with the growth of studies in social issues such as economics, politics and power [11; 12] referring to particular online activities such as game playing, interactions, shopping, information retrieval, etc., with the Presence related studies and with the rapidly enhancing use of virtual reality and augmented reality systems, which started as early as in 1990s [13; 14], with systematic discussions of the place of online technologies within the legal, gender and ethnic discourse [15], with the advances of what is called persuasive technologies [16], robots for care and entertainment [17] and with impulses towards the interaction studies stimulated by an amazingly rapid turn towards the use of social media (image, text and voice transfer technologies) by world-wide masses of users, including seemingly marginal groups such as “grey heads”, on the one side, and preschoolers, on the other [18; 19].

3.Cyberpsychology within psychology: perspectives and bounds

Most of the abovementioned research directions, whether originated decades ago or comparatively new, are continuously developing. In case some studies proved to be insufficient, they turn to become corrected quite soon [20]. That means, the field of online behavior studies is self-correcting and self-regulating – a very important characteristics for a genuine research field. It cannot be expected that all the studies of the online behavior will soon be merged and united into a particular research field, since then this field would cover so many scientific branches. But if we restrict ourselves to a single discipline such as for example psychology, then will cyberpsychology sooner or later become an officially recognized special field within academic psychology? Evidently, an academic research field is to be affiliated with a particular problem area, special methods of study, approved theories, and in psychology – with the existence and availability of representative samples of study participants. This is not enough, though, for an “academic start-up”: more to this, the problem area is to be actual and arousing interest both in professional scholars and academic managers or investors; respectful scholars and research associations (even if new-born) should stand for a new research field; in order to make an appeal to college

students, program modules and textbooks, career perspectives and would-be workplaces are required, both in business and in academy; academy prospects imply professional journals issued by respectful publishers, positions for Ph.D. and post-doc applicants, etc.

Cyberpsychology has its problem area, namely psychology of human online behavior. Such a behavior includes mainly interaction, cognition, and entertainment (including but not restricted to playing videogames, listening to music, downloading and watching movies) which are the prior activities in the cyberspace, plus online shopping, web navigation, usage of sex/porno applications, or work online. This problem area is widely (in fact, world-widely, i.e. within almost every family) recognized as important and actual, any opinions and views made public by psychologists become the theme of the day for fierce discussions. With billions users of information technologies, the representative samples of study participants are available; the rules of informed concern and up-to-day ethical issues specific for the cyberspace use are thoroughly discussed [21]. The brand new and so far sensational, bringing strong affects life-style "staying_online_day_and_night" has recently arisen. Particular theoretical models inherent to cyberpsychology are not the point of this paper; needless to state that many models can be and are indeed *de jure* borrowed from classical and current psychological studies. Moreover, a traditional psychological agenda may be updated to include knowledge patterns gained within cyberpsychology; for example, this is stated to be true for the social cognition discourse [22]. Methodology is partly borrowed, too, from experimental psychology, from stats (including Big Data methods) and computer science methods, while cyberpsychology has already enriched social research methodology in several ways. First, by working out the basic outlines of how to test online within big communities, how to adapt psychological materials and procedures to use them distantly, and how to carry out an online experiment [15; 23]. Second, by working out a totally new methodology of *in virtuo* (additionally to *in vivo* and *in vitro*) research [24], i.e. by working out virtual reality models [25; 26]. In this way, entirely new mind and body phenomena have been explored and described, namely, *out-of-body* and "three arms" (including a rubber one) effects [27; 28; 29], as well as the so-called *Proteus effect* [26; 30]. In short, genuine cyberpsychological methods could enrich methodology of academic psychology via cyberpsychology as a field of studies within psychology. The paper [31] published in 2012 said that the approximate number of papers in the field of cyber behavior studies, published during a quarter of century in English, can be estimated as three to four thousand. No more than a minor part of such papers may be classified as referring to cyberpsychology, but this minor part totals quite a big quantity of papers. The variety and an approximate number of papers on the theme "Internet and Psychology" is shown at a webpage of references collected by Azy Barak http://azy.edu.haifa.ac.il/references/; the references include journal papers and book chapters published exclusively in English (while a lot of research has been published – to the best of the author's knowledge – in German, Chinese, Spanish, Russian, Korean or Italian, among many other languages); the list of references is not full since it has been last updated over a year ago (March 1, 2015). This list of references includes many edited books and monographs; these sources, especially those with almost encyclopedic content [15; 23; 32] may well be transformed into textbooks. Thus the number of authors of the papers referring to cyberpsychology is big enough to carry on ongoing studies and to teach students. Among these authors are the respectful scholars, in terms of being publicly known, even to a layman; though nobody knows whether they are respectful enough to

influence presidents and provosts of universities or educational investors to start up with cyberpsychology schools (B.S. and M.S. level) in this or that university. The first (to the best of the author's knowledge) such initiative, undertaken at the Nottingham Trent University (UK), turned out to be a short-time experience and finally came to an end. The M.S. programs on cyberpsychology are active in Dublin (Ireland), namely at the Dún Laoghaire Institute of Art, Design and Technology, and at the Royal College of Surgeons. All this gives good chances to analyze both positive and negative experience, taking as well into account those educational modules which are thematically close to cyberpsychology and are taught at many universities within diverse learning modules for college students. A credible beneficial moment is that several educational programs may be compared while making decisions referring to the would-be program modules.

To touch upon the null points in short, it should be stated that cyberpsychologists are not united in an international professional association; among local communities we can, to the best of our knowledge, mark only SIGMAC: The Special Interest Group for Media, Art and Cyberpsychology (http://www.psihq.ie/page/art/135/0) within the Psychological Society of Ireland. The most part of professional journals in the field (such as *Cyberpsychology, Behavior and Social Networking*, as well as *PsychNology Journal*, *Games for Health* or *Computers and Human Behavior*) publish both psychological and non-psychological (referring for example to education, communication science, human factors, etc.) papers; the web journal *Cyberpsychology* (http://www.cyberpsychology.eu) publishes only four issues (two regular and two special) per year. Career perspectives for would-be college students, Ph.D. candidates and post-doc applicants specializing in cyberpsychology are vague.

4. Themes in cyberpsychology: classified

As mentioned above, the position of cyberpsychology within psychology is uncertain: right now it is dispersed within diverse areas of psychology, and nobody can tell for sure whether cyberpsychology will become a separate psychological field or not. One way or another, this problem area exists. A suggestion for classification of cyberpsychological themes is given further. This suggestion is based on the author's personal scholar experience and that of the other researchers, upon analysis of their publications.

First of all, we believe that such terms as 'virtual' or 'virtuality' are too general to be used as classification points: these terms may stand for almost every online activity. Instead of virtuality, the suggested classification points include: *anonymity, hybrid behavior, leveling up reputation, mobility, immersion*, and *distributed behavior*. The rest of the Section is given to the comprehensible explanation of these terms.

Anonymity provokes risk-taking and crime, sharing of personal data information, promotion of multiple and alternative identities in social networks – holding numerous identities sometimes results in dissociative disorders. Criminal hackers (such as carders, crackers, distributors of viruses), trolls, shy lurkers, hate speech supporters and advocates, political hacktivists enjoy the benefits of staying anonymous. On the other hand, anonymity provokes online support and favor, volunteer work, caregiving and charity; after all, lurkers may attain competence and/or confidence and stop being 'invisible.' Legislators, ethicists, educators, celebrity bloggers, psychiatrists, security

experts have a common ground in taking advantages and disadvantages of the anonymity factor.

Hybrid behavior means mixed/augmented online and real-life multitasking work, such as the use of avatar's recommendations for real-life affairs, consultations with Siri and talks with chatbots, breaking real-life rules and ignoring possible danger in order to make and place online selfies. Many people feel preoccupied with participation in underground web communities and wear visible signs related to their hobby groups. Engineers and neurophysiologists create and test transhuman prosthetic devices such as pacemakers or light-sensitive electronic chips to be implanted under the retina, which turn human beings into hybrid cyborgs. Here is a common field of activity for robotics/computer scientists, neurocognitivists, linguists, web designers, physicians, sociologists and educators.

Leveling up reputation takes birth in upbringing/development of avatars and characters while playing videogames, especially MMO games. Moreover, leveling up reputation via self-presentations, intensive interactions, often – via scandalous behavior, is a hot practice for bloggers and social networkers. Online reputation and self-image can be updated by writing sophisticated, or humorous, or simply well-written texts, commenting the inputs of friends and followers, placing diverse visual/audio files of common interest, initiation of discussions which seem to be important to masses of subscribers. Such skills include foreseeing social perceptive reactions of large but little-known audiences. This kind of foreseeing be it correct or incorrect, makes experience (sometimes positive, often sad) be gained in the process of "trial and error" efforts. Experts in social and personality psychology, communication and media studies, Big Data, web and game design, marketing and advertising find this field a promising task for carrying on studies and developing popular web applications.

Mobility means that numerous gadgets make people mobile, their attitudes to work include formats of freelance and off-office; among other positive points, mobility means that more and more work positions start to be open for the disabled. When working offline, many people enjoy having more time for the family and relations, while others feel being lost; that is one of the reasons for many parents to restrain their kids from the use of technologies. Educators, organizational psychologists, venture analysts, media scholars, technology experts are welcomed in the field.

Immersion usually refers, but is not restricted to, the use of augmented reality and/or VR systems; it includes as well 'pleasures' and 'fears' of immersion into Internet addiction disorder (often called nowadays problematic or excessive Internet use, abuse or overuse) or into over-aggressiveness which is believed to characterize 'desensitized' video-gamers. While fears are wide-spread, empirically justified views of experts and consultants differ radically. Clinical and developmental psychologists, 3D designers, psychiatrists, educators, all those interested in studying the technological and psychological effects of Presence should step the field.

Distributed behavior includes a remote collaboration, based on shared interests, of enthusiastic volunteers, most often unfamiliar to one another. The best known examples are the groups of knowledgeable people who have collaboratively worked on open source products and on Wikipedia (the last one – in hundreds of languages). Many useful online projects initiated by competent volunteers resulted in giving birth to a sort of new economics, i.e. economics of knowledge. Probably, the most important distributed behavior effect lies in multiplication of talents and competences of knowledgeable people which start collaborating distantly, and getting feedback assurances, they enhance their self-assessment points and acquire positive emotions.

Prospective studies and practical work by sociologists, mathematical psychologists, Big Data specialists, social entrepreneurs, computer scientists are expected to show economical, public and psychological potential of the distributed behavior model.

References

[1] S.R. Hiltz, M. Turoff, *The Network Nation. Human Communication via Computer*, Addison-Wesley, Reading, Mass., 1978.
[2] Sh. Turkle, *The Second Self: Computers and the Human Spirit*, Simon and Schuster, N.Y., 1984.
[3] J. Short, E. Williams, B. Christie, *The Social Psychology of Telecommunications*, Wiley, L., 1976.
[4] J. Siegel, V. Dubrovsky, S. Kiesler, T.W. McGuire, Group Processes in Computer-Mediated Communication, *Organization Behavior and Human Decision Processes* **37** (1986), 157–187.
[5] L. Sproull, S.B. Kiesler, Connections: *New ways of working in the networked organization*, The MIT Press, Cambridge, MA, 1991.
[6] S.C. Herring (ed.), *Computer-mediated communication: Linguistic, social and cross-cultural perspectives*, J. Benjamins, Philadelphia, PA, 1996.
[7] K.S. Young, *Caught in the Net: How to Recognize the Signs of Internet Addiction – and a Winning Strategy for Recovery*, Wiley & Sons, N.Y., 1998.
[8] K.S. Young, C.N. de Abreu (eds.), *Internet addiction: A handbook and guide to evaluation and treatment*, Wiley, Hoboken, NJ, 2010.
[9] D. Crystal, *Language and the Internet*, Cambridge University Press, 2001.
[10] R. Shields (ed.), *Cultures of Internet: Virtual Spaces, Real Histories, Living Bodies*, Sage, Thousand Oaks, CA, 1996.
[11] M. Castells, *Communication Power*, Oxford University Press, 2009.
[12] E. Castronova, *Synthetic Worlds. The Business and Culture of Online Games*, The University of Chicago Press, Chicago and London, 2005.
[13] M.M. North, S.M. North, J.R. Coble, *Virtual Reality Therapy: An Innovative Paradigm*, IPI Press, 1996.
[14] M. Lombard, F. Biocca, J. Freeman, W. IJsselsteijn, R.J. Schaevitz (Eds.), *Immersed in Media: Telepresence Theory, Measurement & Technology*, Springer, Berlin, 2015.
[15] Joinson, K. McKenna, T. Postmes, U.-D. Reips (eds.), *Oxford Handbook of Internet Psychology*, Oxford University Press, L., 2007.
[16] B.J. Fogg, *Persuasive Technology: Using Computers to Change What We Think and Do,* Morgan Kaufmann Publ., Amsterdam, 2003.
[17] Sh. Turkle, *Alone Together: Why We Expect More from Technology and Less from Each Other*, Basic Books, N.Y., 2010.
[18] Sh. Turkle, *Reclaiming Conversation: The Power of Talk in a Digital Age*, Penguin, NY, 2015.
[19] L. Rainie, B. Wellman, *Networked: The New Social Operating System*, The MIT Press, 2012.
[20] R. Kraut, S. Kiesler, B. Boneva, J. Cummings, V. Helgeson, A. Crawford, *Internet Paradox Revisited*, *Journal of Social Issues* **58** (2002), 49-74.
[21] E.A. Buchanan (ed.), *Readings in Virtual Research Ethics*, Infosci Publ., Hershey, PA, 2004.
[22] T. Postmes, R. Spears, Psychology and the Internet: Building an Integrative Social Cognitive Research Agenda, *Psychological Inquiry* **24** (2013), 326–332.
[23] M.H. Birnbaum (ed.), *Psychological Experiments on the Internet*, Academic Press, San Diego, 2000.
[24] B. Wiederhold, Facing your Fears: Virtually, *CyberTherapy & Rehabilitation* **2** (2014), 12-16.
[25] M. Slater, Place Illusion and Plausibility Can Lead to Realistic Behaviour in Immersive Virtual Environments, *Philosophical Transactions of the Royal Society B* **364** (2009), 3549–3557.
[26] J. Blascovich, J. Bailenson, *Infinite Reality: Avatars, Eternal Life, New Worlds, and the Dawn of the Virtual Revolution*, N.Y., 2011.
[27] H.H. Ehrsson, The Experimental Induction of Out-of-Body Experiences, *Science* **317** (2007), 1048.
[28] H.H. Ehrsson, How many arms make a pair? Perceptual illusion of having an additional limb, *Perception*, **38** (2009), 310–312.
[29] G. Riva, Virtual reality and telepresence, *Science*, **318** (2007), 1240–1242.
[30] N. Yee, *The Proteus Paradox: How Online Games and Virtual Worlds Change Us – And How They Don't*, Yale University Press, New Haven, 2014.

[31]
[32] Z. Yan, R.Z. Zheng, Growing from Childhood Into Adolescence: The Science of Cyber Behavior, *Evolving Psychological and Educational Perspectives on Cyber Behavior* (R. Zheng, ed.), IGI Global, Hershey, PA, 2012, 1–14.
[33] Barak (ed.), *Psychological Aspects of Cyberspace: Theory, Research, Applications*, Cambridge University Press, 2008.

A Conceptual Model of Factors Leading to the Digital Exclusion of People with Neurodevelopmental Disorders

Claude L. NORMAND[a, 1] Dany LUSSIER-DESROCHERS[b] Stéphanie-M. FECTEAU[a] Valérie GODIN-TREMBLAY[b] , Marie-Ève DUPONT[b], Jeannie ROUX[b], Alejandro ROMERO[c]

[a] *Université du Québec en Outaouais, Gatineau, Qc, Canada*
[b] *Université du Québec à Trois-Rivières, Trois-Rivières, Qc, Canada*
[c] *Université du Québec à Montréal, Montréal, Qc, Canada*

Abstract. A review of the literature was performed to identify factors associated with the digital exclusion of people with neurodevelopmental disorders. This analysis led to the creation of a digital accessibility pyramid, comprising five levels: 1- access to digital devices, 2- sensorimotor skills, 3- cognitive skills, 4- technical competencies, and 5- social skills. Progression in the pyramid is based on the premise that to ensure optimal use of information and communication technologies, people must develop the necessary skills or receive the necessary support from their environment (from the microsystem to the macrosystem) to attain each level from the bottom up.

Keywords. Disability, accessibility, digital divide, social exclusion.

1. Introduction

The development of information and communication technology (ICT), has revolutionized the way humans interact, online as well as offline [1]. ICT affords numerous advantages to all citizens, e.g. an almost unlimited access to information and entertainment, a multiplication of opportunities to socialize, countless possibilities to advocate or express one's opinion, as well as the simplification of daily tasks [2]. A UNESCO report also claims that access to the digital world could empower people by increasing self-determination and social participation of all citizens [3]. Indeed, access to the WWW reduces geographical and physical barriers to accessing content, places and people. Neurodevelopmental disorders constitute a special class of disabilities. These include intellectual disabilities, communication disorders, autism spectrum disorder, attention-deficit/hyperactivity disorder, specific learning disorder, and certain motor disorders [4]. Contrary to sensory or physical disabilities, neurodevelopmental disorders are often invisible. They are characterized by lifelong cognitive, social and emotional limitations. Hence this population is often forgotten when it comes to "accessibility" measures [5].

[1] Corresponding author, claude.normand@uqo.ca

Our paper focuses on the digital exclusion of people with neurodevelopmental disorders. Priority is given to people living with an intellectual disability. We shall present a conceptual model, based on a scoping review of the literature, to explain the combination of factors preventing this segment of the population from being fully active social participants in the digital world. First, personal characteristics that place people at risk of digital exclusion will be described. Second, we shall take an ecological systems perspective to show how digital inclusion and social participation could be achieved with adequate support and accommodations from the environment.

2. Factors at work in digital exclusion

Computerized information and communication technology devices have multiplied and become more mobile, more affordable, and more user friendly. Nevertheless, compared to the general population, people living with cognitive limitations spend less time using ICT, despite the numerous advantages these devices could bring into their daily lives [5]. This be explained by a combination of factors that we have conceptualized as a *digital accessibility pyramid* comprising five levels. The first level is a precondition to all others: physical access to digital devices. The next levels, in order, include sensorimotor skills, cognitive demands, technical compentencies, and social abilities.

2.1. Access to digital devices

A lack of sufficient financial resources appears to be the primary obstacle to digital inclusion for people with disabilities [6]. In Canada, almost 50% of people with intellectual disabilities rely on social assistance as their sole source of income [7]. This prevents them from acquiring not only up-to-date equipment, but also an internet connection. Depending on the features of the disability, specialized equipment adapted to the needs and abilities of the person may be required, adding to the original cost of the digital device. Furthermore, access to a computer or other ICT can be restricted by the person's caretakers. Family members, educators or residential support staff may believe that the person 1- is or will be unable to use the device, 2- does not need to use ICT, 3- could spend too much time at the computer, 4- could be exposed to inappropriate content or be victimized online, 5- might lose or break the device (e.g. mobile) [6, 8-10].

2.2. Sensorimotor skills

Studies show that in order to use ICT devices effectively, people need a minimum of sensory (mainly tactile, visual, and proprioceptive) and motor skills [11-12]. Yet, motor impairments affect a large number of people with neurodevelopmental disorders [13-14]. These impairments are most notable in the use of a computer mouse, which requires hand-eye coordination, gripping and dexterity. The smaller ICT devices such as mobile phones are also more difficult to handle. Furthermore, these sensorimotor constraints delay reaction time and speed of execution at a computer task, which can lead to frustration. Several customized peripherals are currently available to help

people with sensorimotor limitations use ICT. Alternative mice, touch screens, enlarged keyboards, visually operated computer software, voice recognition and synthesis systems are but a few of what is currently available on the market. Of course, these put additional strain to the cost of standard digital equipment.

2.3. Cognitive overload

Once access to ICT is secured and limitations in sensorimotor skills are compensated by adapted hardware or software, the cognitive requirements of ICT use come into play. The more steps are required in a digital task, the more the quality of the performance by people with cognitive disabilities will deteriorate, regardless of the level of difficulty of the task itself [15]. Indeed, a person's initial cognitive abilities remain discriminating factors in ensuring effective use of digital technologies. Selective attention, vigilance, working memory, reasoning, problem solving, long and short term memory, planning, word recognition are some of these basic requirements. Yet, neurodevelopmental disorders are characterized by deficits in several of these cognitive functions [4, 16].These may bring to a halt or at least create a ceiling effect on the use of certain types or certain functions of ICT for this population. Online communication through e-mail or chat relies on reading and writing text. Adults with an intellectual disability are conscious of their limitations. Two studies supporting adults in creating a blog or using a social networking site demonstrated they were fearful of making spelling mistakes when posting a comment [17-18]. Any search for information online also requires a level of literacy and problem-solving skills rarely attained by people with an intellectual disability [19-20]. A panel of experts has estimated that 24 sensorimotor abilities and 29 cognitive abilities were required to accomplish 16 computer tasks -- divided into 161 subtasks or subsequent steps -- while navigating the internet [12]. Clearly, cognitive limitations are a major determinant of the digital divide leading to the exclusion of people with neurodevelopmental disorders from the mainstream who is "constantly" connected [11, 21]. It has been suggested that web designers seek the collaboration of people with intellectual disabilities to create cognitively accessible information [5, 22-23]. The same could apply to computer hardware and software designers. For example, confusion can be produced by using the same "button" and action for two opposite functions, namely to turn ON or OFF a mobile phone or computer pad. Alternatively, going from a touchscreen computer to a computer screen which does not respond to touch, but rather a pointer, can also cause confusion or bring about helplessness (and vice versa).

2.4. Technical competencies

Having secured access to ICT, accommodated sensorimotor and cognitive demands to the abilities of the user, one must draw upon a certain level of technical competencies to be efficient and enjoy using the devices available. Technical competencies are necessary for three broad functions: 1- handling digital devices and surfing through digital applications, 2- preventing risks (e.g. virus attack, loss of data, protection of private information) and 3- solving problems, repairing or restoring equipment or software malfunction. There is a wide range of levels of technical skills in the general population, from the most basic, like saving documents and shutting off the computer correctly, to the most sophisticated, such as computer programming. Cognitive limitations hinder the development of technical competencies, thereby reducing the

possibilities offered by the technology for the majority of users with an intellectual disability. When a technical problem is encountered, it can be difficult if not impossible for people with an intellectual disability to solve the problem. As shown above, searching and finding a solution online or even in an instruction manual require many steps and cognitive tasks [12]. If all else fails, technical breakdowns will come with the cost of repair, another prominent obstacle to digital inclusion for this segment of the population. This example illustrates very well the interdependence of the levels of our accessibility pyramid.

2.5. Social abilities

With regard to electronic communication and social networking in particular, social abilities will be solicited to take part adequately in the digital world. Netiquette refers to the set of rules or conventions guiding online interactions [24]. A breach in netiquette could therefore lead to social exclusion online, and be reproduced offline. Conversely, deficits in social abilities, stigmatization and social exclusion in the offline world could unfortunately be transferred to the online sphere of interaction. Indeed, people with neurodevelopmental disorders are more likely to be targets of online abuse [25]. The desire to please, low level of self-determination or compliance, credulity and the search for social inclusion so typical of people with an intellectual disability put them at risk of sexual solicitation, extortion, identity theft, cyberbullying or other forms of cybervictimization [8, 26]. Some users will prefer to shut themselves off, for example by abandoning their Facebook profile, rather than continue trying to "fit in" the virtual world of friendships.

3. From digital exclusion to social participation

Progression in the pyramid is based on the premise that to ensure optimal use of ICT, and take part in the digital social environment and culture, people must acquire the necessary skills and competencies or receive the necessary support from their environment to attain each level from the bottom up. Limitations at each level can create a ceiling effect or shut the door to social participation. A lack of material, physical or psychosocial resources contribute to the social exclusion of people with neurodevelopmental disorders. However, this conceptualization places too much weight on the shoulders of ICT users to explain the digital divide. One needs to embed this model into an ecological systems perspective. According to Bronfenbrenner's theory [28], the micro, meso, exo and macro systems all interact with the demands of the accessibility pyramid onto the individual. Each tier of the pyramid calls upon resources from *all* ecosystemic levels, not just the individual's personal abilities, for digital inclusion to be possible [5].

It is not our purpose to draw an exhaustive list of resources necessary or available at each systemic level. Rather, we shall call upon examples to illustrate our proposition. As we have stated, access to the digital technology requires financial resources which are extremely limited in a majority of households where persons with intellectual disabilities live. The microsystem, composed in part by a person's family, employer or school is likely to own and could provide access to an ICT device. At the mesosytemic level, characterized by interactions across elements from the micro system, one can

imagine the school coming to an agreement with the family to allow the pupil with an intellectual disability to borrow a computer for the weekend. At the exosystemic level, where one finds municipal services, the public library provides access to computers for all citizens. In Canada, government programs (macrosystem) can subsidize the purchase of computer hardware and software for people with disabilities.

The same logic can be applied to the sensorimotor demands of ICT use. Cognitive demands may appear more difficult to provide for by external sources, but education and individualized personal support in computer use can be provided by the microsystem. Training offered to caretakers who wish to support the person exemplifies the mesosytem's contribution to some of the cognitive required. As we have argued earlier, website designers who occupy a niche in the exosystem could make their applications more cognitively accessible, visually (in format) as well as in terms of literacy (in content) [22-23]. Finally, the macrosystem's laws can take into account the declaration of *The Rights of People with Cognitive Disabilities to Technology and Information Access* to forge new legislation ensuring equal opportunities to web content. As recommended by the U.S. President's Committee for People with Intellectual Disabilities [23], governments can provide funding for research into and development of cognitively accessible applications and technology for the purposes of education, community living, employment, economic well-being, as well as health and wellness.

4. Conclusion

This conceptual model is a first attempt to identify factors leading to the digital exclusion of people with neurodevelopmental disorders. It constitutes a logical explanation of the digital divide based on a search of the scarce literature published on this topic, for this particular population. We have made it simple to understand, and simple to use by those who support the inclusion and full social participation of people with neurodevelopmental disorders. However, it has yet to be empirically tested.

Moreover, ethical issues permeate this model of digital accessibility. For example, by supporting a person with an intellectual disability to create a Facebook profile and use social networking sites, one can expose users to unwanted sexual cybersolicitation by a more vast pool of potential sexual abusers, than a disabled person would likely meet offline in a lifetime. If schools provide a laptop for use at school only, this creates inequality with classmates who are most likely to have computer access at home as well. If health and social services introduce assistive communication technology during intervention, this may put undue financial pressure on caretakers to acquire the same equipment. Therefore, ethical issues will need to be debated and researched as well.

More research is needed to establish accessibility needs and barriers for people with neurodevelopmental disorders. Only then will we know how best to bridge the divide.

References

[1] L. Rainie, B. Wellman, *Networked The New Social Operating System*, MIT Press, Cambridge, Ma, 2012.

[2] J. Blascovich, J. Bailenson, *Infinite Reality. The Hidden Blueprint of Our Virtual Lives*. Harper Collins Publishers, New York, NY, 2012.

[3] Watkins, *Model Policy For Inclusive ICTs In Education For Persons With Disabilities*, UNESCO, Paris, 2014.

[4] American Psychiatric Association (APA), *Diagnostic And Statistical Manual of Mental Disorders:DSM-5,* Author, Arlington, VI, 2013.

[5] D. Chadwick, C. Wesson, C. Fullwood, Internet access and people with intellectual disabilities. *Future Internet* **5** (2013), 376-397.

[6] B.S. Hoppestad, Current perspective regarding adults with intellectual and developmental disabilities accessing computer technology. *Disability and Rehabilitation:Assistive Technology,* **8** (2013), 190-194.

[7] Canadian Association for Community Living, *Poverty Watch*, Author, Toronto, ON, Canada, 2012.

[8] P.C.M. Buijs, E. Boot, A. Shugar, W.L.A. Fung, A.S. Bassett, Internet safety issues for adolescents and adults with intellectual disabilities, *Journal of Applied Research in Intellectual Disabilities* (2016), online DOI: 10.1111/jar.12250

[9] L. Löfgren-Mårtenson, E. Sorbring, M. Molin, ''T@ngled up in blue'': Views of parents and professionals on internet use for sexual purposes among young people with intellectual disabilities, *Sexuality and Disability* **33** (2015), 533-544.

[10] S. Parsons, H. Daniels, J. Porter, C. Robertson, Resources, staff beliefs and organizational culture: factors in the use of information and communication technology for adults with intellectual disabilities. *Journal of Applied Research in Intellectual Disability* **21**(2008), 19-33.

[11] D. Dagenais, K. Poirier, S. Quidot, S. *Raconter l'expérience et comprendre les pratiques : l'inclusion numérique des personnes handicapées au Québec.* Communautique, Québec, Qc, 2012.

[12] A.W.K. Wong, C. Chan, C.W. P. Li-Tsang, C.S. Lam, Competence of people with intellectual disabilities on using human–computer interface. *Research in Developmental Disabilities* **30** (2009), 107–123.

[13] E. Carmeli, T. Bar-Yossef, C. Ariav, R. Levy, D.G. Liebermann, Perceptual-motor coordination in persons with mild intellectual disability. *Disability and Rehabilitation* **30** (2008), 323-329.

[14] X. Ming, M. Brimacombe, G.C. Wagner, Prevalence of motor impairment in autism spectrum disorders. *Brain & Development* **29** (2007), 565-570.

[15] T.P. Alloway, Working memory and executive function profiles of individuals with borderline intellectual functioning. *Journal of Intellectual Disability Research* **54** (2010), 448-456.

[16] H. Danielsson, L. Henry, D. Messer, J. Rönnberg, J, Strengths and weaknesses in executive functioning in children with intellectual disability. *Research in Developmental Disabilities* **33** (2012), 600-607.

[17] McClimens, F. Gordon, People with intellectual disabilities as bloggers: What's social capital got to do with it anyway? *Journal of Intellectual Disabilities* **13** (2009), 19-30.

[18] C.N. Shpigelman, C.J. Gill, How do adults with intellectual disabilities use Facebook? *Disability & Society* **29** (2014), 1601-1616

[19] K. Bunning, E. Trapp, K. Seymour, M. Fowler, B. Rollett, Survey of the linguistic accessibility of websites designed for people with intellectual disability. *Journal of Applied Linguistics & Professional Practice* **7** (2010), 297-316.

[20] B. Harrysson, A. Svensk, G.I. Johansson, How people with developmental disabilities navigate the Internet. *British Journal of Special Education* **31** (2004), 138-142.

[21] Vodoz, L. (2010). Fracture numérique, fracture sociale : aux frontières de l'intégration et de l'exclusion. [Digital divide, social divide : at the frontier of integration and exclusion] *SociologieS*. From http://sociologies.revues.org/3333

[22] H. Kennedy, S. Evans, S. Thomas, Can the web be made accessible for people with intellectual disabilities? *Information Society* **27**(2011), 29-39.

[23] President's Committee for People with Intellectual Disabilities *Leveling the playing field: Improving technology access and design for people with intellectual disabilities,* PCPID, Washington, D.C., 2015.

[24] G. McMurdo, Netiquettes for Networkers, *Journal of Information Science* **21** (1995), 305-318.

[25] M. Wells, K. J. Mitchell, Patterns of internet use and risk of online victimization for youth with and without disabilities, *Journal of Special Education* **20** (2013), 1-10

[26] C.L. Normand, F. Sallafranque St-Louis, Cybervictimization of young people with an intellectual or developmental disability, *Journal of Applied Research in Intellectual Disabilities* **29** (2016) 99-110.
[27] U. Bronfenbrenner, *The Ecology of Human Development: Experiments by Nature and Design*. Harvard University Press, Cambridge, MA, 1979.

Cybertherapy: a scientific model? A text mining analysis of published abstracts

Lise HADDOUK[a, 1] and Brice GOUVERNET[a]
[a]*Rouen University*

Abstract. In the field of cybertherapies, meta-analysis reveal the scientific advancement in different fields, such as virtual reality exposure therapy for anxiety disorders [1] or the effect of immersive technology on user presence [2]. Certainly, knowledge about a phenomenon depends on results. But, following a socio-constructivist approach [3], it seems obvious that these results also depend on the researcher's intentionality, which fluctuates with social, cultural, economic, political or theoretical circumstances. Researchers' implicit models [4] also impact the design of the studies, the results and consequently, the scientific representation of the investigated phenomenon. One way to assess scientific models is to study publications abstracts. In order to observe the scientific models in cybertherapies and their evolution, we analyzed 857 abstracts from indexed Pubmed publications, obtained in January 2016 with the following requests: "cybertherapy" OR "computer based therapy" OR "online therapy" OR "web based therapy" OR "telepsychology" OR "telepsychotherapy" OR "tele-mental health ". Following data-mining methods [5], we combined (a) classical approaches in lexicometry [6], [5], (b) the « Meaning Extraction Method » [7] and (c) network analyses [8]. We also crossed data with publications dates to observe the evolution of the concepts. Results will help us to observe the evolution of scientific models in cybertherapies as well as the evolution of concepts such as emotions or intersubjectivity.

Keywords. Cybertherapy, Telepsychology, Meta analysis, Scientific models evolution

1.Introduction

We can define cyberpsychology as the area of psychology focusing on the study of : "the effects of cyberspace on the behaviour of humans and of society in general" [9]. Moreover, this field of research understands cyberspace as a psychological space, that is to say a transitional space or a basic extension of the psychic world of the individual[5]. In the field of cyberpsychology, cybertherapy is emerging as a new tool to treat a variety of psychological conditions. APA defined telepsychology as : « the provision of psychological services using telecommunication technologies »[6].
Researches in telepsychology show specific, but also integrative methods [10], [11], [12].

[1] Corresponding author, lise.haddouk@gmail.com
[5] http://w3.uqo.ca/cyberpsy/en/cyberpsy_en.htm
[6] http://www.apa.org/practice/guidelines/telepsychology.aspx

Beyond an academic definition, which probably has a top-down effect on the investigation fields of the discipline, can we consider a definition based on obvious facts, that is following a bottom-up process ? At first look, meta-analyses, agregating the main results of the studies published in this area, permit to answer this question [13], [1], [2]. However, it would be illusive to reduce cyberpsycholgy to results only. Following a socio-constructivist approach, it seems obvious that results also depend on the researcher's intentionality, which fluctuates with social, cultural, economic, political or theoretical circumstances [3],[4]. Cyberpsychology becomes rooted in theoretical fields, specific epistemology and specific practices, as the virtual reality exposure therapy[7] [10], or the video-conference interviews [14]. By the nature of its purpose, intimately linked to technological evolutions, it is undergoing constant changes (such as the evolution of technological medias used for immersion, which has probably an influence on VRET). Define cyberpsychology leads then to report a model, emerging from works in the scientific litterature, whose argumentative summary finds its expression via the abstracts. Following data-mining procedures applied to textual data [6], [5], we will try to highlight this model from lexical statistic analysis of the abstracts of indexed papers on Pubmed, and to study the temporal evolution of this model. From an operating point of view, it is about

- identify the model's components, by a preliminary investigation of the main concepts (noun and verbs) used in the abstracts and study their combinatory modalities, permitting the emergence of topics.
- report the role of these topics in the construction of the scientific argumentation related to cyberpsychology, ie to evaluate their importance : what is their weight, their organisation, their hierarchy.
- study the temporal evolution of the role of these topics.

2.Problem

How can we evaluate a scientific model in cybertherapy? How can we evaluate the evolution of the concepts used in cybertherapy since its appearance ? We assume than one method to observe the scientific model and the evolution of the concepts is to study publications abstracts.

3. Method/Tools

857 abstracts indexed in pubmed were obtained in January 2016 with the following request : "cybertherapy" OR "computer based therapy" OR "online therapy" OR "web based therapy" OR "tele psychology" OR "telepsychotherapy" OR "tele-mental health". 308 different supports of publication were found. Between 1980 and 1996, only 10 abstracts were recorded. We chose to discard them and focused our analysis on 847 bstract.

[7] VRET.

Figure 1(a) shows the repartition of the abstracts by year of publication[8], Figure 1(b) shows the 20 main supports of publication.

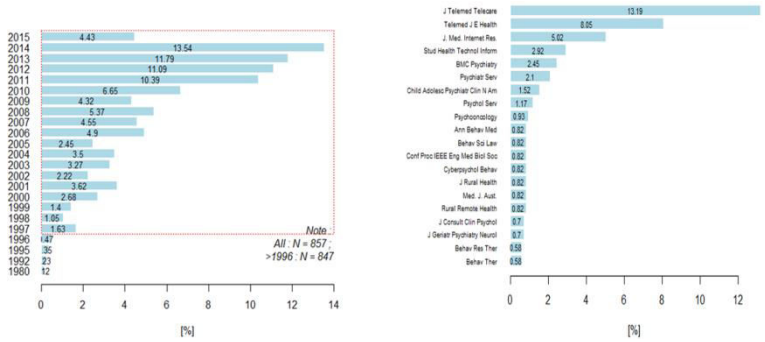


Figure 1. Data characteristics.

3.1. Procedures for analysis

General framework of this study is inspired from a systemic approach of human phenomena. Therefore, we combined:

- classical approaches in data-mining and text-mining (terms occurrences and co-occurrences analysis) [6], [5], emerging modeling of topics extraction from textual corpus : Probabilistic Topic Models [15], bayesian approach in the continuity of the Latent Semantic Analysis[9] [7].
- network analysis, whose interest in the field of psychopatholgy [16], [17], of health psychology [18] or textual data analysis [8], has recently been demonstrated.

Indeed, usually, the importance of a term / a concept / a topic reflects its occurrence frequency (or its factorial weight in LSA). Except for the stopwords (empty words, frequent but not significant such as auxiliary verbs, conjunctions,…), the more a term is mentioned, the more it is considered as central in the communication.

Yet, network analysis emphasizes that a variable centrality can't be summarized as its importance *per se*, ie out of any context : a variable is equally important by the role it has within a network. In particular, a variable is all the more central since it is : « a junction for communication within the network » [8]. Applied to text-mining, the examination of this betweenness centrality : « shows the variety of contexts where the word appears » [8].

[8] There are less abstracts in 2015 probably because in January 2016, all papers published in 2015 were not listed yet.

[9] LSA.

3.2. Process

Following data-mining processes, we proceeded to a preliminary cleaning of the data. Between 1980 and 1996, only 10 abstracts were recorded. We chose to discard them and focused our analysis on 847 abstracts published since 1997. Stopwords and empty words have been excluded, as specific terms for abstract redaction (for example: background, analysis, subjects,…). Finally, analyses have been made on noun and lemmatized verbs present in *a minima* 98% of the abstracts. Considering the nature of the textual corpus collected, similar in structure and restricted in length, we binarized the data, in the continuity of Reinert [19] or Chung and Pennebaker's propositions [7].

3.3. Measures

The first step of the analyses led us to observe the lexical occurrences and the variability of these occurrences between 1997 and 2015. In a second time, connections between lexical unities have been evaluated by topic modeling procedures. They have been done with R software and stm package [20], [21]. Choice of the optimal number of topics to include in the model has been guided by the search of balance between semantic coherence, specificity of terms in a topic, stability of the solution to cross-validation and residues minimization procedures [20], [21]. After characterizing topics from the analysis, their prevalence within the corpus has been studied, as well as their temporal evolution during the last 19 years. Then, occurrences and co-occurrences studies have been completed by network analysis, using R qgraph package [16], [22] in order to determine central topics, ie those with the stronger betweenness coefficient. Finally, temporal evolution of the topics centrality has been analysed.

4. Main Results

Occurency Analysis : Figure 2(a) shows the most prevalent 30 terms in the abstracts. Looking over the connections between the publication date and the terms prevalence doesn't show any significant difference (bootstrapped chisquare with 2000 replicates = 509.57, $p>.05$).

Topics Analysis : Topic modelling procedure led to identify 21 topics. Main terms relating to these topics, as well as the average weight of these topics are presented in Figure 2(b). Statistically significant differences in topics distribution according to the abstracts publication year cannot be highlighted (bootstrapped chisquare with 2000 replicates = 198.54, $p>.05$).

Network Analysis : Figure 3 shows topics that remain central, beyond temporal evolution. Some of them seem more related to the epistemological and clinical field of cybertherapy, (such as cognitive and behavioral therapies, mental health and video relationship) than others (health, care).

Correspondance Analysis. Figure 4 shows topics' betweenness centrality crossed with years of publications. Significant relationships between and topics betweenness are found (chi = 3245.015, $p<.01$). Among central topics, it seems that abstracts would speak more on process and relationship in 2015, and less of control and comparability

than in 2007, when it may have been important to demonstrate the effectiveness of cybertherapies. But central topics don't really change and they don't define a specific semantic field in cyberpsychology. We noticed a very medical semantic, not a very psychological one. Also, the terms « emotion » or « intersubjectivity » don't occur.

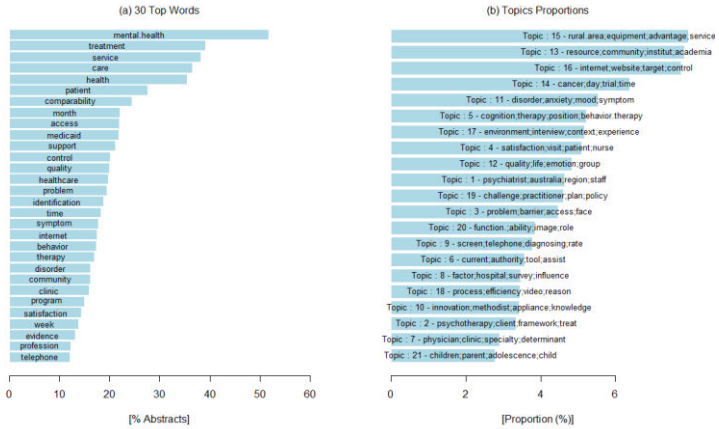


Figure 2. Lexical analysis.

Note: Nodes size is proportional to betweenness centrality value.

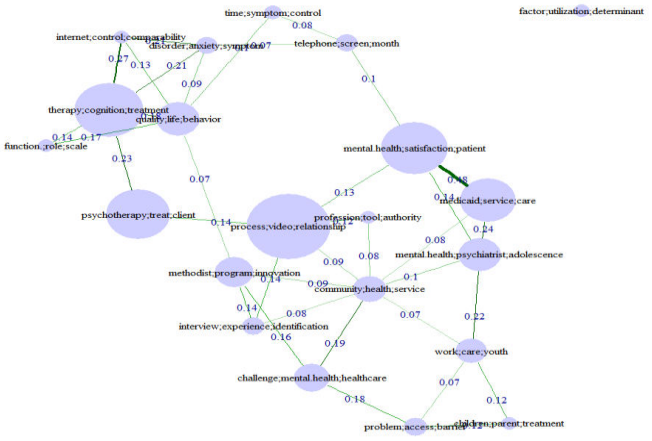


Figure 3. Network Analysis.

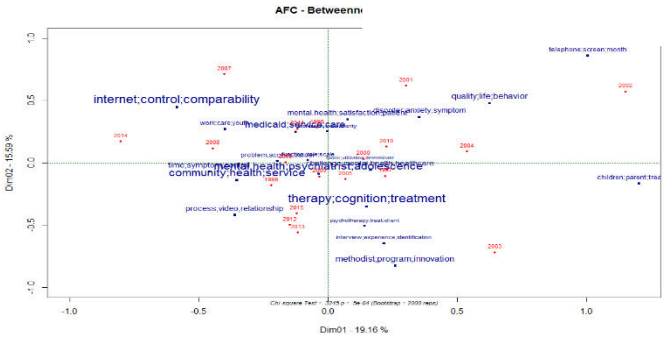


Figure 4. Correspondance analysis between topics centrality and years of publication.
Note: topics Labels size is proportional to mean betweenness centrality value.

5. Conclusion

The results of our study lead to the conclusion that even if we might have in mind that the scientific model of cybertherapy evolves as fast as the technologies, it may not be totally the case. Considering the relative youth of cyberpsychology, it is not surprising to see that the model we obtained is rooted in a limited number of topics. Yet, we can note that this model underlines the weight of medical references and, at least from a lexical point of view, to a theoretical model based on facts (evidence based), biopsychosocial, or even bio-social. This raises the question of the psychological semantic in the field of cybertherapy.

Considering these results, another perspective of our research would be to consider publication strategies, such as keywords to use that could help to enhance the visibility of publishing media specialized in cyberpsychology and cybertherapy. For this, we would need to conduct larger scale researches, for example with other databases which are not included in Pubmed.

Finally, a literature monitoring can be possible, to watch the evolution of the scientific model in cybertherapy year by year. Indeed, by the combination of lexicometric method and network analysis, our purpose was to highlight a scientific model in cybertherapy. The results that we obtained argue for this method. They invite to move beyond the occurrence and co-occurrence analyses that give an equal statue to the terms, to try to extract the most central terms in a systemic discourse approach. Such a method could support a scientific monitoring device that could be useful for the recognition of cyberpsychology and future research. This scientific monitoring could be achieved by annual paper identifying inter relations between most central topics of the domain for a year. It would even be possible to place the algorithm that we used on a website ensuring the visibility of cyberpsychology, both for scientific audience than for general audience, for a real time following of the scientific model of the discipline.

References

[1] M.B. Powers, and P.M. Emmelkamp, Virtual reality exposure therapy for anxiety disorders: A meta-analysis. *Journal of Anxiety Disorders*, **22** (2008), 561-569.

[2] J.J. Cummings and J.N. Bailenson, How immersive is enough? A meta-analysis of the effect of immersive technology on user presence. *Media Psychology*, **19** (2016), 272-309.

[3] K.S. Kendler, P. Zachar and C. Craver, What kind of things are psychiatric disorders? *Psychological medicine*, **41** (2011), 1-8.

[4] J.M. Epstein, Why model? *Journal of Artificial Societies and Social Simulation*, 11(4), (2008), 12.

[5] J. Han, M. Kamber, and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, Burlington, 2011.

[6] V. Gupta, and G.S. Lehal, A survey of text mining techniques and applications. *Journal of emerging technologies in web intelligence*, **1** (2009), 60-76.

[7] C.K. Chung, J.W. Pennebaker, Revealing dimensions of thinking in open-ended self-descriptions: An automated meaning extraction method for natural language. *Journal of Research in Personality*, **42**(2008), 96-132.

[8] D. Paranyushkin, Identifying the pathways for meaning circulation using text network analysis. Berlin: Nodus Labs. Retrived at: http://noduslabs. com/research/pathways-meaning-circulation-text-network-analysis, 20[9]

[9] Grand Dictionnaire terminologique de la langue française, 2000.

[10] S. Bouchard, Virtual reality treatment. In: I. Milosevic, and R.E. McCabe, editors, Phobias: The psychology of irrational fear. , ABC-CLIO, Santa Barbara (CA), 2015.

[11] S. Bouchard, S. Dumoulin, M. Michaud, and V. Gougeon, Telepresence experienced in videoconference varies according to emotions involved in videoconference sessions. Annual Review of CyberTherapy and Telemedicine (ARCTT), **167**(2011), 128-132.

[12] C. Galimberti, E. Brivio, M. Cantamesse, and F. Cilento Ibarra, Intersubjectivity as a Possible Way to Inhabit Future Cyberplaces. Annual Review of Cybertherapy and Telemedicine, **154** (2010), , 9-13.

[13] T.D. Parsons, A.A. Rizzo*, Journal of Behavior Therapy and Experimental Psychiatry*. **39**(2008), 250-261.

[14] L. Haddouk, Intersubjectivity in Video Interview. Annual Review of Cybertherapy and Telemedicine, **199** (2014), 158-162.

[15] D. M. Blei, Probabilistic topic models. Communications of the ACM, **55**(2012), 77-84.

[16] G. Costantini, S. Epskamp, D. Borsboom, M. Perugini, R. Mõttus, L. J. Waldorp, and A. O. Cramer, State of the aRt personality research: A tutorial on network analysis of personality data in R. Journal of Research in Personality, **54** (2015), 13-29.

[17] O. Cramer, S. Sluis, A. Noordhof, M. Wichers, N. Geschwind, S. H. Aggen, and D. Borsboom, Dimensions of normal personality as networks in search of equilibrium: You can't like parties if you don't like people. *European Journal of Personality,* **26** (2012), 414-431.

[18] A. Gouvernet, S. Combaluzier, P. Chapillon, and A. Rezrazi, Sexual motivations: A critical review. *Sexologies*, **25**((2016), e24-e28.

[19] Reinert, Une méthode de classification descendante hiérarchique: application à l'analyse lexicale par contexte. Les cahiers de l'analyse des données, **8** (1983), 187- 198.

[20] M. E. Roberts, B. M. Stewart, D. Tingley, and E. M. Airoldi, The structural topic model and applied social science. In : Advances in Neural Information Processing Systems Workshop on Topic Models: Computation, Application, and Evaluation. (2013)

[21] M. E., Roberts, , B. M. Stewart, and D. Tingley, stm: R package for structural topic models. R package, 1, 12. (2014).

[22] S. Epskamp, A. O. Cramer, L. J. Waldorp, V. D. Schmittmann, and D. Borsboom, Qgraph: Network visualizations of relationships in psychometric data. Journal of Statistical Software, **48**((2012), 1-18.

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 tech-nology but a complex technological and rela-tional process.

In this sense, clinicians and health care pro-viders that want to successfully exploit cy-bertherapy need a significant attention to clinical issues, technology, ergonomics, hu-man factors and organizational changes in the structure of the relevant health service.

Wiederhold & Riva, 2004

Networked Flow in Blended Learning Settings: a Longitudinal Mixed-Method Study

Carlo GALIMBERTI[a, 1] Alice CHIRICO [a], Eleonora BRIVIO [a,d], Fabiana GATTI [a,d] Elvis MAZZONI [c], Giuseppe RIVA [a,b], Luca MILANI [a], Carla MAZZOLENI [d], Elisa ALBERTINI [a], and Andrea GAGGIOLI [a,b]

[a] *Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy*
[b] *Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano, Milan, Italy*
[c] *Department of Psychology, Alma Mater Studiorum, University of Bologna, Italy*
[d] *Centro Studio Ricerche di Psicologia della Comunicazione, Università Cattolica del Sacro Cuore, Milan, Italy*

Abstract. We investigated the process of Networked Flow (NF) in 10 self-selected learning teams (graduate students enrolled in an academic course on Enterprise Communication) collaborating in blended settings. The NF model suggests that teams reach maximum group creativity when participants experience high levels of flow and social presence. Moreover, the model predicts that emergence of NF is associated with specific group structural dynamics. The research protocol consisted in a longitudinal mixed-method design, which integrated: (i) the analysis of experiential features of collaborative experience (flow, social presence); (ii) the analysis of communicative interaction; (iii) the structural features of collaboration dynamics (social network indexes). Preliminary findings suggest the feasibility and potential usefulness of integrating quali-quantitative methods for the investigation of NF in creative collaboration settings.

Keywords. Networked Flow, Group Creativity, Flow, Social Presence, Social Network Analysis, Conversation, Illocutionary Analysis

1.Introduction

In recent years, several authors have emphasized the importance of collaboration in promoting creativity. Recently, Gaggioli et al. [1] introduced a new theoretical and methodological approach to study optimal group collaboration: Networked Flow (NF).

This model holds that maximization of creativity requires the establishment of an optimal group experience, in which individual intentions inform and guide collective goals. Specifically, the experience of group flow [2, 3] combined with highest levels of social presence (i.e., the sense of being in the same place with another person) [4-6] promote a *shared collaborative inter-subjective space* able to maximize group

[1] Corresponding author, carlo.galimberti@unicatt.it

potential. Further, the model predicts that emergence of this shared optimal experience is associated with specific group structural dynamics, which can be investigated using social network analysis technique.

2.Methodology

The NF model holds that optimal group collaboration is a multifaceted process which can be associated to specific group structures. Specifically, it proposes that the emergence of NF entails two levels of analysis: (i) the experiential level (quality of group experience, in terms of flow and social presence); (ii) the structural level (social network structure and patterns of communicative interactions [7]).

The present study involved 102 participants (graduate students enrolled in an academic course on Enterprise Communication). The overall sample included 21 males and 81 females (average age = 22.98, SD = 1.69). Participants formed 10 self-selected teams (mean team size = 10.24; SD = 1.28) who collaborated over 11 weeks in blended setting (involving both face-to-face and virtual meetings). Groups were tasked with elaborating a joint project (the production of a videoclip concerning a topic addressed by the course). Quantitative measurements included: (i) self-report instruments to address the experience of flow (*Flow State Scale*; [8]) and social presence (*Networked Mind Social Presence Inventory*; [4, 5]); (ii) data gathered from online communications, which were subsequently analysed using Social Network Analysis. Finally, communicative interactions (both face to face and mediated conversations) were studied using a multi-perspective approach to conversation, which allowed identifying indicators of group optimal experience.

3.Results

3.1. Quantitative data

To illustrate the methodology, we focus our analysis on group 10, which showed the highest levels of flow and social presence (Flow mean: 124.33; S.D. = 7.54; Social Presence mean = 74.37; S.D. = 3.99). SNA data were used to describe group's structural dynamics. Figure 1 illustrates changes of group structure across 8 weeks of collaboration (from week 4 to week 11). Specifically, we examined changes in social network indexes of: Density (the ratio between the interactions activated and received by each members of a group); In-Degree Centralization (a measure of members' "status"); Out-Degree Centralization (a measure of members' "influence"), and CPI (an indicator of "structural social presence" [9]).

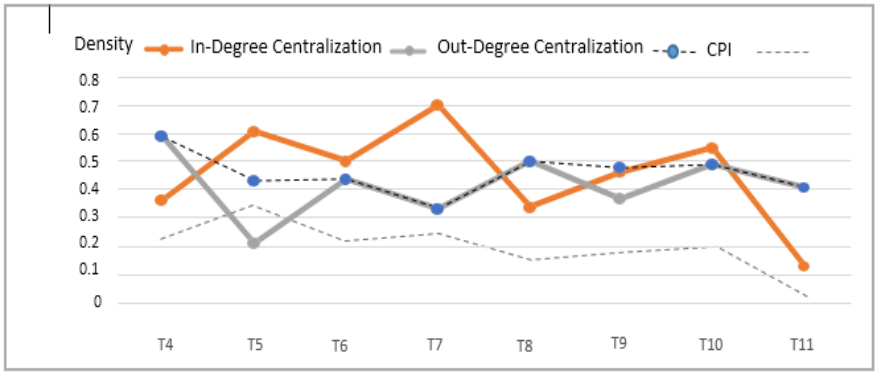


Figure 1. Changes of group structure across 8 weeks of collaboration (from 4th to 11th week).

Results shows that the central weeks of collaboration (from week 4 to week 7) are the most relevant for the emergence of a clear group structure. In this interval, the leadership was homogeneously distributed among members (as indicated by In-Degree Centralization and Out-Degree Centralization values) and exchanges occurred among all members equally (as indicated by Density and CPI values). On the other hand, new leadership structure formed towards the end of the course (from week 9 to week 11).

3.2. Qualitative data

Two recordings from the first and a half-way group meeting were considered to identify macro-sequences of problem solving or creative (idea-generating) processes. Ten sequences were identified and three sequences from the first meeting and one from the half-way meeting were selected to be transcribed using the system developed by Sacks et al. [10]. The analysis of these sequences are still ongoing but preliminary results allowed to identify patterns of communicative interactions that may have fostered the high levels of Networked Flow measured in the quantitative phase of the research. Extracts from the sequences are used here to exemplify the obtained results.

The analyses show that Group 10 used the same pattern of 'accumulation' of ideas across meetings, and that this process is mainly managed by two types of figures: one is present at time of the recorded meetings and is the functional leader of the team; the other one is absent but presentified through the other participants' discourse and his 'fictional' presence is used by the group to regulate decision making processes. This second type of regulator can be an absent team member or a person external to the group (in the example below the regulating figure is the professor of their class):

1 E But I think that he ((the professor)) wants us to use music because in my opinion because he – (.) but we - he is
2 Introducing music to us, it's jazz and he linked jazz to organizations, to enterprises, to business
3 etcetera, etcetera – thus perhaps he – thus he brings in music bands for us, otherwise he could have brought in
4 even a painter – [and the painter would have done improv
5 G [But maybe (0.4) ehm::: a way to demonstrate improv could be
6 I put – a musician and – a painter in the same room and see how they relate to each other = - and I just
7 Ask them "paint according to what you hear or play according to what you see:"

During the first meeting, the group proceeds randomly, it elaborates and discards ideas at a rapid pace without giving themselves time to organize the ideas they have had: time management is not a concern; they have no clear goal.

Basically, the first meeting is characterized by low degree of mono-logical coherence and the constant research of dialogical continuity. Dialogical continuity is fundamental for resolving the assigned task and is to be maintained by the group even if mono-logical coherence is lost: it is important for group development that individual member renounce to make their own ideas or opinions prevail in order for group dialogue to be maintained. The strategy of accumulation and discard is aimed to support this need for exploration and to avoid conflict.

1	G	= and we see ehm: different artists how they react, thus the: [= poet what he writes, the painter what
2		He paints and: [the dancer what he dances:[= and:: that all I think
3	H	[Otherwise you cannot hear
4	E	= th[e painter!
5	H	[Otherwise you cannot hear
6	E	[= Eh!
7		Correct
8	H	[This is so nice!
9	G	[= And:: then-
10	A	[Then (0.3) or we decide on a common theme, not music, a theme
11	G	A theme:
12	H	[But, that is:
13	-	[=
14	B	[Yeah one says to improv on something, instead a theme is focused
15	G	Then, what she is says is ok, but if you do that it's not real group work. I
16		Think that it depends, that i[s= - depends on how you sell it (0.4), meaning-
17	B	= [that is- (0.3) correct that in my opinion if-
18	C	Then in the end there is something made by the group, because everyone is influenced by the same thing
19		So if we rely on the fact that in the end the result is a – group thing (h) it is on point
20	G	In my opinion yes
21	A	Maybe we have to choose ehm: a theme – an idea

During the half way meeting, they still proceed in the same way, by accumulating ideas and proposals, but the group members focus on analyzing each possibility, solving problems, and then moving on another points of the discussion: the group has a specific goal in mind that has to be reached. In this case, dialogical continuity is not perceived as a need to be answered (see the emergence of small oppositions in the dialogue below, which do not appear in the first meeting) but becomes a way for short term mono-logical coherence to emerge: accumulation of topics and ideas is strictly linked to a sequence of problems and their solutions.

1	G	No but: - (s)he is:: shooting us – that is:: for your dissertation, you are studying movie
2		making a[nd thus: you are sticking to me and you stay, come, you shoot us – [and see how it is::
3	I	[Ah ok (h)
4		[And you say "since you are at it,
5		Bring me a coffee" (h)
6		No, ok it's ok
7	H	Correct
8		[No, ok, you can ask a lot of questions
9	-	[=
10	G	[This could be the justifica-
11	E	To her it must be eh-
12	C	Correct you can ask questions [= but for example at the auditions: that is-
13	B	[= you can ask questions-
14	B	And it can be fitting that I look at her and say something like "who's that girl?"=
15	I	Yes
16	-	(h)
17	B	= and you say "ehm:: [is she a ( )" and I say "ah ok"
18	E	[A gatecrasher!
19	F	A gatecrasher (h)

20 D The designer's assistant
21 H That's it, good job!
22 B And what do we write, a student?
23 G [It could work: =
24 C [In my opinion yes
25 F Hey D – ehm:: [we are a bit in a bind, and then – who is usually present at the audition? =
26 G = [it's the only thing that comes to my mind

4. Discussion

To better illustrate the methodology, we focused the SNA and qualitative analysis on the team showing highest level of flow and social presence.

SNA data collected from this group revealed the emergence of a specific interaction pattern during the central weeks of collaboration. This was characterized by a "distributed leadership" and by a "democratic attitude" (i.e., interactions occurred among all members equally). A further observation was the emergence of a leader only towards the end of the collaboration period, probably in order to manage the entire group towards the finalization of the task (i.e. the delivery of the group presentation).

Qualitative analysis of macro-sequences of problem solving and idea-generating processes contributed to further elucidate SNA results, by identifying specific markers of networked flow:

- The ratio between conflicts produced and conflicts resolved;
- Number of group members that take part into the conversation;
- Role fluidity: organizational/institutional roles, enunciative roles;
- Team management processes (problem solving, decision making, etc.) supported by an internal or external (material and/or human) resources
- Type of problems and the created ethnomethods used to solve them
- Number of subroutines that the group cannot solve
- Prevalence of dialogical continuity over monological coherence
- Ratio of successful and satisfied speech acts and the total number of speech acts.

Within the group conversations, it is possible to underline both structural elements, that also emerge from the quantitative analysis, and proper team social psychological functional elements. There are four important levels in conversation [11] that are pivotal to flow:

1. Individual level
2. Conversational level
3. Group level
4. Organizational level.

Each level realizes a different part of optimal experience and it integrates the previous levels. Therefore, to enhance networked flow it is important to consider all the previously mentioned levels and to train people to improve their abilities in level 1-3 (effective communication and team management) and to deal efficiently with level 4.

5. Conclusion

The goal of this contribution was to describe a mixed methodology for investigating the emergence of Networked Flow in a longitudinal observational setting, by examining collaborative teams of students. To illustrate the model, we focused the analysis on the team characterized by highest levels of flow and social presence. Results indicated that the emergence of NF is associated with specific structural indicators. Specifically, social network analysis data showed equal participation of each team member during the collaboration process. Furthermore, the analysis of communicative interaction patterns allowed to identify possible markers of optimal collaboration process (i.e., ratio between conflicts produced and conflicts resolved, role fluidity and others). Overall, these results indicate the feasibility and potential usefulness of integrating quantitative and qualitative methods in the investigation of creative collaboration process.

References

[1] A. Gaggioli, et al., *Networked Flow: Towards an Understanding of Creative Networks*, Dordrecht: Springer, 2013.
[1] R.K., Sawyer, *Group creativity: Music, theater, collaboration.* 2003.
[2] R.K., Sawyer*, Group genius: The creative power of collaboration*, New York: Basic Books, 2007.
[3] F. Biocca, and C. Harms, *Guide to the Networked Minds Social Presence Inventory v. 1.2: Measures of co-presence, social presence, subjective symmetry, and intersubjective symmetry.* East Lansing: Michigan State University, 2003.
[4] F. Biocca, and C. Harms, *Networked minds social presence inventory (scales only version 1.2)*, Tech. rep, MIND Labs, Michigan State University, Michigan, USA (2002). http://cogprints. org/6742/. Accessed 6 November.
[5] A. Harms, and F. Biocca, *Internal consistency and reliability of the networked minds measure of social presence*, in *Seventh Annual International Workshop: Presence 2004*, Valencia, Universidad Politecnica de Valencia, 2004.
[6] C. Galimberti, A. Chirico, E. Brivio, E. Mazzoni, G. Riva, L. Milani, A. Gaggioli, Bridging Minds: A Mixed Methodology to Assess Networked Flow*, Studies in health technology and informatics*, **219** (2015), 33-36.
[7] B. Diana, D. Villani, M. Muzio, G. Riva, *La validazione italiana della Flow State Scale - FSS.*, in Flow, benessere e prestazione eccellente. Dai modelli teorici alle applicazioni nello sport e in azienda, M. Muzio, G. Riva, and L. Argenton, Editors, FrancoAngeli, (2012), 123-142.
[8] Gaggioli, A., E. Elvis, L. Milani, G. Riva, The creative link: Investigating the relationship between social network indices, creative performance and flow in blended teams. *Computers in Human Behavior* **42** (2015), 157-166.
[9] H.Sacks, E.A. Schegloff, and G. Jefferson, *A simplest systematics for the organization of turn-taking for conversation.* Language **50** (1974)696-735.
[10] A. Trognon, and M. Batt, *Interlocutory logic*, in *Interlocutory Logic. A unified framework for studying conversational interactions*, In J. Streeck, Editor., Benjamins: Amsterdam (2010), 9-46

Efficacy of a digital education program on Life Satisfaction and digital self efficacy in older adults: A mixed method study

Eleonora BRIVIO[a, 1] , Silvia SERINO[b,c], Carlo GALIMBERTI[a] and Giuseppe RIVA[b,c]
[a] *Centro Studi e Ricerche di Psicologia della Comunicazione, Dipartimento di Psicologia, Università Cattolica del Sacro Cuore di Milano, Italy*
[b] *Dipartimento di Psicologia, Università Cattolica del Sacro Cuore di Milano, Italy*
[c] *Applied Technology for Neuro-Psychology Laboratory, Istituto Auxologico Italiano, Milan, Italy*

Abstract. People aged 65 and over often have difficulties in interacting with ICTs, even though these technologies are considered to be essential in ageing healthily, as they allow people to maintain their communicative and cognitive abilities and their social relationships even when the former biologically decline and the latter are difficult to keep up as mobility slowly becomes more challenging. This research aims to explore the efficacy of a 6 class Digital Education program in improving digital self efficacy (tablet use) and life satisfaction in people aged 65 and over, using a quali-quantitative longitudinal design (measurements taken after the first class – T1 - and after the last one –T2). Quantitative phase sample consists in 130 65 y.o. and over participants, ethnographical sample is a 10 person class, all attending a digital education program. Results show improved levels of digital self efficacy but not significant difference in life satisfaction after the course.

Keywords. Positive technology, Positive Psychology, Healthy Ageing, Tablet, Self efficacy, Life Satisfaction

1. Introduction: Positive Technology and Healthy Ageing

In Europe, the most recent demographic projections estimated that there are 87.31 million older individuals [1]. This trend is projected to increase, as the ageing population (aged 65 and over) will reach 1.2 billion by 2025. Although ageing is usually related to both physical and cognitive decline, many older individuals want to remain physically and cognitively healthy [2]. The dramatic advances in the Information and Communication Technology (ICT) sector has recently resulted in exploiting the potential benefits of advanced technologies also for older healthy individuals [3,4]. This is what has been called "Positive Technology", an emerging paradigm field that may be defined as the scientific and applied approach exploiting the advantages offered by advanced technologies for improving well-being [5]. More

[1] Corresponding author, elenora.brivio@unicatt.it

specifically, it is possible to classify three different kind of positive technologies according to their effects on three most peculiar aspects of well-being [6]: (i) hedonic positive technologies: advanced technologies used to foster positive emotions and pleasant experiences; (ii) eudaimonic positive technologies: advanced technologies used to help individuals in reaching engaging and self-actualizing experience; and (iii) social/interpersonal positive technologies: advanced technologies developed to improve social integration between both individuals and groups.

2. The Study

This research aims to explore on an empirical basis if people aged 60 and over perceive improvements in auto-regulative skills (satisfaction with life, digital self efficacy) when they take part to a digital education program to learn how to use a tablet and its basic functions. Both Satisfaction with Life and Digital Self Efficacy can be considered coherent with the Positive Technology Model, and especially the eudaimonic positive technology aspect, as the former is considered a subjective construct of perceived well being and quality of life [7], the latter instead is the perceived ability of carrying out a specific action [8], in this case the use of tablet

In particular, the study has two research questions:

- RQ1: Describe and explain if and how the use of ICTs improves Life Satisfaction and Digital Self Efficacy in people over 60 learning to use a new technology
    - H1: Digital Self Efficacy levels increase at the end of the course in comparison to the baseline
    - H2: Life Satisfaction levels increase at the end of the course in comparison to the baseline
- RQ2: Describe the interactions between learner and technology and between learner-technology-learner and the phenomenological signs of Digital Self Efficacy and Satisfaction with life (i.e. eudaimonic positive technologies), in terms of emotion expressed (i.e. hedonic positive technologies) and relationship built (social/interpersonal positive technologies).

2.1 The context

The context of this study is a series of digital courses activated under the ABCDigital programme (active in 35 high school in the Lombardy region of Italy), which provides people aged 65 and over free digital education via a reverse mentoring/training system in which high-schoolers train and teach them how to use tablets. Each course consists of six 2-hour classes, in which 6-15 participants are taught by one student-trainer, assisted by one teacher-supervisor and 3-6 student-tutors. Each class is focused on a specific topic and is mainly practice-oriented.

2.2 Methodology

The study employs a partially mixed concurrent quantitative-dominant research design

[9]. In particular, the quantitative phase employed a longitudinal approach, with self report questionnaires filled out at the beginning (T1) and at the end (T2) of the course. Measures – other than socio-demographical information - used in this study were:

- Digital Self efficacy: a 23 item survey questionnaire (5-point likert scale) was developed to test self efficacy in using tablets was developed according to Bandura's [8] and Caprara's [10] indications for testing domain-specific self efficacy and on computer self efficacy [11].
- Life Satisfaction: the Life Satisfaction Index – Version A (LSIA-11, 11 items, a 3-point likert scale) [7] was used to determine the participants' quality of life and general life satisfaction. It is a questionnaire validated for use with people aged 65 and over.

Qualitative phase consisted in a non-participant overt observation of a 6 lesson course, using a Focused Ethnography approach [12]. This perspective focuses on communicative exchanges between the actors within their specific environment and favors short-term field visits and was used in the past to study digital education programmes [13]. Three observers were on field and at time they alternated their presence and position within the room. All participants signed a informed consent form prior to the start of the course.

2.2.1 Quantitative population and sample, and qualitative corpus of observation

Population of this study are the participants enrolled in the ABCDigital programme, active in Lombardy region of Italy. A total of 167 participants (female=101) who completed the course by Q1 2016 and filled out both pre and post course questionnaires make up the sample for the quantitative phase.

The corpus for the qualitative phase consists in 6 observations of the 2 hours lesson across the eight week the course took place in a high school in downtown Milan, Italy. A total of 9 participants (min. 5, max. 9 per lesson), 5 student-tutors alternating as tutors and main trainer, and 2 teacher-supervisor were present during the observations.

3. Results

A principal component analysis (PCA) was conducted on the 23 item tablet-self efficacy questionnaire with oblique rotation (direct oblimin). The analysis uncovered a two factor structure: the first subscale (13 items) points to a general tablet use self efficacy (perceived ability to move in the tablet environment, basic functions, etc; Cronbach's alpha=.932), the second dimension (10 items) includes item regarding self efficacy in app-specific use (e.g. use a app to make a train reservation; Cronbach's alpha=.908).

Pre-post differences in digital self efficacy were tested using a paired sample T-Test. The comparisons were significant and the results are reported in table 1: for both dimensions, scores improve in T2. Differences in Life Satisfaction were measured through the LSIA-11 questionnaire and the comparisons were not statistically significant for all three dimensions of life satisfaction. Even though the analysis was

not significant, it can be noted that there is a downward trend in all the three dimensions of Life Satisfaction.

Ethnographical observations allowed to highlight several behaviors linked to perceives ability, emotions and relationships with the technology and other participants. Physical interaction with the tablet (dexterity) improved during the course but some actions, such as clicking on the touch screen, remained difficult. This is probably due to a scarce hand sensitivity (thickened skin, loss of fine motor skills) and/or fear to break the tablet: participants try to press the requested button but click too quickly or to strongly on the tablet, which do not respond to the gesture. In this case, the tutors had to intervene to help the participants, showing the right hand motion and pressure to apply.

Table 1. T-Test results for Tablet Self Efficacy and the LSIA-11 subscales.

	m_{t1}	ds_{t1}	m_{t2}	ds_{t2}	T	df	Sig. (2 tailed)
Self Efficacy							
General Tablet SE	1,87	.74	2,56	.88	-11,069	166	.001*
App-Specific SE	2,24	.80	2,69	.88	-6,791	165	.001*
LSIA-11							
Mood Tone	1,87	.33	1,84	.42	,583	132	.05
Zest for life	1,92	.42	1,89	.40	,921	130	.05
Congruence b/w desired and achieved goals	2,47	.60	2,46	.62	,267	126	.05

At the very beginning of the course, participants awaited the trainer and the tutors' say-so to start using the tablet, leaving it lying on the table until indicated, and after that they tried to follow step-by step the indications they were given. With time, the participants started handling the tablet and exploring without direct prompts from the trainers. This is can be considered a cue of rising levels of perceived self efficacy.

There is a distinct difference in the improvements made by the participants in handling the general aspects of the tablets (e.g. settings, home button) and app-specific aspects. App-specific skills were acquired relatively quickly and the participants were able to use apps quite successfully. General functions of the tablets and their connection to the app (e.g. attaching files, retrieving an image after taking a picture) remained difficult to understand to the last class of the course.

Another interesting behavior refers to interpersonal interactions. The participants tended not to have any interaction among themselves, if they didn't already know each other and even attempts to foster collaboration made by the tutors were short-lived and limited to the proposed exercise (e.g. sending a mail to each other). Even with people knowing each other interactions were limited and participants only helped each other when they were sure they had employed the solution indicated by the tutors, with whom they build good but dependent-like relationship: participants did not try to solve problems themselves but called tutors over to be helped.

An observation has to be made for the emotions expressed by the participants: an operation carried out successfully on the tablet warranted a high-voiced exclamation (e.g. 'I made it!'), as if to request attention and positive feedback from other participants and the tutors and to express self-satisfaction. Negative outcomes instead were only commented with the tutors and usually transformed from a limited complain about not being able to carry out an action (e.g. I got lost, I don't know where I am') to a general expression of dismay over their overall ability to use the tablet (e.g. 'I am

really really not good at this'), as if they wanted to be reassured. This pattern of behavior did not change during the course.

4. Discussion

Results of the qualitative and quantitative phases of the study are preliminary but allow a few interesting considerations. Firstly, digital self efficacy seems to improve at the end of the digital education course, which suggests that the ABCDigital is effective in increasing the participants' perceived ability to use tablets: at the same time, it is worth noting that scoring in the general tablet use dimension of digital self efficacy, while improving significantly, is still low, which is corroborated by the ethnographical observations that report constant difficulties in operating the tablet at a basic level (e.g. customize settings, moving between apps, etc.) even at the end of the course. This discrepancy between perceived and actual ability could be interpreted as an effect of social desirability and desire to please and not to let down the student-tutors with whom the participants built a strong sense of camaraderie.

In self report questionnaires, the participants seem to overestimate their overall ability: observations show that even at the end of the course most participants relied heavily on the student-tutors to carry out any operations on the tablet, and therefore cannot be considered completely independent in tablet use. However, this overestimated evaluation of their own ability is important because it may jump start independent use and exploration of the technology outside the classroom and without assistance, which participants were reluctant to do at the beginning of the course. Data on life satisfaction did not have the expected results, as it did not show any change before and after the course. It is worth noting that overall the starting levels of life satisfaction were very high.

The slight, albeit not significant, downward trend of the data on the three dimensions, could be explained by the rising difficulty of the class (which would contradict the Self Efficacy results – at least partially) or directly by the end of the course, which had a important social effect on the participants – as noted by the qualitative observations - as they built supporting relationships with the student-tutors - relationships that end with the course, and with them a new social network - cannot continue as participants seem not to have built relationship among themselves but only with the tutors.

5. Conclusion

The study shows that a digital education programme, such as ABCDigital, can have effect on digital self efficacy, while it seems not to affect a more encompassing and a-specific construct like Life Satisfaction, probably due to the short duration and time between measurements. Anyhow results show that even just learning to use a new technology can be ascribed to the Positive technology paradigm: learning to use tablet generates positive emotions and negative emotions that can be dealt with (hedonic level), it can improve self efficacy in using tablet and stimulating further exploration and use (eudaimonic level); and helps developing new relationships (social/interpersonal level). Future course should focus on supporting independent use of the tablet (helping participants find solution independently) and creating a network

among participants, which can be used after the course is over as a support system for tablet use initially and social network against social isolation after.

References

[1] A. K. Lagiewka, European innovation partnership on active and healthy ageing: triggers of setting the headline target of 2 additional healthy life years at birth at EU average by 2020, *Archives of Public Health,* **70** (2012), 1-8.
[2] G., Riva, P.A. Marsan. & C. Grassi (Eds.), *Active Ageing and Healthy Living: A Human Centered Approach in Research and Innovation as Source of Quality of Life*, IOS Press, Amsterdam, The Netherlands, 2014.
[3] G. Riva, D. Villani, P. Cipresso, C. Repetto, S. Triberti, D. Di Lernia, A. Chirico, S. Serino, A. Gaggioli, Positive and Transformative Technologies for Active Ageing, *Studies in Health Technology and Informatics*, **220** (2016), 308-31.
[4] G. Riva, A. Gaggioli, D. Villani, P. Cipresso, C. Repetto , S. Serino, S. Triberti, E. Brivio, C. Galimberti, G. Graffigna, Positive Technology for Healthy Living and Active Ageing**,** in G. Riva, P.A. Marsan, C. Grassi (Eds.), *Active Ageing and Healthy Living: A Human Centered Approach in Research and Innovation as Source of Quality of Life*, IOS Press, Amsterdam, The Netherlands, 2014, 44-56.
[5] D. Villani, P. Cipresso, A. Gaggioli, & G. Riva (Eds), *Integrating Technology in Positive Psychology Practice*, IGI Global, Hershey, PA, 2016.
[6] M.E.P. Seligman, *Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment,* New York, NY, Free Press, 2002.
[7] F. Franchignoni, L. Tesio, M. Ottonello, & E. Benevolo, Life satisfaction index: Italian version and validation of a short form, *American Journal of Physical Medicine and Rehabilitation, 7**8***, (1999), 509- 515.
[8] Bandura, *Self-efficacy: The exercise of control*, Freeman, New York, NY, 1997.
[9] N. Leech & A. Onwuegbuzie, A typology of mixed methods research designs, *Quality & Quantity* **43**(2007), 265-275.
[10] G.V. Caprara, *L'autovalutazione dell'autoefficacia: Interventi e contesti culturali*, Edizioni Erickson, Trento, Italy, 2001.
[11] E. Brivio & F. Cilento-Ibarra, Nuove tecnologie e autoefficacia percepita: Influenze del genere e delle modalità d'uso, *Qwerty: Open and Interdisciplinary Journal of Technology, Culture and Education,* **5** (2010).
[12] H. Knoblauch, Focused Ethonography, *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* **6** (2005).
[13] Strada, E. Brivio, & C. Galimberti, Digital education for older generation non native users: A focused ethnography study of a pilot study, *Qwerty: Open and Interdisciplinary Journal of Technology, Culture and Education,* **8** (2013).

Acknowledgements

The authors would like to thank: Paola Rossetti (Assolombarda) and Davide Inclimona (Assolombarda) and the Assolombarda and ACCENTURE ABCDigital teams for their help and support in this work; Simona Mazzolini.
This work is supported by the D3.2 2014 Progetti di Interesse d'Ateneo scheme, Università Cattolica del Sacro Cuore, Milan.

Where is the Virtual Self? Virtual Worlds and the Self as a Cyborg

Simon EVANS[a,1]
[a]*Department of Social Psychology,*
London School of Economics and Political Science

Abstract. In the context of widespread availability of digital technology as a means for interacting with others, it is useful to explore the extent to which participation in online environments, such as virtual worlds, reflect a transformation in the experience of self in society. One approach is to consider how self emerges from the context provided by the interactions that occur across and within physical and virtual environments, through capturing the experience of someone as they actively engage with a virtual world. This can be done employing Subjective Evidence-Based Ethnography (SEBE) methodologies. SEBE involves first-person audio-visual recording of experience with a subcam (a miniature video-camera worn at eye level), followed by a Replay Interview (RIW) using the recording to collect participant subjective experience. In this study, participants' usage of the virtual world Second Life has been recorded, capturing the inworld virtual activity and the physical The research discussed here seeks to understand this experience, with an objective of maximizing access to the "insider perspective" of the virtual world user. One way of doing this is to employ a digital ethnographic technique, Subjective Evidence-Based Ethnography (SEBE), which is specifically designed to directly access world context in which it is framed. Inductive thematic analysis of the data arising from the usage sessions and the RIWs reveals a number of findings. There are several levels of interaction occurring between the virtual world user, their avatar, other users, the virtual world technology, and the physical environment. The experience of self that emerges is one in multiple locations, bridged by technological mediation, such that someone who uses virtual worlds becomes a form of cyborg.

Keywords. Virtual self, virtual worlds, Second Life, Subjective Evidence-Based Ethnography, digital ethnography, cyborg

1. Introduction

The contemporary self has been characterized as increasingly experienced and mediated via "new technologies" (television, computers, mobile phones and other digital devices), and hence as a "virtual self"[1]. One particular phenomenon is "virtual worlds", online synchronous graphical environments whose participants use avatars to interact in real time, and of which there are several types which vary according to orientation [2]. Because of their potential for exploration of identity, role play, and alternative lifestyles, virtual worlds may offer an opportunity for reinventing the self and hence have implications for how self can be conceptualized [3].

[1] Corresponding author, s.evans@lse.ac.uk

subjective experience [4]. By considering how experience of self may be said to emerge through context and how SEBE methodologies provide direct access to that experience, we demonstrate here how the contemporary self is contingent on the mediation of technology, but in a co-relationship between the physical and virtual realms.

2. Emergence of self through context

Two strands of social psychological theory that inform how self emerges through context are Symbolic Interactionism (SI) and Activity Theory (AT). Both infer that self is not merely influenced by context but emerges through it. SI theories focus on the everyday interactions that occur in social worlds and consider how a person is a multiple product of the interaction that occurs with others in particular contexts, in a continual process of evaluation and transformation. For example, Mead considers self as emerging through appreciating the perspective of the other in everyday interactions [5], and Goffman emphasizes self as emerging through the self-awareness of the multiple roles that are performed in everyday settings [6]. Meanwhile, AT considers how self arises through activity, but with similar conclusions to SI: through momentary actions and interactions between self, other and artifacts in particular situations and environments, emerges change and hence self-knowledge [7, 8].

One approach that considers virtual rather than physical context, and is influenced particularly by AT, is Social Psychology of Cyberplaces [9]. This highlights how cyberspace as a whole is comprised of myriad "cyberplaces", non-fixed social worlds characterized by specific tools, languages and practices mediating their inhabitants' experiences [10]. Arguably, while it emphasizes the agentic nature of social actors in virtual environments, these actors are present in a range of contexts and social worlds, both virtual and physical. Hence, these worlds and contexts may influence and intersect and interact with each other, to present specific experiences from which self emerges.

This is the purpose of the research presented here: to consider how physical and virtual contexts interact with each other and the experience of self.

3. SEBE: beyond reported experience, towards direct experience

The aim of maximizing access to the insider perspective steers the research in the direction of a qualitative approach, given the ultimate goal for qualitative methods is an understanding of the perspective of those being studied [11]. Qualitative research conventionally makes extensive use of interviews and discussions, because they allow in-depth investigation of individuals' experiences [12]. The potential problem with interviews is that they provide access to experience "one step removed", i.e. the evidence they provide is reported experience, filtered through the lens of the researcher's own objectives and interpretations.

Digital ethnography offers a way through this, emphasizing the potential for digital technologies to allow understanding of human culture in context [13]. In particular, Subjective Evidence-Based Ethnography (SEBE) is one digital ethnographic technique that is intended to allow direct access to a participant's experience. It provides data that is collected as it happens and in collaboration with the participant, rather than depending solely on the researcher's interpretation of reported experience. It essentially

involves first-person audio-visual recording, followed by confronting participants with the recordings to collect the subjective experience in a Replay Interview (RIW) [4, 14, 15]. For present purposes SEBE techniques have been used to capture typical virtual world experience and the physical environment in which it occurs, hence observing how the physical and virtual contexts intersect, "as it happens" and from the perspective of those having that experience.

4. Materials and methods

To our knowledge, this research represents the first time SEBE procedures have been adapted to examining virtual phenomena, and so the methods and materials typically used were adapted for the task. The example virtual world used was Second Life, which provided a pool of willing participants familiar with other aspects of the author's research [16, 17]. Three SEBE procedures (N = 3) were conducted in the United Kingdom across the period June 21st to November 16th, 2012, one in a participant's home, one in a workplace, and the third in a hotel meeting room. Before each procedure, participants gave informed consent, and were provided with instructions on informing other users that their interactions may be recorded.

Each procedure comprised four stages: a preliminary stage comprising a textual individual interview conducted in Second Life, exploring general experience of using an avatar in a virtual world; an audio-recorded physical interview providing contextual information regarding typical virtual world usage and activities; a usage session, recorded with a first-person audio-visual recording device, with participants engaging in their typical activities; a video and audio-recorded RIW, with the researcher and participant viewing the recorded usage session together, the researcher prompting the participant to describe the experience.

Several pieces of electronic equipment and computer software were used, including: digital video and audio recorders; a laptop with installed Second Life software; screen capture software; and first-person recording devices, known as "subcams". Subcams are of bespoke design, constructed by the LSE Department of Psychology Technical Workshop, comprising spectacles attached to which is a miniature camera, microphone and digital recorder (Figure 1).

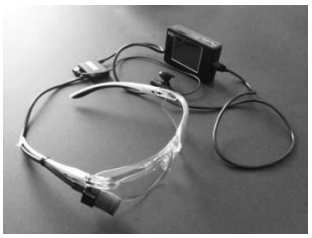


Figure 1. A subcam.

An inductive thematic analysis procedure was used to assess the data, being a method for identifying, analyzing and reporting themes [18]. The inductive approach allows themes to emerge "bottom-up", through a cyclical process of analyzing the data, and hence foreground the insider perspective of the research participants. In this case

the RIW transcripts and subcam recordings where coded separately, before being amalgamated to provide a final set of themes.

5. The findings: aspects of worlds' intersection

The findings reveal 20 basic themes with common semantic meaning, which can be grouped into four organizing themes reflecting common abstract principles: personal experiences; experiences with other users; experience of using the virtual world and its technology; the flow of experience from "real life" to the virtual world, and vice versa. These in combination characterize a global theme reflecting aspects of the physical-virtual world intersection. A particular recurring theme across the analysis is the role of virtual world technology in mediating experience.

With respect to personal experiences, users employ avatars to engage in behaviors appropriate for the virtual world, even when in contexts where no other users are present. For example, one participant sat her avatar at a beach bar at her home, but realized the pose was incorrect, yet despite no other avatars present, the participant amended the pose. As she explained later, it felt "wrong" to not be seated appropriately, and it was part of becoming immersed into the virtual world. In this sense, the avatar is a digital extension of the physical world self, with the avatar user situated in multiple locations simultaneously: the virtual world, the physical world, and even sometimes another virtual environment or website. This is also evident when the research experience coincides with the virtual experience. For example, as one participant's session drew to a close, the author entered the room (Figure 2). The participant was in mid-discussion with a friend, the two avatars hugging in Second Life, and for a period the participant interacted both in the virtual world and the physical. Later, the participant allegorized the sense of being present simultaneously physically and virtually to how one manages everyday "real life" interactions with others: the body interacts with another person, while the mind thinks about what to do, what to say, and how to interact. Hence "being there" immersed in the virtual world is not synonymous with "absence here" away from the physical. In a sense the mind is in two bodies, one physical facilitated by biology, and the other virtual, facilitated by technology.

Figure 2. Multiple locations: interacting in physical and virtual worlds simultaneously.

In relation to experiences with other users, the user interface (UI) plays a particular mediating role. Communication and interaction is mediated by text and avatars, and hence constrained and enabled by what is possible through those mediators. Moreover, immersion is facilitated not just by the technology as described above, but as one participant described as the "co-presence" of others. However, the

nature of the technology means that while the presence of others may facilitate immersion, it does not guarantee it. For example, another participant did not experience immersion into the virtual world during the session: despite spending time in a public location surrounded by other avatars, she was engrossed in several tasks simultaneously, including amending the UI settings, having private conversations, and reading the Internet. To some extent, rather than being immersed in the virtual world *per se*, she was immersed in the space provided by text boxes and webpages. With respect to experience of using the virtual world, there are particular tensions between it and the physical world, including the extent to which physical technology facilitates a virtual experience. The virtual world is framed by the UI, comprised of graphics that represent the world and its avatars, together with a plethora of head-up displays (HUDs) and text boxes. In turn, the consistency, quality and speed of delivery of these is dependent on the user's computer and Internet capabilities, as well as the virtual world servers. This is evident in how, while all used the same computer, the participants had various experiences in the appearance of the world, which UI they used, and how they used it (Figure 3). Hence, while the technology may facilitate immersion in the virtual world, it simultaneously may disrupt it.

Figure 3. Same world, same computer, different experience.

Regarding the extent to which experiences in the physical world impact on, influence, and flow through into the virtual world, the virtual world role in experience is contingent on being located in, and interacting with, multiple physical and virtual environments and situations. For example, one of the participants was not feeling well, and spent the time using Second Life in her bedroom, the laptop resting on her legs, and surrounded by refreshments, tobacco, cigarette papers, and her pet dog, all of which she interacted with throughout her session. She explained that this particular set of circumstances emerged from feeling unwell, and was her particular habit on such occasions. In her case, the technology of the virtual world is one of the artifacts adapted to, and interacted with, in the context of her biology.

6. Conclusions: the intersection of worlds and the implications

By using SEBE methodology to directly access the experience of virtual world users as it happens, the research findings both support and elaborate on the literature regarding Symbolic Interaction and Activity Theory: it indicates how the self in virtual worlds emerges through interactions with others using mediating tools. In this case, the others are fellow users of the virtual world, while the mediating tools are artifacts in the virtual context (animations, furniture, etc.) as well as the elements of the UI through which the virtual world is accessed.

Technology is the overarching mediating tool in the experience of virtual worlds: not just the UI, but the computer, Internet Service Provider, and virtual world servers

combine to provide the experience through which self emerges.
However, technology provides an environment for self that is of a particular form, a self that is constrained, multiple and disconnected. The self is experienced within and constrained by the particular framework provided by the UI, and is located simultaneously in multiple physical and virtual contexts and situations. Hence, the findings extend the notion that users of cyberspace are located in cyberplaces: they are not only social actors in social worlds but across them. These worlds intersect, overlap and influence each other. The experience of self that emerges is one in multiple locations, bridged by technological mediation, experienced through the fuse of an organic body and technology. In a sense, the virtual worlds' user has become a form of "cyborg", a human that has had machine elements grafted into their physical being [19].

References

[1] B. Agger, *The Virtual Self: A Contemporary Sociology*, Blackwell, Oxford, 2004.
[2] P. R. Messinger, E. Stroulia, K. Lyons, M. Bone, R. H. Nu, K. Smirnov, S. Perelgut, Virtual worlds – past, present, and future: new directions in social computing, *Decision Support Systems* **47** (2009), 204-228.
[3] Peachey, & M. Childs, Virtual worlds and identity, in A. Peachey & M. Childs (Eds.) *Reinventing Ourselves: Contemporary Concepts of Identity in Virtual Worlds*, Springer-Verlag, London, 2011
[4] S. Lahlou, S. Le Bellu, S. Boesen-Mariani, Subjective evidence based ethnography: method and applications, *Integrative Psychological and Behavioral Science* **49** (2015), 216-238.
[5] G. H. Mead, *The Social Psychology of George Herbert Mead***,** University of Chicago Press, Chicago, 1956.
[6] Elliot, *Concepts of the Self*, Polity, Cambridge, 2001.
[7] A. Nardi, Studying context: a comparison of activity theory, situated action models and distributed cognition, in B. A. Nardi (Ed) *Context and Consciousness: Activity Theory and Human-Computer Interaction*, MIT Press, Cambridge, MA, 1996, p. 69-101.
[8] A. Stetsenko, & I. M. Arievitch, The self in Cultural-Historical Activity Theory: reclaiming the unity of social and individual dimensions of human development, *Theory & Psychology,* **14** (2004), 475-503.
[9] E. Brivio, F. C. Ibarra, C. Galimberti, An integrated approach to interactions in cyberplaces, in R. Taiwo (Ed.) *Handbook of Research on Discourse Behavior and Digital Communication: Language Structures and Social Interaction,* Information Science Reference, Hershey, PA, 2010.
[10] D. D. Waskul, *Self-Games and Body-Play: Personhood in Online Chat and Cybersex*, Peter Lang, New York, 2003.
[11] G. E. Gorman, P. R. Clayton, M. L. Rice-Lively, L. Gorman, *Qualitative Research for the Information Professional: A Practical Handbook*, Library Association Publishing, London, 2007.
[12] G. Gaskell, Individual and group interviewing, in M. W. Bauer & G. Gaskell (Eds.) *Qualitative Researching with Text, Image and Sound: A Practical Handbook*, Sage, London, 2000.
[13] D. Murthy, Digital ethnography: an examination of the use of new technologies for social research, *Sociology* **42** (2008), 837-855.
[14] S. Lahlou, How can we capture the subject's perspective? An evidence-based approach for the social scientist, *Social Science Information* **50** (2011), 607-655.
[15] S. Lahlou, Observing cognitive work in offices, in N. Streitz, J. Siegel, V. Hartkopf & S. Konomi (Eds.) *Cooperative Buildings. Integrating Operations and Architecture* (Vol. 1670), Springer, Heidelberg, 1999.
[16] S. Evans, The self and Second Life: a case study exploring the emergence of virtual selves, in A. Peachey & M. Childs (Eds.) *Reinventing Ourselves: Contemporary Concepts of Identity in Virtual Worlds*, Springer-Verlag, London, 2011.
[17] S. Evans, Virtual selves, research perspectives: exploring the role and implications for taking the insider perspective in virtual worlds research, in P. Jerry, N. Tavares-Jones & S. Gregory (Eds.) *Riding the Hype Cycle: The Resurgence of Virtual Worlds*, Inter-Disciplinary Press, Oxford UK, 2013.

[18] V. Braun, & V. Clarke, Using thematic analysis in psychology, *Qualitative Research in Psychology* **3** (2006), 77-101.
[19] C. H. Gray, H. J. Figueroa-Sarriera, & S. Mentor (Eds.), *The Cyborg Handbook*, Routledge, New York,1995.

E-mental health on-campus: College students' views of online help-seeking

Gillian KARWIG [a,1] and Derek CHAMBERS[a]
[a]*ReachOut Ireland*

Abstract. Third level students in Ireland are highly likely to use the internet when seeking mental health information and support. This study deconstructed the concept of online help-seeking by exploring students' views of e-mental health and their likelihood of availing of e-mental health. Over 5,000 students responded to an online survey, and four focus groups were hosted with students. Although the majority of survey respondents (85%) reported being likely **to** search for mental health information online, a lower proportion reported being likely to avail of online support (whether peer or professional support). Nearly two-thirds of survey respondents indicated a preference for speaking with someone in person about their feelings; however, one-quarter reported being more likely to use online supports than face-to-face supports, if offered by their college's counselling service. Results demonstrate the value of colleges providing quality online mental health information to students (as information endorsed by their colleges was perceived as more trustworthy); results also highlight the need to further explore the potential role of online supports on-campus, through continued consultation with students.

Keywords. Help-seeking, online, college students, e-mental health

1. Introduction

College students are uniquely placed to receive mental health information and support, given the embedded system of support services available within most campuses [1]. From an Irish perspective, individual colleges report a growing demand for therapeutic support from their counselling services. Annually-collated data from the Irish Association of University and College Counsellors demonstrates that, nationally, 5.5% of students availed of counselling in 2013-2014, compared with just over 4% of students in 2007-2008 [2]. While it is positive that students are increasingly willing to seek professional support, it should also be noted that the number of full-time counsellors across campuses has decreased in recent years [2]. This increase in help-seeking from Student Counselling Services therefore presents a challenge regarding how best to support students with current service capacity.

E-mental health – the use of online and technological resources and services for the delivery of mental health information and support - represents an opportunity to scale up the response to meet the diverse mental health needs of students. The potential

[1] Corresponding author, gilliank@reachout.com

for exploring the use of e-mental health initiatives on-campus is highlighted by findings from the My World Survey, whereby 'the internet' was selected by the majority of third level students (77%) as a source of mental health information and support that they *would be likely to use* [3]. Notwithstanding this result, it is important to understand *how* students are most likely to use the internet (and technology) when seeking help, to inform the potential role of online supports on-campus. A recent Irish study investigated the help-seeking preferences of third level students (focusing on e-mental health and college supports and services in particular), and de-constructed the concept of internet and technology-based support [2]. Results from the study report pertaining specifically to e-mental health will be discussed below.

2. Methods

A mixed-methods approach was undertaken for this study. An online survey was developed, and the survey link was circulated to students in participating colleges. The survey comprised 30 items across three sections: i) Demographic/basic information; (ii) Students' views and use of various supports and services; and iii) Students' mental health. Additionally, four focus groups were hosted with students. To ensure representation of views from different student 'types', the groups were open to any gender, and separate groups were hosted for first-year and final-year students. The groups were audio-recorded and transcribed, following which the transcripts were coded using thematic analysis [4].

3. Results

3.1 Survey results

Seventeen third level institutes participated in the online survey, and the final survey sample included 5,556 students. The majority of respondents were female (61%), Irish (85%), and aged between 18 - 22 years (60%).

3.1.1. Attitudes towards e-mental health:

Students were asked to indicate their level of agreement with statements reflecting various attitudes towards e-mental health. Table 1 presents results pertaining to the response options 'agree' and 'strongly agree'.

Table 1: Students' responses to statements regarding attitudes towards e-mental health

	Agree/ Strongly agree
Mental health information on the internet can be unreliable	**54%**

Using the internet/technology for mental health information and support can allow for anonymity, privacy and confidentiality	**84%**
I'd prefer to talk with someone in person about how I'm feeling, rather than with someone online	**63%**
There is a vast amount of valuable mental health information available online	**71%**
Online counselling from a professional can be just as effective as face-to-face counselling	**17%**
There can be harmful discussions about mental health in forums, social networking sites or discussion boards	**81%**
I'd be more likely to use online than face-to-face supports, if available from the college counselling service	**26%**

The results in Table 1 suggest that students present with diverse attitudes towards e-mental health. For example, while seven out of ten students agreed that there is a vast amount of valuable mental health information online, over half of students (54%) agreed that online information can be unreliable. Additionally, although the majority of students agreed that mental health discussions within online platforms can be harmful, a similar proportion (84%) also acknowledged that e-mental health can afford confidential and anonymous information and support. Notably, nearly two-thirds of students reported a preference for talking to someone in person about their feelings, rather than with someone online. This preference for face-to-face interaction may relate to the additional finding in Table 2, whereby only 17% of students agreed that online counselling can be as effective as face-to-face counselling. Notwithstanding the preference of the overall sample for face-to-face support, one-quarter of students (26%) indicated that they would be more likely to use online supports than face-to-face supports, if offered by their college's counselling service.

3.1.2 Future use of e-mental health for mental health information and support:

Students were asked to indicate their likelihood of using the internet and technology in a variety of ways when seeking mental health information and support. Table 2 presents results pertaining to the response options 'likely' and 'very likely':

Table 2: 'If you felt that you needed mental health information and support, how likely are you to…?'

	Likely/ Very likely
Look up information online about mental health	**85%**
Look up information online about mental health supports/services	**81%**
Communicate with a personal friend online	**51%**
Communicate with others online	**23%**

Take part in online counselling with a health professional	**18%**
Use a mobile app related to mental health and wellbeing	**30%**
Use an online programme related to mental health	**40%**
Use the college website (e.g. podcasts and leaflets on mental health)	**45%**
Avail of online counselling from the Student Counselling Service	**33%**

Results demonstrate that students are most likely to avail of e-mental health by searching for online information about mental health (85%) and information regarding supports and services (81%). This points to the need for students to be provided with *quality* online information, given that 54% had agreed that online information 'can be unreliable'. Notably, the proportion of students likely to use the college site (45%) was significantly lower than the 85% likely to search for information online generally; statements from students within the focus groups suggest a lack of visibility of existing mental health information within a college's site as a possible factor affecting this difference.

Approximately half of respondents (51%) reported being likely to communicate with a personal friend online; this likelihood fell to 23% regarding communication with *others* online (with the survey item referencing examples of 'forums, Facebook, support groups or discussion boards'). This may reflect a preference for seeking help from a more familiar source of support; equally, it may reflect the survey finding regarding students' acknowledgement of harmful discussions about mental health within such platforms.

Less than one-fifth of students reported being likely to avail of 'online counselling with a health professional'. However, this likelihood increased significantly to 33% ($p<0.001$) regarding online counselling *delivered by their college's counselling service*. Focus group discussions suggest that students may be more positively disposed towards online counselling from a service embedded in their immediate environment, where they have knowledge of the specific professional involved.

3.2. Focus group results

Thirty-three students in total participated across the four focus groups, comprising 13 first-year students, 18 final-year students and 2 postgraduate students. The majority of students were female (27 participants), Irish (29 participants) and 18-22 years of age (27 participants). Similar to the survey results, focus groups discussions on e-mental health highlighted multifaceted and diverse views. Notably, discussions converged on an overarching theme: the importance of regulation and best-practice in the e-mental health sector, to ensure the safe delivery of online mental health information and support. Students' discussions regarding online information, online peer support and professional support will be summarised below in the context of this theme.

3.2.1. The need for reliable and quality mental health information online

The wealth of available online information was referenced as a benefit when seeking help: 'the first thing that I'd think of is the internet, it has so many resources… for information it's really good as well' (FG2). However, the difficulty of navigating this abundance of information was discussed, with reference to feeling 'overwhelmed': 'I

almost feel like it's too broad, you can type in symptoms or whatever, but there's so much, what site do you go to first…there's almost too much' (FG1). This was echoed by another student regarding the number of hits generated through the use of search engines: 'if you Google you can be led down so many rabbit holes' (FG2). Concerns were also raised regarding the reliability of online information obtained from a general search, with the statement 'I think sometimes if you just generally Google it, instead of going to like a proper website, you end up thinking that you're way worse than you actually are' (FG2).

Notably, focus group participants suggested that having online information or third-party sites specifically endorsed by their college would denote the reliability of such information. For example, one student referred to a list of sites that had been provided to students during Orientation, which 'might be good ones to check out, instead of randomly Googling your symptoms' (FG2); another student indicated 'if there was something accredited by the college or something, you'd know you could go there, that would be a good first stop' (FG2). Students proposed that colleges could provide such information within frequently-used sections of the college site, such as their student portal (a specific landing page for students), in addition to Blackboard. Crucially, availing of frequently-used resources in this manner would ensure that online information is visible, consistently available and easily accessible, the value of which was summarised succinctly by one student – 'if you do have a problem, it's a lot easier to just see something and click on it, rather than think about it and go find it' (FG3). As such, there is a clear role for colleges to undertake regarding the provision of reliable online mental health information.

3.2.2 Online peer-support platforms – the value of moderation

Students similarly presented with diverse views regarding the use of online peer-support platforms. As per survey results, anonymity was referenced as a benefit: 'I think they're good places to say something that you can't really discuss with a friend or partner' (FG4). Additionally, the value of interacting with others experiencing similar issues was noted, and awareness of the shared experience of others was suggested as a facilitator of further help-seeking: 'I think it's a lot easier to go online first to see is there other people with the same problems, and then you might go to your friends afterwards' (FG1).

However, students also expressed the need for caution when using peer-support resources, with reference to the presence of individuals who may 'just try and stir trouble' (FG3), and 'could be saying anything' (FG1), in addition to the belief that 'there can be a lot of hate on those kinds of things' (FG3). Students suggested that moderating such platforms - including monitoring and review of communications - could facilitate safer online interactive environments. Suggestions included 'carefully censoring' such platforms (FG3) as 'you definitely need someone who's watching over the whole time' (FG4). The value of moderation was also discussed in the context of online commenting facilities, as 'you can prevent people from posting hateful things, so that's really good' (FG2). As such, peer support platforms - while recognised by students as relevant sources of support for some – were discussed in the context of the need for communications between platform users to be safely and appropriately managed.

3.2.3. Formal support online – ease of access versus security of counselling sessions

Students were invited to discuss their thoughts regarding the use of online platforms for the provision of counselling. An acknowledged benefit included the ease of accessing online counselling for those in isolation, whether due to geographical location or otherwise ('someone who's very depressed and finds it hard to get out of bed' (FG3)). Although focus group participants reported a lack of personal interest in video counselling, a number agreed that it could facilitate future face-to-face support for those too anxious to initially attend a counselling session in person, with the potential for 'using it as a stepping stone, to bring someone into actual one-on-one counselling' (F2). However, an element of distrust was primarily noted regarding the concept of video counselling. In particular, students expressed concern over the potential for the security of their sessions to be compromised, whether from someone 'hacking into it' (FG1)), or the restricted view of the session: 'you don't know is there somebody else in the room, if it's a Skype and you can only see behind them' (FG1). Issues of 'trust' were also expressed regarding the credibility of the professional providing online counselling, with one student conceding that 'someone over the internet is… a lot of the time it's just someone over the internet, and they might have the certs but to prove it, and for people to have confidence in that, it might be tough to build on that' (FG4). This may reflect the increased likelihood of survey respondents to avail of online counselling if specifically offered by their college's Student Counselling Service, which may be as a result of increased trust and confidence in a service that is visible on-campus. As per online peer support, students highlighted that although online counselling may be useful for some, the medium of delivery necessitates adherence to the principles of safe and ethical service provision.

4. Conclusion

This study provided insights into the views of a large cohort of students regarding e-mental health initiatives. Results demonstrate a clear rationale for colleges to provide reliable online mental health information to students, including signposting to quality third-party sites: students are highly likely to seek online information (notwithstanding reservations as to its fidelity); however, students also trust the information provided by their college. It is crucial that colleges are actively involved in collating quality online information and sites, and in communicating this information in a visible manner. This could ensure that students are less likely to use a general search engine, thereby mitigating their difficulty in navigating an overwhelming amount of potentially unreliable information online. The value of simply seeking information cannot be overstated, as knowledge of how and where to seek help, in addition to greater understanding of a problem, may facilitate further help-seeking, whether online or in-person.

While the provision of online mental health information represents an action relevant to the majority of students, the provision of online support may be appealing to a much lower proportion of students. Nearly two-thirds of survey respondents reported a preference for talking to someone in person about a problem, and students expressed concerns regarding the delivery of online peer or professional support. Nevertheless, additional results suggest that the inclusion of online support within the model of service provision on-campus is worth exploring: one-quarter of survey respondents

expressed a preference for online support from their college's counselling service, and one-third reported being likely to avail of online counselling if offered by their college. The feasibility of online support should therefore be explored further in consultation with students, particularly as the e-mental health activities delineated in the survey (summarised in Table 2) represent but a proportion of a wider range of online initiatives. For example, what specific types of online supports are students most likely to use if offered by their Student Counselling Service? Guided online mental health programmes? Online counselling via a specific medium (video, instant messaging or email)? Such consultation is relevant to Action 7.4.4 within *'Connecting for Life: Ireland's National Strategy to Reduce Suicide, 2015-2020'* [5]: 'evaluate innovative approaches to suicide prevention, including online services and targeted approaches for appropriate priority groups'; third-level institutions are referenced as key partners to undertake this action.

Notwithstanding the need for further exploration of students views' of e-mental health, results demonstrate that students are capable of critically considering the provision of online information and support, and recommend that online resources and services should be safe, trustworthy, and delivered with due regard to best-practice.

References

[1] J. Hunt & D. Eisenberg, Mental health problems and help-seeking behaviour among college students, *Journal of Adolescent Health*, **46** (2010), 3 – 10.

[2] G. Karwig, D. Chambers & F. Murphy, *Reaching Out in College: Help-Seeking at Third Level in Ireland*, ReachOut Ireland, Dublin, 2015.

[3] B. Dooley & A. Fitzgerald, *My World Survey – National Study of Youth Mental Health*, Headstrong & University College Dublin School of Psychology, Dublin, 2012.

[4] V. Braun & V. Clarke, Using thematic analysis in psychology, *Qualitative Research in Psychology*, **3** (2006), 77 – 101.

[5] Department of Health, *Connecting For Life: Ireland's National Strategy to Reduce Suicide 2015 – 2020,* Department of Health, Dublin, 2015.

Online Counselling: web-conferences as new "trusted setting" for psychological support

Davide ALGERI[a] ,Sara GABRI[b], Luca MAZZUCHELLI[c] and Alessandra MICALIZZI [b,1]
[a]*SIPO – Servizio Italiano di Psicologia Online*
[b]*Università Cattolica del Sacro Cuore*
[c] *OPL – Ordine degli Psicologi della Lombardia*

Abstract. The online psychological consultation is a spreading phenomenon that offers several context of application. In the last decade the number of users has been increasing because of the more and more deep "appropriation" of online devices and tools. Italy is a peculiar geographic context both for the penetration of the Internet and for the limited cultural attitude to call on a professional service in case of psychological need. The paper aims at showing the results of a fieldwork carried out in Italy by the SIPO, Service for Online Psychology, that offers online psychological support by Facebook chat and Skype videochat. The study is focused on the videoconference service and investigates the following goals: Individuating the main drivers that lead to choose a mediated service; Defining pros and cons of the use of mediated technology; monitoring the quality of the service and identifying the levels of satisfaction and the areas of improvement. To collect data two online questionnaires has been used: users are invited to fill the first one at the beginning of the psychological path and the second one at the end. SIPO has collected 944 questionnaires and the results have been elaborated by SPSS 16. The results show how the number of users has been increasing since the beginning of the service; even if the main public is made up of young people there is an interesting percentage of adults; moreover in the 68% of cases it Is the first approach to a psychological service. The comparison with the first wave shows how it is reduced the percentage of people that unrealistically think to solve the problem: the main expectation for the respondents is to understand the personal difficulty in order to find the best way to work on it.

Keywords. online treatment, cyber-psychology, Computer mediated therapy (CMT)

1. Introduction

Online psychological consultations were born in USA in the 90s, when the spreading of technology became available for a growing number of potential users. The label includes web-based interventions, online counselling and therapy, Internet-operated therapeutic software, and other online activities (e.g., as supplements to face-to-face therapy)[1]- Several studies [2-3] outline the role and potential of new

[1] Corresponding author, a.micalizzi@opl.it

technologies in psychological support. Areas in which they are used are the treatment of anxiety disorders, parenting, sexuality education and other issues [4].

However, few studies have empirically and longitudinally investigated in systematic way the characteristics and the efficacy of online psychological counselling [5]. This paucity of data may depend on the relative novelty of such practices. Furthermore, the use of online psychological counselling is still debated on a theoretical level [6], making it difficult to isolate salient variables in the evaluation of the process and its efficacy.

Online counselling is considered particularly effective for its widespread accessibility. Users are not constrained by geography, but rather by access to a computer with an Internet connection [7]. The pervasive availability makes the health care services accessible to individuals without any territorial limits and giving the client access to information any time [6]. Moreover, some users underline the benefit to start treatment in remote modality at a first stage [8].

The lack of cues linked with the face to face interaction generates some consequences. On one hand, it reduces the empathetic mechanism and the psychological implication in the therapeutic relation [2]. On the other one, it facilitates the self disclosure of the user thanks to a ''disinhibiting effect'' [10] caused by the protection of the screen [9].

In light of these evidences, the aim of this present study is to understand the value of distance online interventions and counselling through the use of new technologies. In this study, data deriving from the online chat service and the video counselling service will be compared, to define the different profiles of users who request psychological help in both cases.

Going in this direction, the Italian Service for Online Psychology (SIPO) has instituted a free helpdesk on Facebook and more recently, on Skype.

Each service present a different scope: while the helpdesk on Facebook was designed as a means to offer a first welcome and an orientation towards a professional who may offer help and whom one may contact to commence a path towards change, the helpdesk via Skype was added to offer the possibility to undertake brief cycles of psychological consultation, also through webcam.

In the following pages it will be presented the main results about the analysis of the users' survey, carried out by CAWI, in two different steps: at the beginning of the counselling treatment and at the end.

2. Design of the research

2.1. Participants

The sample is constituted by male and female subjects with ages ranging from <18 to 60 years of age, on voluntary basis, who responded to a questionnaire administered at the end of an interview, even if only subjects in the age of 18, or older, can access the service. The video counselling sample is composed of 944 subjects, whose 611 females and 333 males.

2.2. Goals, Method and materials

The study aims at exploring three aspects: the needs that are met by an online service; the profiles of users; the motivations and expectations toward the use of an Internet based counselling service.

Data were collected by asking each user, in the moment of their first login, to complete a questionnaire upon entry and upon exit, which allowed monitoring the course of the services and the level of the users' satisfaction. For the videoconference session, the contact was established by appointment.

To login into the video-consultation it was possible to ask users to fill out a form on the website of the Italian Service for Online Psychology. The requests were distributed amongst the SIPO consultants after they had proposed a date for a meeting (usually for free). They then invited the user to fill out a module to access the service. The day of the meeting the psychologist had 30-40 minutes available to listen to the users' questions and to collect information necessary to decide whether to indicate a local reference to contact or propose a cycle of interviews of psychological support (with charge in accordance with the fee of the psychologist taking care of the case). In this case as well, at the end of the interview the users were asked to complete a questionnaire.

The questionnaire was divided in several parts: the first one focused on socio-demographic characteristics; the second one addressed to individuate the motivation for turning to a psychologist; the following sections investigated the reasons for choosing an option at a distance, the spheres associated with the disorders, and the expectations linked with the use of the service.

3. Main Results

The following data are about the videoconference service: they have been collected by interviewing clients that use the online counselling by SIPO during 2015. In order to identify dynamic changes, it will be offered also a comparison with the data collected in 2013 as a benchmark. Data collected from the chat support channel, are discussed in an article on the request for psychological help in the digital age: offering counselling through chat and video counselling [4].

3.1. Profile of the videoconference support users

The service, tailored exclusively to Italian speakers, saw a greater participation of users in the age range between 18 to 25 years (41,68%) and a majority of women who represented 64,73% of users (Fig. 1). If we compare this percentage with the data about the 2013 we can notice an increase of female users and a reduction of the number of males.

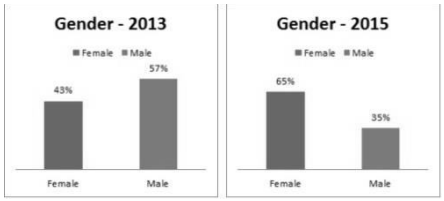


Figure 1. Differences in the sample gender from 2013 to 2015.

The analysis of geographical data shows a concentration of participants in the North of Italy (36,9%) and in the South (38,3%), while residents in the central area are only the 18,1% of the sample. Moreover data record an increase of users that live in a foreign Country. In this way we can recognize a first important role of online counselling service: it allows native Italian speakers to have access to a psychological consultation even if they live in a foreign Country. The sample includes people with a medium and high educational level and the request of an interview of online counselling comes from above all students (30,3%) followed by entrepreneur and freelance (Fig. 2).

Craftsman - Merchant - Farmer	52 (5,5%)
Housewife	47 (4,97%)
Manager - Officer - Employee - Teacher	154 (16,28%)
Entrepreneur - Self-employed	170 (17,97%)
Student	287 (30,34%)
Laborer	93 (9,83%)
Un-employee	135 (14,27%)
Pensioner	8 (0,85%)
Total	946

Figure 2. Profession.

3.2. Online experience and evaluation

The users get in touch with the SIPO service by a direct research on the main search engine (65,4%) or by link inserted in online news about health and care (17,16%). Only the 3,1% land to the website by the word-of-mouth.

The wave of 2015 confirms an important aspect of the online counselling service: SIPO help service represents the first request of psychological support for 68,3% of respondents. This means that online counselling harbors the needs of a user that probably are not interested at a first stage to have personal contact with a specialist.

The push to seek help is represented by two main motivations: 29,1% of users declares that "not knows where to turn to for help" and a similar percentage (28%) that expresses the need of immediate support. These results underline a state of "emergency" as well as a "narrative urgency" [12]. While 19,5% admit to having chosen online counselling for convenience, another 14% declares to use an online service because of the feeling of shame and embarrassment caused by the face to face contact (Fig. 3).

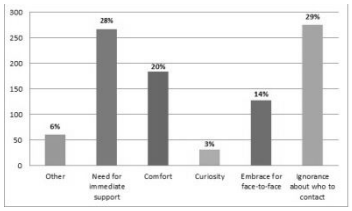


Figure 3. Motivations associated with search for online support 2015.

The difficulties reported by users are mainly problems with mood and anxiety, relational problems. Compared with the results of wave carried out in 2013, the number of subjects with depression and anxiety disturbs has been reduced passing from 30% to 19% (Fig. 4).

Other	122 (12,91%)
Addictions	17 (1,8%)
Eating Problems	29 (3,07%)
Depression/Humor problems	223 (23,6%)
Anxiety problems	182 (19,26%)
Sexual problems	37 (3,92%)
Relationship (partner, children, friends)	335 (35,45%)
Total	945

Figure 4. Problems presented.

The last part of the questionnaire aimed at understanding the reasons why people search a psychological support online. We identified three main motivations: "talking about", "understanding", and "solving" the problem.

The encounter is accompanied by expectations associated primarily with the opportunity to understand better the problem one is going through. However, a discrete percentage of cases made unrealistic requests of solving the problem immediately (Fig. 5). Comparing data about 2013 and 2015 we can find an "upgraded" approach to online service: the percentage of users that addressed to the service to understand the problem is raised and the number of people that think to resolve the problem with the online consultation is reduced.

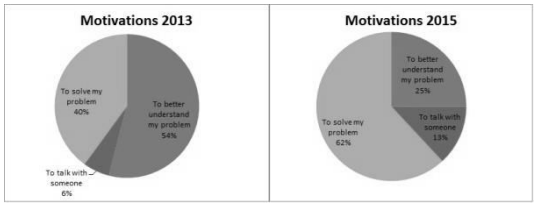


Figure 5. Comparison for motivation to a Psychological online support in 2013 and 2015.

4. Discussion

The comparison of data between the two waves of the study shows a general evolution of the users' practices and approaches to the online service. First of all the public is more heterogeneous, even if young and females remain the main target.

Most of them have not experience of psychological treatments or specialists and it is confirmed by the high percentage of whom declares to contact SIPO because they have not previous contacts with other services (29%). However people that express the urgency to solve the problem as if the SIPO service is considered a "first aid", for emergency, make the highest percentage. This supports the hypothesis that virtual counselling meets the need of narrative urgency, that is higher when people live a critical life's moment [12].The problems toward which they struggle are linked with the interpersonal sphere, while the percentage of diseases has decreased. It is confirmed by the results about the aims of the virtual path: the first reason is "to understand" the problem than to solve it. The survey seems to confirm the role of "first stage" service that online SIPO counselling has in order to meet the psychological need of a dialog to better focus on the problems. In this way Skype service confirms to be an effective way to overcome the barriers to mental care access, such other online tools and contexts [13].Moreover, SIPO has the opportunity to play a strategic role of direct the users to the right service. Online contact, indeed, doesn't preclude a following beginning of a face to face psychological path (or treatment).

References

[1] Barak, A., Klein, B., Proudfoot, G. Defining Internet-Supported Therapeutic Interventions, *Annual Behavioural Medicine*, **38** (2009), 4–17.
[2] Liess, A., Simon, W., Yutsis, M., Owen, J.E., Altree Piemme, K., Golant, M., & Giese-Davis, J. Detecting emotional expression in face-to-face and online breast cancer support groups, *Journal of Consulting and Clinical Psychology*, **76** (2008), 517–523.
[3] Perle, J.G., Langsam, L.C. & Nierenberg, B. Controversy clarified: An updated review of clinical psychology and tele-health, *Clinical Psychology Review,* (forthcoming).
[4] Gabri, S., Mazzucchelli,L., Algeri, D. The request for psychological help in the digital age: offering counselling through chat and video counselling, *E-Journal of Psychotherapy Research*, (2015).
[5] Roehlen, A. B., Zach, J .S., & Speyer, C. Online therapy: Review of relevant definitions, debates, and current empirical support, *Journal of Clinical Psychology*, **60** (2004), 269-283.
[6] Alleman, J.R. Online counselling: The Internet and mental health treatment, *Psychotherapy*, (2002) 39, 199–209.
[7] Baker, K., Ray, M. Online counselling: The good, the bad, and the possibilities, *Counselling Psychology Quarterly*, **24** (2011), 341–346.
[8] Andersson, G., Bergstro, J., Buhrman, M., Carlbring, P., Holl, F., Kaldo, V., Waara, J. Development of a new approach to guided self-help via the Internet: The Swedish experience, *Journal of Technology in Human Services*, **26** (2008), 161–181.
[9] Gamba, F. *Lo spazio dello schermo*, CELID, 2004, Rome.
[10] Barak, A., Boniel-Nissim, M., & Suler, J. Fostering empowerment in online support groups, *Computers in Human Behavior*, **24** (2008), 1867–1883.
[11] Dielman, M., Drude, K., Ellenwood, A. E., Heinlen, K., Imar, T., Lichstein, M., Mills, M., & Asch, P. S. Telepsychology guidelines, *Ohio Psychological Association*. Downloaded from http://www.ohpsych.org/professionalissues.aspx.
[12] Jedlowski, P. *Il sapere dell'esperienza*, Carocci, 2008, Rome.
[13] Pietrabissa G., Manzoni G.M., Algeri D., Mazzucchelli L., Carella A., Carella A., Pagnini F., Castelnuovo G. Facebook Use as Access Facilitator for Consulting Psychology *Australian Psychology*, 50 (2015) 299-303.

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.

iederhold & Riva, 2004

Impact of Distractors on Executive Control in Older Adults: Construct-Driven and Function-Led Approaches to Neuropsychological Assessment

Thomas D. PARSONS[a,1] , Michael BARNET[a], Timothy MCMAHAN[a]

[a]Computational Neuropsychology and Simulation Lab, Department of Psychology, University of North Texas

Abstract. Whilst virtual environment-based neuropsychological assessments have been presented as potential aides in enhancing ecological validity, many were modelled on construct-driven approaches found in traditional assessments. Recently, neuropsychologists have been arguing for a new generation of function-led neuropsychological assessments that are developed from directly observable everyday behaviors. In the current project, we review findings from both construct-driven and function-led VE-based neuropsychological assessments of cognitive functions in 45 undergraduate students (mean age: 19.96; SD: 2.85) and 40 older adults (mean age: 75.56; SD = 7.43). For the construct-driven assessment, we used a Virtual Apartment with an embedded bimodal Stroop task that included distraction and no distraction conditions. For the function-led assessment, we used a Virtual Multiple Errands Test, wherein participants were immersed in a virtual grocery store and asked to carry out various tasks. Findings suggest that virtual reality-based construct-driven and function-led neuropsychological assessments appear to have potential for increased ecological validity using a virtual environment with real world distractors.

Keywords. Neuropsychology, Virtual Reality, Ecological Validity, Aging

1. Introduction

Laboratory-based neuropsychological studies of relationships between various cognitive constructs and functional abilities in aging populations suggests that there are many factors that contribute to functional decline, including memory [1] and executive functioning [2]. Distracting stimuli may hinder attention by increasing perceptual and cognitive load, limiting ability to perform important cognitive processes [3]. As individuals age, their attentional control may be more affected by distraction [4].

Researchers interested in ecological validity argue that lab-based assessments are not ecologically valid and fail to assess the impact of distractors on everyday activities in the real world. The issue of ecological validity in neuropsychological assessment has

[1] Corresponding author, thomas.parsons@unt.edu

been expressed a number of times over the years via discussions of the limitations of generalizing sterile laboratory findings to the processes normally occurring in people's everyday lives. Some researchers have countered these arguments with the claim that the ecological approach lacks the internal validity and experimental control needed for scientific progress.

One methodology that has potential for a laboratory and everyday functioning rapprochement is virtual reality. Virtual environments (VE) are increasingly considered as potential aids in enhancing the ecological validity of neuropsychological assessments [5]. Given that VEs represent a special case of computerized neuropsychological assessment devices they have enhanced computational capacities for administration efficiency, stimulus presentation, automated logging of responses, and data analytic processing. Since VEs allow for precise presentation and control of dynamic perceptual stimuli, they can provide ecologically valid assessments that combine the control and rigor of laboratory measures with a simulation that reflects real life situations. Additionally, the enhanced computational power allows for increased accuracy in the recording of neurobehavioral responses in a perceptual environmental that systematically presents complex stimuli. Such simulation technology appears to be distinctively suited for the development of ecologically valid environments, in which three-dimensional objects are presented in a consistent and precise manner [6].

2. Construct Driven Virtual Environments

A number of virtual environments have been developed that superimpose construct-driven stimuli (e.g., Stroop; Go/No-go) upon some aspect of the environment. These tests are adaptations of conceptual and experimental frameworks found in traditional neuropsychological assessments. For example, the ClinicaVR Virtual Apartment (Digital Media Works) superimposes construct-driven stimuli (e.g., Stroop; continuous performance task) onto a large television set in the living room. The ClinicaVR Virtual Apartment (Digital Media Works) Stroop has been found to be capable of eliciting the Stroop effect with bimodal stimuli. Moreover, the ClinicaVR Virtual Apartment (Digital Media Works) Stroop has been found to be significantly correlated with other neuropsychological measures of attention [7]. Results from regression analyses indicated that commission errors and variability of reaction times in the ClinicaVR Virtual Apartment (Digital Media Works) Stroop were significantly predicted by scores of the Elevator task and the CPT-II. These preliminary results suggest that the ClinicaVR Virtual Apartment (Digital Media Works) Stroop has potential as a clinically useful measure of cognitive and motor inhibition for adults.

3. Function Led Virtual Environments

In the past decade a number of virtual environments with enhanced graphics (and usability) have been developed to model a function-led approach to neuropsychological assessment. The “function-led approach” to creating neuropsychological assessments includes neuropsychological models that proceed from directly observable everyday behaviors backward to examine the ways in which a sequence of actions leads to a given behavior in normal functioning; and the ways in which that behavior might

become disrupted [5; 7]. For example, the Virtual Environment Grocery Store [8] offers an advanced computer interface that allows the clinician to immerse the patient within a computer-generated simulation that reflects activities of daily living. While in the Virtual Environment Grocery Store, the participant takes part in a number of errands that must be completed following certain rules that require problem solving. Since the Virtual Environment Grocery Store allows for precise presentation and control of dynamic perceptual stimuli, it has the potential to provide ecologically valid assessments that combine the control of laboratory measures within simulations that reflect real life situations.

4. Research protocol and preliminary results

In the current project, we review findings from both construct-driven and function-led VE-based neuropsychological assessments of cognitive functions. We compare performance of older adults on virtual environment-based assessments of memory and executive functioning with that of college-age adults.

4.1. Participants and procedure

Participants: The participant sample included 45 undergraduate students (mean age: 19.96; SD: 2.85) recruited from a pool of undergraduate students in psychology at the University of North Texas; and 40 older adults (mean age: 75.56; SD = 7.43) recruited from independent living retirement communities. Exclusion criteria included history of neurological illness, physical, or psychiatric disorder that might impair performance.

Procedure. This study was approved by the university Institutional Review Board, and informed consent was received from all participants before beginning the study. For the construct-driven assessment, we used the ClinicaVR Virtual Apartment (Digital Media Works) with an embedded bimodal Stroop task that included distraction and no distraction conditions. The ClinicaVR Virtual Apartment (Digital Media Works) presents Stroop stimuli on a display within a virtual apartment as colors are spoken aloud.

Figure 1. ClinicaVR Virtual Apartment (Digital Media Works) Stroop Task

Participants respond to congruent verbal and visual cues—replicating conditions of the traditional paper-and-pencil Stroop. Each section of the Virtual Apartment Stroop task is performed with and without visual, auditory, and visuo-auditory distractors.

For the function-led assessment, we used the Virtual Environment Grocery Store, wherein participants were immersed in a virtual grocery store and asked to carry out various tasks (see Figure 2).

Figure 2. Virtual Environment Grocery Store

After completing the virtual shopping task, participants were asked to recall the items shopped for using free recall and cued recall methods. Fifteen minutes following the completion of the short-delay recall, with a distractor task in between, participants were assessed via long delay free and cued recall.

4.2. Results

Repeated-measures ANOVAs were performed to examine the effects of distracting stimuli on each sample. The aging sample was significantly impacted by distractors, as evidenced by higher distraction condition response times for color-naming ($F = 11.492$, $p < .005$), word-reading ($F = 6.017$, $p < .05$), and interference ($F = 15.896$, $p < .001$) conditions (see Figure 3).

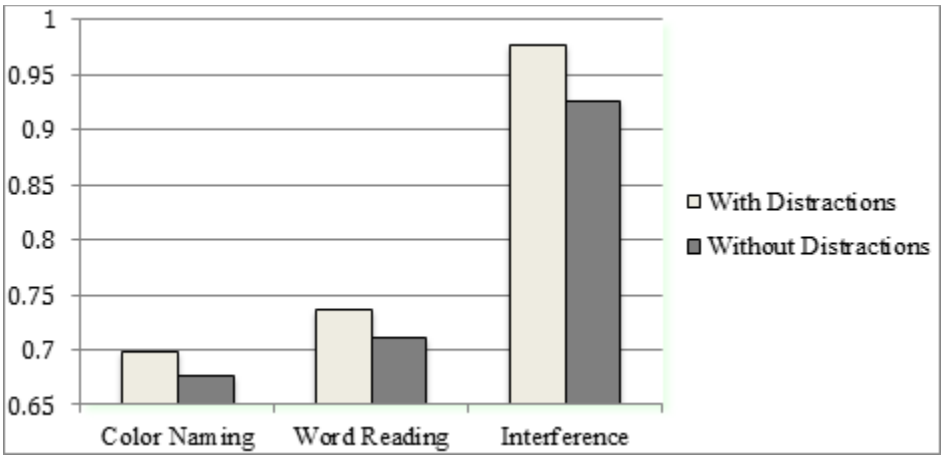


Figure 3. Aging Sample Response Times on the Virtual Apartment Stroop

The college-aged sample was less affected by distractors, only showing higher distraction response times in the color-naming condition ($F = 8.506$, $p < .01$; see Figure 4).

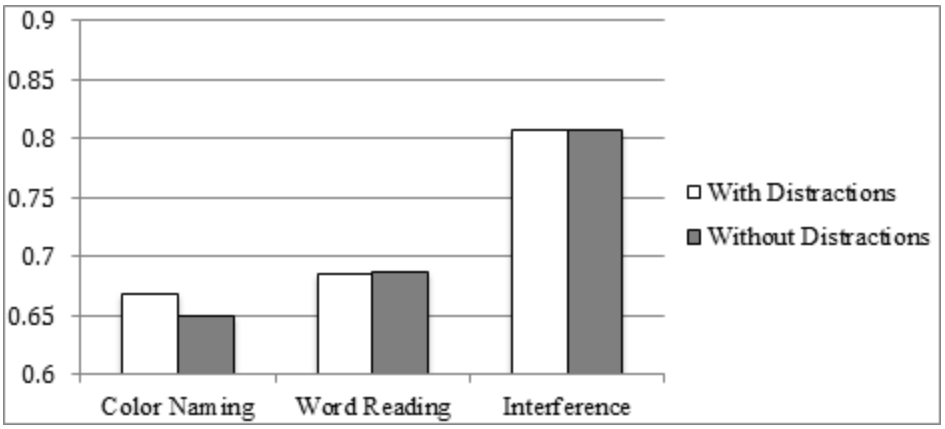


Figure 4. College-Aged Sample Response Times on the Virtual Apartment Stroop

Results of function-led assessment revealed significant differences (favoring younger adults) for all aspects of the evaluation. Specifically, older aged individuals were more vulnerable to external disturbance (e.g., ambient noise and distractors in a virtual environment) than younger age controls. Results of one-way ANOVAs reveal significant differences (favoring younger adults) for short-delay free recall ($F(1, 100) = 36.67$, $p < 0.001$); short-delay cued recall ($F(1, 100) = 21.06$, $p < 0.001$); long-delay free recall ($F(1, 100) = 31.24$, $p < 0.001$); and long-delay cued recall ($F(1, 100) = 24.16$, $p < 0.001$).

5. Conclusions

Virtual environments provide a unique opportunity to study memory and executive functioning within an ecologically valid environment. Our findings indicate that memory and executive functioning in older aged individuals may be more vulnerable to external disturbance (e.g., ambient noise and distractors in a virtual environment) than younger age controls.

Performances on both a construct-driven ClinicaVR Virtual Apartment (Digital Media Works) Stroop task and a Virtual Environment Grocery Store revealed that geriatric individuals were more impacted than a college-aged sample by distractors. The potential for increased ecological validity using a virtual environment with real world distractors supports the notion that these results may generalize to the day-to-day lives of aging persons, indicating this cohort may have decreased attention when confronted by distractions.

Whilst the results from the comparison between an older age cohort and a college cohort revealed significant differences, these findings need to be compared to well standardized neuropsychological assessments. For now, these findings suggest that the virtual reality based shopping task may offer a platform for assessing cognitive performance in an environment that represents everyday functioning

In conclusion, the use of virtual reality-based construct-driven and function-led neuropsychological assessments appears to have potential for increased ecological validity using a virtual environment with real world distractors.

References

[1] L. Ossher, K. Flegal, and C. Lustig, C. Everyday memory errors in older adults. Aging, Neuropsychology, and Cognition, **20** (2013), 220-242.

[2] M. Lewis, and L. Miller. Executive control functioning and functional ability in older adults. The Clinical Neuropsychologist, **21** (2007), 274–285.

[3] N. Lavie,. Distracted and confused?: Selective attention under load. Trends in cognitive sciences, **9** (2005), 75-82.

[4] C. Getzmann, P. Gajewski, and M. Falkenstein. Does age increase auditory distraction Electrophysiological correlates of high and low performance in seniors. Neurobiology of aging **34**, (2013), 1952-1962.

[5] T.D. Parsons. Virtual Reality for Enhanced Ecological Validity and Experimental Control in the Clinical, Affective, and Social Neurosciences. Frontiers in Human Neuroscience (2015) 1-19.

[6] T.D. Parsons, A. Carlew, J. Magtoto, and K. Stonecipher. The Potential of Function-Led Virtual Environments for Ecologically Valid Measures of Executive Function in Experimental and Clinical Neuropsychology. Neuropsychological Rehabilitation, **11** (2015) 1-13.

[7] M. Henry, C. Joyal, and P. Nolin. Development and initial assessment of a new paradigm for assessing cognitive and motor inhibition: the bimodal virtual-reality Stroop. Journal of neuroscience methods, **210** (2012), 125-131.

[8] T.D. Parsons, S. McPherson, and V. Interrante. Enhancing Neurocognitive Assessment Using Immersive Virtual Reality. Proceedings of the 17th IEEE Virtual Reality Conference: Workshop on Virtual and Augmented Assistive Technology (2013). 1-7.

Inside and Outside the Self. Virtual Reality and Repertory Grids in the Spatial Analysis of Anorexic Patients' Meanings

Clelia MALIGHETTI [a, ,1] Silvia SERINO [b,c] , Giuseppe RIVA [b,c] and Sabrina CIPOLLETTA [a]
[a] *Department of General Psychology, Università degli studi di Padova, Padua, Italy*
[b] *Università Cattolica del Sacro Cuore di Milano, Milan, Italy*
[c] Applied Technology for Neuro-Psychology Lab
Istituto Auxologico Italiano, Milan, Italy

Abstract. Allocentric Lock Theory (ALT) suggests that body image disturbance in anorexia nervosa may be caused by deficits in spatial reference frames processing. The general aim of this study was to investigate the presence of deficits in the egocentric and allocentric reference frame processing in patients suffering from anorexia nervosa (AN). We adopted a well-validated virtual reality-based procedure in sample composed by 12 AN patients and 12 healthy controls. The AN patients showed deficits in the spatial ability to recover and update a long term stored representation with perceptual-driven inputs. Our findings suggest the existence of impairments in the processing of spatial reference frames in anorexia nervosa that could be related to a **distorted** body representation. Furthermore, it is possible to argue that the assumption of a not updated allocentric state in the interpretation of interpersonal experience is in relation to the rigid, extreme and unvarying way of construing Self and others heightened in anorexia nervosa within a personal construct psychology perspective. This kind of exploration may be conducted by using repertory grids.

Keywords: Virtual Reality; Anorexia Nervosa; Body Image; Allocentric Lock Theory; Repertory Grid; Constructivism

1. Introduction

Anorexia nervosa (AN) is an eating disorder characterized by severe body image disturbances (BID) whose causes are still not clear. The domain of spatial cognition showed a connection between experience of the body and of space, suggesting that we tend to think about space through the interaction between our body and objects in the surrounding world [1,2]. The spatial information is organized around two different reference frames: egocentric and allocentric [3]. An egocentric reference frame considers the body as a reference of first person experience, and it has its primary

[1] Corresponding author, clelia.malighetti@studenti.unipd.it

source in somato-perceptions [4]. It is founded on an integrated percept of the current state of the body and it is defined by body axes (righ-left, up-down, front-back). In this frame the position of the object changes with the movement of the perceiver [5]. In the allocentric reference frame, the body is an object in the physical world, the position of which is independent of the position of perceiver, and it has its primary source in somato-representations [6,7]. From a neuroscientific perspective, Byrne and colleagues asserted that the short-term retention of perceptual information is achieved by egocentric representations, while long-term spatial memory is supported by allocentric representations [8]. In this view, the process of spatial encoding and retrieval is supported by the continuous translation between egocentric and allocentric representations [9]. Following this framework, Allocentrick Lock Theory [6,7,10] of eating disorders assumes that impairments in the translation between the egocentric and allocentric reference frames, either for exogenous or endogenous causes, could trap subjects in a negative long-term memory of their body (i.e., my body is fat), which is stored as an enduring allocentric representation [11]. Within this theoretical perspective emphasizing the role of spatial reference frame processing in body image, we might suppose that anorexia nervosa may be associated with impairment in the ability to update the stored allocentric representation of the body with egocentric perception driven inputs [6,7,10]. A recent study was conducted by Serino et al.[12] to investigate the processing of spatial deficits in eating disorder. This study focused on the performances of anorexic and bulimic patients, compared to a control group, in spatial abilities assessed with neuropsychological tests and the use of a virtual reality(VR)-based procedure. Their findings showed significant deficits in both groups, in relation to healthy controls, in all of the spatial tests administered: visuo spatial, navigation, mental rotation and short/log term spatial amnestic abilities. In addition, the results derived from VR-based tasks showed specific impairments in the processing of spatial reference frames in anorexic and bulimic patients that, in coherence with the main tenets of Allocentric Lock Theory [6,7,10].

Starting from these premises, the general aim of the present study was to further explore spatial reference frame processing in AN patients compared to healthy controls (HCs), in order to investigate potential deficits that might be associated with distorted body image in anorexia. In particular, we evaluated allocentric "retrieval" and its "update" with a well- validated VR-based procedure [12] [13].

2. Material & Methods

A total of 24 young women participated in the study. The sample was composed of 12 AN female patients (mean age= 22.08 years ±6.37; mean education= 11.58±3,47; mean BMI=16.87±1.40), recruited from a clinical centre in Northern Italy and 12 Healthy Controls (HCs) (12 Females, mean age= 24 years ±5.93; mean education= 14.08±3.96: mean BMI= 19.88±1.51) matched for sex, age, race/ethnicity, language and education. All Participants mean age was 23.04 years (SD= 6.10).

Inclusion criteria envisaged to meet the diagnostic criteria for anorexia nervosa based on Diagnostic and Statistical Manual of Mental Disorders (DSM 5). Exclusion criteria included visual impairments and vestibular disorders. All participants were informed about the purpose of the research and provided written

informed consent. The Ethics Committee of the Catholic University of Milan approved the study. The study provided a well-validated Virtual Reality (VR)-based procedure consisting of an encoding phase, followed by a retrieval phase in two different counterbalanced tasks. At first all participants were invited to an initial training in virtual reality in order to familiarize them with the virtual technology. The procedure started with an encoding phase in which participants were asked to find a hidden object and memorize its position in a virtual city. After they had discovered the object they were invited to indicate the position of that object on a real map (a full aerial view of the virtual city) with a pen (Task 1). In Task 2 participants were invited to retrieve the position of the object, which was absent, after entering the virtual city from another starting point. Task 1 ("allocentric retrieval") required and measured the ability to retrieve an allocentric representation, while Task 2 ("spatial synchronisation retrieval") assessed the ability to refer to this stored long-term representation and update it according to (egocentric) perceptual-driven inputs. In both tasks, the spatial accuracy of the answer was the dependent variable. The accuracy of spatial location in VR tasks is defined as the difference between the correct and the estimated positions of the object. First, spatial coordinates (x and y) of the object location in the two tasks (i.e. Task 1 and Task 2) were corrected by dividing the measured distance by the total length: in this way all the coordinates have a value between (0 , 0) and (1 , 1), where (0 , 0) is at the bottom left side of the city and (1 , 1) is at the top right side of the city, and (0.5 , 0.5) is at the centre of the city. This process was needed to compare the two different tasks. Once corrected, the spatial coordinates can be compared by calculating their distance using the formula Sqrt [(x2 - x1)^2 - (y2 - y1)^2] , where (x1 , y1) and (x2 , y2) are the corrected coordinates.

Differences between AN and HCs groups were computed in SPSS 22.0 (IBM, Corp, NY) using independent sample t- test for both VR-based tasks.

3. Results

Anorexic patients, compared to HCs group, showed significant impairments in the Spatial Synchronization Task. This task assessed the abilities to refer and update the long-term representation in the egocentric perceptual-driven representation (Table 1).

Table 1. Comparison between AN patients and Healthy control group (HCs) on the measures derived by the virtual reality.

Test	AN	HCs		
	Mean (SD)	Mean (SD)	t	*p*
Accuracy of Spatial Synchronization	-1.48 (1.09)	-2.17 (.26)	2.121	.045
Accuracy of Allocentric Retrieval	-.44 (-.52)	-.52 (.28)	.814	.425

4. Discussion

The aim of the study was to evaluate spatial abilities in people with anorexia nervosa in order to further investigate hypotheses of deficits in spatial abilities in anorexia nervosa [6]. Our results derived from virtual reality procedure revealed specific impairments in the AN group, compared to HCs, in Spatial Synchronisation, with the anorexic participants being significantly less accurate in the ability to refer to the stored long-term representation and update it with (egocentric) perceptual-driven inputs [13]. These findings are consistent with the main tenets of Allocentric Lock Theory in suggesting that people with anorexia nervosa may be characterized by an impairment in the processing of spatial reference frames that might be connected to distorted body representations [12]. The Allocentrick Lock Theory [6,7,10] considered distorted body image as a consequence of impairments in the way of body is perceived and recalled. The consequences of this cognitive bias consisted in the permanent experience of a wrong and overestimated body, despite the evidence of the shape or the size of the body, that force them to live in a virtual body, different from the real one. From a cognitive perspective, the "allocentric" memory of the body changes and reorganizes the existing memories of the body producing a priming effect on any bodily experience that affects thoughts and behaviour involved in the interpretation of any future body relevant events [6,7,10].

The social consequences of these impairments consist in a static and sometimes unrealistic system for the interpretations of social interactions, based uniquely on a lock allocentric stance [7]. This allocentric perspective requires that the existence and the experience of others are mainly detached from the interaction with them, as a consequence of a social knowledge based on memories of past egocentric interactions and inferences drawn upon them [7] Frith and Vignemont [14] in this sense claimed: "What would happen if we had only an allocentric representation of others and ourselves? If you do not understand how you are related to the others, if you do not know your social location relative to them in an immediate way, you may suffer from poor social interactions... You may try to compensate for your lack of egocentric

representations of others by using your allocentric social knowledge. Yet, this knowledge will not have been acquired on the basis of normal social experience and may result in a set of abstract rules" (p.726). Starting from these findings, it is possible to argue that this use of allocentric social knowledge in interpersonal experience might be read in terms of personal and interpersonal world of experience [15]. A useful tool to explore AN patients' way of construing themselves and others is repertory grid analysis. Repertory grid is a semi-structured interview underpinned by personal construct theory (PCT) [16] used to explore dimensions and structures of the personal construct system in order to describe the way in which people gives sense to their experience [17]. Kelly identified human beings as scientists involved in the formulations and testing out of hypotheses, to interpret, organize and anticipate the experience, positing a theory of the world based on the construction of personal constructs of events by which the person can handle and predict experience [16]. From this theoretical perspective, we are constantly committed in the creation and revision of hypotheses to evaluate the effectiveness of our own construing. PCT considered psychological disorder in terms of an inconsistent way of construing, caused by a lack in the revision process despite repeated invalidations [16]. On this basis, AN is identified by PCT with deficits in interpersonal construing characterized by relatively rigid and impoverished construing of self and others [18] According to PCT and Button's theory of AN, their results showed a tight, unidimensional and extreme way of construing in anorexic patients compared to a healthy control group, supported by Button [19] as strategies to avoid anxiety and invalidations, in order to control events. This rigid and unidimensional way of construing social roles and interpersonal situations trapped the patients in an unvarying tendency to perceive and evaluate oneself and others using dichotomous thinking which is hard to revise and therefore an indicator for cognitive rigidity [18]. This unvarying way of construing is in line with the rigid, static and sometimes unrealistic interpretations of interpersonal experience supposed by ALT. Anorexic patients need to adopt a tight and unidimensional construing in an attempt to avoid invalidations derived from the inconsistent and impoverished predictions of interpersonal interactions. Through this intentional and calculated plan, anorexic patients give sense to their experiences, and make them more controllable. AN experience is constructed around a monolithic and unidimensional perspective in which uncertainties are not allowed and others are not involved.

Further analyses are necessary to deepen our understanding of the mechanisms involved in the spatial reference transformation process, and to explore factors and causes affecting anorexic patients' block. A multidimensional approach integrating neuropsychological, cognitive, and social perspective, founded on a constructivism approach, may contribute to the study of body representations disorder in anorexia, in order to improve prevention and treatment interventions.

References

[1] G. Committeri, G. Galati, A.L. Paradis, L. Pizzamiglio, A. Berthoz, D. LeBihan, Reference frames for spatial cognition: different brain areas are involved in viewer-, object-, and landmark-centered judgments about object location, *Journal of Cognitive Neuroscience* **16** (2004), 1517-1535.

[2] W. Mou, T.P. McNamara, C.M. Valiquette, B. Rump, Allocentric and egocentric updating of spatial memories, *Journal of Experimental Psychology: Learning, Memory, and Cognition* **30** (2004), 142.

[3] R.L. Klatzky, *Allocentric and egocentric spatial representations: definitions, distinctions, and interconnections,* in C. Freksa and C. Habel (Eds) *Spatial Cognition. An Interdisciplinary Approach to Representing and Processing Spatial Knowledge*, Springer, Berlin, 1998, p. 1-17.

[4] M.R. Longo, E. Azañón, P. Haggard, More than skin deep: body representation beyond primary somatosensory cortex, N*europsychologia* **48** (2010), 655-668.

[5] S. Serino, G. Riva, How different spatial representations interact in virtual environments: the role of mental frame syncing, *Cognitive Processing* **16** (2015), 191-201.

[6] G. Riva, S. Gaudio, A. Dakanalis, I'm in a virtual body: A locked allocentric memory may impair the experience of the body in both obesity and anorexia nervosa, *Eating and Weight Disorders* **19** (2014),133-134.

[7] G. Riva, S. Gaudio, A. Dakanalis, The Neuropsychology of Self Objectification, *European Psychologist* (2015), 34-43.

[8] G. Riva, The key to unlocking the virtual body: virtual reality in the treatment of obesity and eating disorders. *Journal of Diabetes Science and Technology* **5** (2011), 283-292.

[9] P. Byrne, S. Becker, N. Burgess, Remembering the past and imagining the future: A neural model of spatial memory and imagery, *Psychological Review* **114**(2007), 340–375.

[10] G. Riva, Out of my real body: cognitive neuroscience meets eating disorders, *Frontiers In Human Neuroscience* **8** (2014), 236.

[11] N. Burgess, Spatial memory: how egocentric and allocentric combine, *Trends in cognitive sciences*, **10** (2006), 551-557.

[12] S. Serino, A. Dakanalis, S. Gaudio, G. Carrà, P. Cipresso, M. Clerici, G. Riva, Out of body, out of space: Impaired reference frame processing in eating disorders, *Psychiatry research*, **230** (2015), 732-734.

[13] S. Serino, G. Riva, How different spatial representations interact in virtual environments: the role of mental frame syncing, *Cognitive processing*, **16**, (2015) 191-201.

[14] U. Frith, F. de Vignemont, Egocentrism, allocentrism, and Asperger syndrome, *Consciousness and Cognition*, **14**, (2005) 719-738.

[15] S. Cipolletta, Construing in action: Experiencing embodiment, *Journal of constructivist psychology*, **26**(2013), 293-305.

[16] G.A Kelly, *The psychology of personal constructs. Volume 1: A theory of personality*, WW Norton and Company. New York, 1955.

[17] F. Fransella, R. Bell, D. Bannister, *A manual for repertory grid technique*. John Wiley & Sons, New Jersey, 2004.

[18] E.J. Button, R.L. Warren, Self-image in anorexia nervosa 7.5 years after initial presentation to a specialized eating disorders service. *European Eating Disorders Review* **10**(6) (2002), 399-412.

[19] E.J. Button, *Construing and clinical outcome in anorexia nervosa*. Doctoral dissertions, University of London, 1980.

Cognitive Styles Specifics of Adult Computer Gamers

Nataliya V. BOGACHEVA[a,1]
[a] *Pedagogics and Medical Psychology Department, I.M. Sechenov First Moscow State Medical University, Moscow, Russia*

Abstract. Cognitive styles are often referred to as stable characteristics that determine individual`s perception, memory, thought, and problem solving [1], highly related to learning processes as well [2]. In cyberpsychology, cognitive styles are widely studied in connection to digital learning [3] and virtual realities, but not to video game play. The aim of this study was to find out linkage between computer video games use and specific cognitive styles: field dependence – field independence and impulsivity – reflexivity. The study showed that adult computer gamers are more likely to perceive information analytically and they do not actually show signs of impulsivity, at least while performing cognitive tasks. The gamers with different levels of gameplay activity also show differences in their cognitive styles that do not seem to be only cumulative.

Keywords. Videogames, cognitive functions, cognitive styles, adult video gamers, impulsivity

1. Introduction

The growing popularity of video games all over the world and among all ages inspire psychologists and social scientists to investigate all conceivable effects that gaming might have on human consciousness, thinking and behavior. However, while some aspects, such as gaming addiction, violent games impact in gamers` aggressive behavior, gamers` spatial thinking, attention and memory specifics are widely studied (with sometimes ambiguous results), some other cognitive and personal traits of video gamers are less popular among researchers, including cognitive styles. In addition, statistical data from Russia and other countries demonstrates that the video gamers` population is growing older – a typical gamer nowadays is 30-35 years old. However, most of the video gamers` studies are still focused on children and adolescence. Opposite, this study was designed to investigate more about adult video gamers and their cognitive styles and to draw more information about widely discussed problem of video gamers` impulsive behavior [9, 10, 11].

2. Cognitive Styles Research

Cognitive studies, described by S. Messick [1:5] as “stable attitudes, preferences, or habitual strategies” that determine “typical modes of perceiving, remembering, thinking, and problem solving” and influence not only cognition, but social functioning

[1] Corresponding author, bogacheva.nataly@gmail.com

as well, have been widely studied in 1950s – 80s. At present, cognitive styles are sometimes associated with other style characteristics, such as learning styles, thinking styles, attributional styles, etc. [2, 4] That might be the reason why cognitive styles in cyberpsychology are commonly studied in their reference towards digital and virtual education [3], and rarely – in connection with video games [5].

Thus, such cognitive styles as field dependence – field independence [6] and impulsivity – reflexivity [7] are very likely to be connected with video game experience. Cognitive style field dependence – field independence, presented in the works of H. Witkin [6] describes the way individuals perceive complex environments. Field independent people are known to differentiate figures from the background easily, and to be more analytic in general. Opposite, field dependent individuals are more holistic in their perception [1] with more social oriented intelligence [2, 3]. It is discussed, that field dependent individuals are not only less effective in solving puzzles [5], but also require different educational environments than field independent students [3] because they relate more on classmates, social contacts and discussion and less – on working alone and analyzing literature. As for video games, field independent individuals are more prone to experience presence in virtual environments [8], so it can be suggested that in video games environments they also gain more presence experience that makes video game play more pleasurable. Therefore, we assume that field independent individuals are likely to play video games more than field dependent.

As for impulsivity – reflexivity cognitive style, the connection with video gaming is more ambiguous. Numerous researchers suggest that playing video games enhances impulsivity [9, 10]. The theoretical background is that playing video games require quick responses while virtual mistakes do not lead to some crucial events. The same strategy in real life might be harmful as it encourages risky behavior. Therefore, video games are believed to teach people to be impulsive not only in the virtual world, but in the real world as well. While some empirical studies support this hypothesis [9, 10], other show no connection between video games and impulsiveness [11, 12]. Some researches even suggest that video games can help in cognitive control functions training, including response inhibition [13, 14]. J. Kagan [7:17] describes impulsive cognitive styles as the tendency to “select and report solution hypotheses quickly with minimal consideration for their probable accuracy”. In opposite, reflective (or reflexive) style makes individuals think longer to avoid mistakes. As the literature suggests, video gamers are more likely to be impulsive, as video games do not require much reflexivity.

2.1. Materials and Methods

Witckin`s Embedded Figures Test (EFT) was used to measure cognitive style “field dependence – field independence” (FD-FI). In this test, participants were required to find a simple geometric figure in a more complex, multicolored design as fast and accurate as possible [6]. The more time it takes to find the figure, the higher is the participant`s field dependence.

Kagan`s Matching Familiar Figures Test (MFFT) was used to measure cognitive style “impulsivity – reflexivity”. In this test, the participant is shown a picture of a familiar object (a standard) and eight similar variants with one of them being exactly the same as the standard. The participant is required to find the identical to the standard variant as fast and accurate as possible [7]. The number of mistakes and the cognitive

tempo (time needed for the answer) are the scores for impulsive (many mistakes, fast answers) or reflexive (few mistakes, slow answers) cognitive style.

2.2. Participants and Procedures

The sample consisted of 150 voluntary adult participants (65 males, 85 females), aged 18 to 35 year (M=24.2) from Russia. The participants were recruited via computer game forums advertising, social network advertising, advertising among students in universities and through snowball sampling methods. After an oral interview with demographic and video games related questions, the participants were subdivided into groups according to their video game preferences.

Non-gamers` (control) group consisted of 60 participants (20 males, 40 females), mean age 24.5. These participants reported having little to no video games experience in general, never being interested in video games, and not playing video games for 3 years or longer hitherto.

Gamers` group consisted of 90 participants (45 males, 45 females), mean age 24. These participants reported being interested in video games and playing these games for several years till now for at least 1 hour per week (for most participants – for 3-5 hours per week or more). Gamers, who regularly played for more than 12 hours per week (60 participants, 33 males and 27 females), were referred to as *active gamers*, while those who played less than 12 hour per week – as *less active gamers*. Members of the gamers group were then asked about their reasons to play video games, preferred video games` genres and other game related preferences.

All the participants then separately completed both cognitive styles tests in classical paper-and-pencil variants.

2.3. Results

According to Kolmogorov-Smirnov test, EFT results (mean time) are normally distributed (p=0.09), while MFFT results (mean number of mistakes) are not (p=0.002). That is why parametric statistical tests were used to calculate the data for EFT and non-parametric tests – for MFFT.

Field dependence – field independence. The gamers` group in general performed faster in EFT than the control group. The average mean time of the hidden figure search in the gamers` group is 18.7±9.1 sec, versus 24.4±10.9 sec in the non-gamers` group. The difference is significant according to the Student`s t-test for independent samples (p=0.001). The average time for different subgroups is presented in **Table 1**.

Table 1. Average time of hidden figure search in EFT (field dependence – field independence measurement)

	"Active" gamers	**"Less active" gamers**	**Non-gamers**
Mean time (sec)	17.8	20.6	24.4
SD	9.4	8.5	10.9

ANOVA shows that the differences between groups are statistically significant (p=0.002). More specific, the difference is significant (p=0.001) between the active gamers` subgroup and the non-gamers` group, while it is insignificant for the less active gamers` group, compared both with active gamers (p=0.599) and non-gamers (p=0.273). According to two-factor analysis of variance, the participants` gender makes no significant impact in the results (p=0.54), so it is suggested that the between-group differences are related mostly to the video game activity.

Impulsivity – reflexivity. While video gamers show slightly slower cognitive tempo results in MFFT, compared to non-gamers (M=60.9 sec, SD=28.3 sec versus M=54.6 sec, SD=27.9 sec respectively), Mann–Whitney U test assumes that the difference is insignificant (p=0.159). In contrast, the quantity of mistakes in the gamers` group (M=5.3, SD=4.7) is significantly smaller (p=0.036) than in the non-gamers` group (M=7.5, SD=6.0). The results for active and less active gamers are shown in **Table 2**.

Table 2. Average first response time and quantity of mistakes in MFFT (impulsivity – reflexivity measurement)

	"Active" gamers	**"Less active" gamers**	**Non-gamers**
Mean time (sec)	59.4	63.9	54.6
Time SD	30.5	23.5	27.9
Mistakes (average)	5.7	4.5	7.5
Mistakes SD	4.3	5.4	6.0

Less active video gamers are shown to be the least impulsive among all the groups. They have the highest first response mean time (thus, the difference is statistically insignificant with both the active gamers` group (p=0.327) and the non-gamers` group (p=0.059)) and the least amount of mistakes (significantly less than in the control group (p=0.015), but insignificant in compare with the active gamers` group (p=0.166)). Like in the case of field dependence – field independence cognitive style, the differences between males and females in general are insignificant (p=0.685 for first response time and p=0.057 for amount of mistakes).

3. Discussion and conclusions

The participants in the gamers` group showed better results: they were faster in performing EFT and more accurate than and almost as fast as participants from the control group in MFFT were. As both tests require working with visual images, we assume that along with cognitive styles specifics, these results are connected with visual attention benefits, typical for video gamers [15].

As for the main goal of the research, adult video gamers show particular cognitive styles. Compared to the non-gamers of the same age, the video gamers are more field independent and less impulsive (more reflexive), at least while performing cognitive tasks. At this point we are unable to tell, whether the gaming experience enhances people`s ability to perceive and manipulate information or people with certain cognitive styles are more likely to play video games. Thus, based on the literature sources, it is possible to suggest, that the relationship is bilateral. While cognitive styles are hardly changed by human activity [2], learning strategies and cognitive controls can be trained in practice, for example – through regularly playing video games [2, 13].

There are also cognitive styles` differences between active and less active video gamers and these differences are not simply quantitative, but more likely qualitative ones, at least for the impulsivity - reflexivity cognitive style. The less active gamers seem to be the most reflexive. This linkage can be explained: reflexive gamers are less likely to be carried away by playing games. However, the gamers in general are less impulsive, or at least more accurate (make less mistakes) when performing cognitive tasks. This contradicts recent works, discussing video gamers impulsivity (see [9, 10]),

but supports other works, that show that adult gamers are not impulsive [11] and tend to be more correct with decision making in visually ambiguous situations [13].

It is also important to note that participants of the current study are unlikely to have severe cases of video games addiction, as all of them reported to do well, have jobs and interests apart from video games world, and all of them were socially active enough to participate in a time consuming offline study. At the same time, most of the previous studies either do not differentiate addicted gamers from non-addicted [9] or show little to no specifics for non-addicted gamers comparing to the addicted ones [11].

Definitely, further studies are required to find if there are other cognitive styles` specifics, typical for video gamers. It is also important to clarify, if the investigated cognitive styles are specific for certain video games` genres or types or more or less common for all adult video gamers.

References

[1] S. Messick, Personality consistencies in cognition and creativity. In Messick S. (Ed.), *Individuality in Learning*, Jossey-Bass, San Francisco, CA, 1976, 4-23.

[2] R. Riding & S. Rayner, *Cognitive Styles and Learning Strategies:Understanding Style Differences in Learning and Behavior*, Routledge, New York, 2012.

[3] T. Mitchell, Sh. Chen & R. Macredie, Cognitive styles and adaptive web-based learning, *Psychology of Education Review* **29(1)** (2005), 34-42.

[4] A. Furnham, *The Psychology of Behaviour at Work: The Individual in the Organization*. Psychology Press, Hove, New York, 2005.

[5] J. Hong, M. Hwang, K. Tam, Y. Lai & L. Liu, Effects of cognitive style on digital jigsaw puzzle performance: A GridWare analysis*, Computers in Human Behavior*, **28(3)** (2012), 920-928.

[6] H.A. Witckin, P.K. Oltman, E. Raskin & S.A. Karp, *A Manual for the Embedded Figures Test*, Consulting Psychologists Press, Palo Alto, CA, 1971.

[7] J. Kagan, Reflection-impulsivity the generality and dynamics of conceptual tempo, *Journal of Abnormal Psychology* **71** (1966), 17-24.

[8] D. Hecht & M. Reiner, Field dependency and the sense of object-presence in haptic virtual environments, *Cyberpsychology & Behavior* **10(2)** (2007), 243-251.

[9] D.A. Gentile, E.L. Swing, G.L. Choon & A. Khoo, Video game playing, attention problems, and impulsiveness: evidence of bidirectional causality, *Psychology of Popular Media Culture* **1** (2012), 62-70.

[10] O. Metcalf & K. Pammer, Impulsivity and related neuropsychological features in regular and addictive first person shooter gaming, *Cyberpsychology, Behavior and Social Networking* **17** (2014), 147-152.

[11] E. Collins, J. Freeman & T. Chamarro-Premuzic, Personality traits associated with problematic and non-problematic massively multiplayer online role playing game use, *Personality and Individual Differences* **52** (2012), 133-138.

[12] L.S. Colzato, W.P.M. Wildenberg, Sh. van der Zmigrod & B. Hommel, Action video gaming and cognitive control: playing first person shooter games is associated with improvement in working memory but not action inhibition, *Psychological Research* **77(2)** (2013), 234-239.

[13] M.W.G. Dye, C.Sh. Green & D. Bavelier, Increasing speed of processing with action video games, *Current Directions in Psychological Science* **18** (2009), 321-326.

[14] J. van Muijden, G.P.H. Band & B. Hommel. Online games training aging brains: limited transfer of cognitive control functions, *Frontiers in Human Neuroscience* **6** (2012), Article 221. URL: http://www.frontiersin.org/Human_Neuroscience/10.3389/fnhum.2012.00221/full

[15] S. Green & D. Bavelier, Action computer game modifies visual selective attention, *Nature* **423** (2003), 523-537

[16]

A 3D virtual environment for empirical research on social pain: Enhancing fidelity and anthropomorphism in the study of feelings of ostracism inclusion and over-inclusion

Eva VENTURINI [a,,1] Paolo RIVA [b], Francesco SERPETTI [c], Leonor ROMERO LAURO [b], Federica PALLAVICINI [a], Fabrizia MANTOVANI [a], Renee CLOUTIER [d], Fred MCMAHAN [d], Kiefer STONECIPHER [d] *AND* Thomas D. PARSONS [d]

[a] CESCOM: Department of Human Sciences for Education, University of Milano-Bicocca, Milan, Italy.

[b] *Department of Psychology, University of Milano-Bicocca, Milan, Italy.*

[c] *INFN, Florence, Italy*

[d] *Computational Neuropsychology and Simulation Lab, Department of Psychology, University of North Texas*

Abstract. The traditional Cyberball paradigm is a 2D virtual ball-toss game that uses line drawn characters for research on ostracism. Using this paradigm, studies have reported increased level of distress during the exclusion condition. While the 2D Cyberball was developed purposefully to be minimal, it lacks the ecological validity that many virtual environments now offer. For this study, we developed a virtual reality-based Cyberball paradigm with highly anthropomorphic avatars, in line with other studies and with 3 conditions (Inclusion, Exclusion and Over-inclusion). In an effort to assess the impact of increased fidelity and anthropomorphism in the CyberballAvatar3D paradigm, the overall objective of this study is to compare the changes in mood between the 3 steps of original 2D low anthropomorphism Cyberball and our new high-anthropomorphism CyberballAvatar3D in a sample of undergraduate students.

Keywords. Cyberball, Virtual Reality, Social Pain, 3D, Avatar

1. Introduction

The traditional Cyberball paradigm [1] is a 2D virtual ball-toss game that uses line drawn characters for research on ostracism. Social scientists have started using the virtual gaming task called Cyberball to induce social exclusion in participants. A number of researchers have used the Cyberball game as an experimentally controlled social exclusion assessment that elicits affective [2], neurobiological [3], psychophysiological [4], and hormonal [5] responses. Results from neuroimaging studies have revealed that the experience of being excluded from ball-tossing evokes increased activation of the dorsal anterior cingulate cortex and anterior insula, which correlates with self-reports of physical and social pain [6], however, these results have

[1] Corresponding author, e.venturini3@campus.unimib.it

been put into question in recent publications [7]. A more recent study [8] found that the Cyberball task activated the dorsal anterior cingulate circuit less than other experimental social pain tasks. These findings are consistent with the suggestion that the social pain that follows from Cyberball is less intense than the social pain that follows from more personal forms of social rejection [9].
Given that the 2D Cyberball was developed purposefully to be minimal (i.e., devoid of most social information), it lacks the ecological validity that many virtual environments now offer [10]. A recent advance in the Cyberball paradigm is an immersive virtual environment version, in which the participants wear a head-mounted display (HMD), through which the virtual environment was displayed [11]. Data from this study suggest that not only does ostracism in this environment have the same negative effects as in other environments, but these effects are powerful. Other virtual reality desktop versions [12] [13] allow for enhanced flexibility in manipulation of social information about the confederates' avatars, virtual humans, and/or their behaviors [14]. Given recent interest in the study of social pain [13], processing of social cues [15], and the need for novel approaches to assessment and treatment of autistic syndrome using virtual environments [16], we developed a non-immersive virtual reality-based Cyberball paradigm (with highly anthropomorphic avatars) that can be used to assess a sample of adults with high-functioning autism.

2. Cyberball

The *Cyberball game* [1] is a computer based 'ball tossing' game (Fig. 1). Before starting using the game it is possible to set the number of ball tosses and the time between tosses. Furthermore, other features can be adjusted, including the avatars' names, the players' pictures and the presence of a chat. In the inclusion condition, throws are distributed evenly to all players throughout the game. In the exclusion condition, participants receive 4 balls at the beginning of the game and are ignored thereafter (36 tosses). In the over-inclusion condition participants receive all tosses from the 2 other players.

In this study, on-line players were not provided with photos or their names to avoid giving participants any other reason for disliking another player apart from the fact that they were being ostracized by these players.

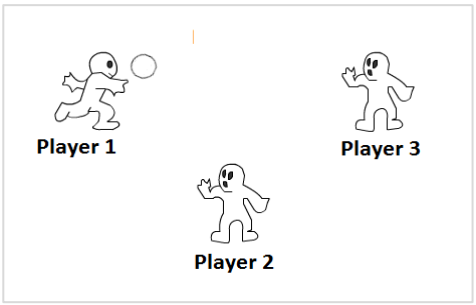


Figure 1. Cyberball (low level of anthropomorphism)

3. CyberballAvatar3D

The *CyberballAvatar3D* (Fig.2 and Fig.3) is a 3D version of the classic paradigm, developed by Unity 5.0. The avatars are rigged and generated by Autodesk Character Generator (free version). This version of the game features the same operations and the same setting at predetermined blocks. The only aspect that changes regards the

characteristics of the environment and the players. In the Avatar3D version, in fact, it has the image of an external environment, a grass in an open field, where 3 avatars (default: left player is a boy and right player is a girl; the participant player is either a boy or a girl) can play with a ball. The dimension of depth and anthropomorphic characteristics of the players make the scene more realistic and immersive.

Figure 2. CyberballAvatar3D (male participant)

Figure 3. CyberballAvatar3D (female participant)

In addition, to increase the sense of presence in participant, the corresponding avatar can be customized by choosing his gender (Fig. 3), the color of hair and clothes. Also in this version of the game the three steps of inclusion, exclusion and over-inclusion are programmed with 40 tosses for each one and with the same time between tosses.

4. Research protocol and preliminary results

In this paragraph we present the protocol of the ongoing research.

4.1. Participants and procedure

The study employed a 3 (Inclusionary status: Inclusion vs. Exclusion vs. Over-inclusion) X 2 (Cyberball Type: Cyberball vs CyberballAvatar3D) mixed factorial design, with the first factor (steps of the game) varying within subjects and the second factor varying between subjects

Participants. The experimental sample included 62 students, (males= 37) voluntary recruited from the University of North Texas. Participants were randomly assigned to the two conditions, while engaged in each of the Cyberball paradigms.

Aim of the study. The overall aim is to validate the functionality of our game, comparing changes in negative emotions and basic needs satisfaction between the 3

steps (inclusion, exclusion and over-inclusion) of original 2D low anthropomorphism Cyberball with our new high-anthropomorphism CyberballAvatar3D in a sample of undergraduate students. The second aim will be to use the 3D game with a sample of adult with autistic syndrome.

Procedure. Before starting the experiment each participant was provided with written information about the study and invited to give written consent for the inclusion. They are told that the researcher is interested in 'the effects of mental

visualization on task performance'. Participants are led to believe they are playing a game of virtual ball-toss with other individuals online, though all tosses are predetermined.

4.2. Psychological assessment

After each step (inclusion, exclusion and over-inclusion) we administered a battery of questionnaires. For each subscale, we reported the value of Cronbach's alpha (mean of the three steps). The *Rejected emotions scale* [17] assessed sense of rejection during the game (20 items on a 7-point Likert scale). The scale measured the intensity of five emotions: Anger (alpha=.855), Happiness (alpha=.899), Hurt feelings (alpha=.820), Anxiety (alpha=.762), Sadness (alpha=.746).
The *Need Threat scale* [18] measured satisfaction of four basic psychological needs: Belonging (alpha=.857), Self-esteem (alpha=.889), Control (alpha=.680), and Meaningful existence (alpha=.867). These were rated on a 7-point Likert scale from 'not at all' to 'very much'.

4.3. Preliminary results

Changes in psychometric measures were analyzed using mixed ANOVAs to compare the mean differences and interactions between conditions (between subjects factor) and mean differences in considered measures between steps (within subjects factor). The preliminary results showed that mixed ANOVAs did not present significant effects and/or interactions related with the between subject factor (all *ps*>.052). Only exception for the hurt feelings variable where we found a significant main effect of the Cyberball Type factor ($F_{1,60}$=5.040 p<.05, partial η2=.077). Specifically, participants who played with the classical version of Cyberball reported higher levels of hurt feelings compared with participants who played with the CyberballAvatar3D (*p*<.05). However, we found a significant effect of the within subject factor, on all dependent variables. Specifically, there was a main effect of the manipulation of Inclusionary status on anger ($F_{1.546,92.740}$=29.427 p=.000, partial η2=.320) (Tab.1), happiness ($F_{1.794,102.273}$=45.958 p=.000, partial η2=.446), hurt feelings ($F_{1.405,84.286}$=16.110 p=.000, partial η2=.212), anxiety ($F_{1.769,106.118}$=45.037 p=.000, partial η2=.429) and sadness ($F_{1.351,81.057}$=10.108 p=.000, partial η2=.242). In table 1 is reported mean and standard deviation for each measure in both condition.

Table.1 Mean and Standard Deviation of negative emotions (within subjects factor)

Condition/step		Anger		Anxiety		Happiness		Hurt feelings		Sadness	
		M	SD	M	SD	M	SD	M	SD	M	SD
2D	Inclusion	1.413	.979	2.135	1.281	3.440	1.495	1.288	.706	1.250	.538
	Exclusion	2.808	1.814	3.395	1.845	5.370	1.401	1.980	1.431	2.163	1.565
	Over-incl	1.433	.740	1.577	.639	3.260	1.889	1.173	.473	1.134	.362
3D	Inclusion	1.174	.597	1.722	1.088	4.051	1.691	1.097	.288	1.263	.569
	Exclusion	2.174	1.480	2.916	1.642	5.588	1.483	1.458	.664	1.923	1.333
	Over-incl	1.153	.561	1.625	.968	3.686	1.742	1.062	.201	1.298	.719

Moreover, we found the main effect of the manipulation of Inclusionary status also on the need to belong ($F_{1.709,102.562}$=142.864 p=.000, partial η2=.704) (Tab.2); control

($F_{1.868,112.103}$=174.406 p=.000, partial η2=.744); meaning existence ($F_{1.584,95.051}$=101.811 p=.000, partial η2=.629) and self-esteem ($F_{1,779,106.753}$=62.810 p=.000, partial η2=.511). Pairwise comparisons showed significant differences between the dependent variables in each step. Specifically, following the exclusion condition participants reported higher levels of negative emotions (considering the five separate emotions) compared to the inclusion and overinclusion conditions (all *ps*<.00l), but there were no differences between inclusion and over-inclusion conditions. Following the exclusion condition participants reported lower levels of basic needs satisfaction (considering the four separate needs) compared to the inclusion and overinclusion conditions (all *ps*<.00l). Then, following the inclusion condition participants reported lower levels of basic needs satisfaction (considering the four separate needs) compared to the overinclusion condition (*p*<.001). In table 2 is reported mean and standard deviation for each measure in both condition.

Table 2. Mean and Standard Deviation of psychological needs (within subjects factor)

Condition/step		Sense of Belonging		Control		Meaning existence		Self esteem	
		M	SD	M	SD	M	SD	M	SD
2D	Inclusion	6.038	1.269	2.936	1.292	6.410	.925	4.321	1.331
	Exclusion	2.987	1.792	1.244	.615	3.718	1.997	2.423	1.315
	Over-incl	6.756	.607	5.282	1.750	6.897	.374	5.269	1.840
3D	Inclusion	6.213	1.095	2.824	1.508	6.269	1.269	3.620	1.611
	Exclusion	3.519	1.942	1.167	.525	4.074	1.997	2.407	1.501
	Over-incl	6.824	.999	4.935	1.581	6.861	.727	5.120	1.860

In keeping with past research based on the classical version of Cyberball, our results show that the exclusion step increased negative emotions and threatened basic needs satisfaction compared with the inclusion and the over-inclusion conditions. Furthermore, our results showed that the over-inclusion also differs from the inclusion step. Specifically, when we compared the overinclusion condition with the inclusion condition, we found that participants felt greater sense of belonging, meaning existence, self-esteem and control. We found the same pattern of results using both versions of Cyberball, suggesting that considering self-reports measures and heathy participants, a virtual reality-based Cyberball paradigm with highly anthropomorphic avatars does induce similar effects of the classical version of Cyberball.

The next challenge of this project will concern the use of the CyberballAvatar3D

with a sample of adults with high-functioning autism; particularly we will test the over-inclusion step for the first time with this syndrome.

References

[1] K. D. Williams, C. K. Cheung, and W. Choi, Cyberostracism: effects of being ignored over the Internet., *Journal of Personality and Social Psychology*, **79 (**2000**)**,748–762
[2] C. H. J. Hartgerink, I. van Beest, J. M. Wicherts, and K. D. Williams, The ordinal effects of ostracism: a meta-analysis of 120 Cyberball studies *PLoS One*, **10** (2015), e0127002.
[3] N. I. Eisenberger and S. W. Cole, " Social neuroscience and health : neurophysiological mechanisms linking social ties with physical health, *Nature Neuroscience* **15** (2012) 1–6.
[4] B. Gunther Moor, E. A. Crone, and M. W. van der Molen, The heartbrake of social rejection: heart rate deceleration in response to unexpected peer rejection. *Psychological Science.*, **21**
[5] (2010), 1326–33.
[6] E. Andari, J. Duhamel, T. Zalla, E. Herbrecht, M. Leboyer, and A. Sirigu, Promoting social behavior with oxytocin in high- functioning autism spectrum disorders, *Proceedings of the National Academy of Sciences of the United States of America*. **107** (2010), 4389–4394, .
[7] N. I. Eisenberger, Broken Hearts and Broken Bones, A Neural Perspective on the Similarities Between Social and Physical Pain, *Current Directions in Psychological Science.* **21(**2012), 42–47.
[8] S. Cacioppo, C. Frum, E. Asp, R. M. Weiss, J. W. Lewis, and J. T. Cacioppo, A Quantitative Meta-Analysis of Functional Imaging Studies of Social Rejection*, Scientific Reports*, **3** (2013), Article Number 2027
[9] J.-Y. Rotge, C. Lemogne, S. Hinfray, P. Huguet, O. Grynszpan, E. Tartour, N. George, and P. Fossati, A meta-analysis of the anterior cingulate contribution to social pain., *Social Cognitive. And Affective Neuroscience*, 10 (2015), 19–27.
[10] N. I. Eisenberger, Social Pain and the Brain: Controversies, Questions, and Where to Go from Here, *Annual Review of Psychology*, **66** (2015), 601–629.
[11] T. D. Parsons, Virtual Reality for Enhanced Ecological Validity and Experimental Control in the Clinical, Affective and Social Neurosciences, *Frontiers in Human Neuroscience.*, **9** (2015), 1–19.
[12] M. P. Kassner, E. D. Wesselmann, A. T. Law, and K. D. Williams, Virtually Ostracized: Studying Ostracism in Immersive Virtual Environments, *Cyberpsychology, Behaviour and. Social.Networking*, **15** (2012), 399–403
[13] E. Mavromihelaki, J. Eccles, N. Harrison, T. Grice-Jackson, J. Ward, H. Critchley, and K. Mania, Cyberball3D+: A 3D serious game for fMRI investigating social exclusion and empathy, *2014 6th Int. Conf. Games Virtual Worlds Serious Appl. VS-GAMES 2014*, 2014.
[14] D. Z. Bolling, N. B. Pitskel, B. Deen, M. J. Crowley, J. C. McPartland, M. D. Kaiser, B. C. Vander Wyk, J. Wu, L. C. Mayes, and K. a Pelphrey, "Enhanced neural responses to rule violation in children with autism: a comparison to social exclusion.," *Devolopmental Cognitive Neuroscience* **1** (2011), 280–94.
[15] G. Riva, Virtual reality as assessment tool in psychology, *Studies Health Technologies Informatics*, **44** (1997), 71–79.
[16] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*. 2013.
[17] M. R. Kandalaft, N. Didehbani, D. C. Krawczyk, T. T. Allen, and S. B. Chapman, Virtual reality social cognition training for young adults with high-functioning autism.," *Journal of Autism and Devolepmental Disorders*, 43 (2013), 34–44
[18] K. E. Buckley, R. E. Winkel**,** and M. R. Leary, Reactions to acceptance and rejection: Effects of level and sequence of relational evaluation, *Journal of Experimental and Social Psychology.*, **40** (2004), 14–28
[19] I. van Beest and K. D. Williams, When inclusion costs and ostracism pays, ostracism still hurts. *Journal of Personality and Social Psychology*, **91** (2006) 918–928.

The Role of School Climate on Willingness to Seek Help for Bullying

Irene CONNOLLY [a,1] and Ciara CORCORAN [a]
[a] *IADT, Dun Laoghaire, Ireland*

Abstract. The relationship between school climate and student willingness to seek help for bullying was the primary focus of this study, with further examination of school climate and aggressive attitudes predicting student willingness to seek help for bullying. The sample consisted of one hundred and twenty two students from a co-educational post primary school. A between groups, questionnaire design was employed to measure perceptions of school climate, aggressive attitudes and student willingness to seek help for bullying. Analysis, through the use of correlations found a strong positive relationship between supportive school climate and student willingness to seek help, with high levels of willingness to seek help associated with high levels of perceived supportive climate. Further analysis employing multiple regression found that school climate and aggressive attitudes were significant predictors of student willingness to seek help for **bullying**, with school climate being the most significant predictor, accounting for 34.4% of the variance in **willingness** to seek help. These findings may hold particular relevance when implementing bullying prevention strategies within schools.

Keywords: bullying, school climate, willingness to seek help, aggressive attitudes.

1. Introduction.

The Department of Education and Skills in Ireland [1] listed the promotion of a positive school climate in the Anti-Bullying Procedures for Primary and Post-Primary schools as part of the implementation of anti-bullying policies. A positive school climate has been recognised as a way to encourage victims of bullying to seek help, alongside a reduction of the incidences of bullying [2]. This highlights the necessity for school climate and bullying to be further examined in detail in the Irish context. The main focus of this study was to examine school climate and predictors of student willingness to seek help for bullying. Another focus was the investigation of school climate and aggressive attitudes predicting student willingness to seek help for bullying. This topic is especially important to illustrate to schools its role in preventing, and managing, school bullying. The Department of Education and Skills [1] define bullying as unwanted negative behavior, which is repeated over time. It can be verbal, psychological or physical, conducted by an individual or group against others. This behavior includes exclusion, malicious gossip and other forms of relational bullying. The relational bullying can include cyberbullying, homophobic or racist bullying. Regardless of the type of bullying which has occurred, all forms of bullying contain

[1] Corresponding author, irene.connolly@iadt.ie

three elements. First, that the act is intentional, second, that it is repeated over time and third that there is a power imbalance between the bully and the victim [3]. Traditional bullying remains a problem in schools however, the emergence of cyberbullying is also causing difficulties. Cyberbullying has been defined as aggressive, intentional acts carried out by a group or individual, using electronic forms of contact, repeatedly against a victim who has difficulty defending themselves [4].

Research has indicated that cyberbullying is more common in European countries that have pre-existing high levels of traditional bullying, rather than in countries where the internet is more established [5]. This suggests that cyberbullying is another aspect of traditional bullying rather than something completely separate to it [6]. Unlike traditional bullying, cyberbullying does not involve face to face or physical confrontation. It does not require any close proximity to the cybervictim and can be conducted from any location. There is little escape from it: the cyberbullying can occur at any time as long as the cybervictim is accessing technology. As with traditional bullying, cyberbullying represents an imbalance of power [7]. In the case of cyberbullying, two possible factors in the power imbalance are the role of anonymity and technological prowess. Anonymity seems to embolden the cyberbully; the belief that they cannot be identified seems to remove social inhibition and norms [8], resulting in disinhibition where young people say and do things online that they might never do face to face. A further argument was put forward that a power imbalance exists within cyberbullying which is the permanency of materials in the cyber world and the difficulties associated with attempting to remove it, hence contributing to the powerlessness of the cybervictim [9].

The prevalence of bullying in Irish schools has been established with research reporting that 30.2% of post primary students have been involved in bullying either as a bully or a victim, with one in ten students being bullied on a frequent basis [10]. The most recent Irish data is provided by research [11] which was carried out with 9-16 year olds (N=500). This study found that 22% of children have experienced many forms of bullying, including traditional and cyber bullying. Children between the ages of 9-10 years reported more bullying by traditional methods (7%) and also most cyberbullying through online gaming (6%). Whereas children between the ages of 13-14 and 15-16 years reported being cyberbullied on a social network site to a greater extent (12.9% and 9% respectively). The existence and prevalence, rates of homophobic bullying in Irish schools has also been established. It was found that 58% of learners acknowledged homophobic bullying happened in their schools, 34% reported homophobic comments made by teachers, and other staff members, while 25% had been physically threatened by peers [12].

Research has shown that bullying effects academic achievement, physical and mental health as well as the social and emotional well-being of those involved. High levels of depression, anxiety and loneliness were also common effects of bullying where 32% reported recurring memories of bullying incidences which left them feeling panicked and stressed [13]. Research in Ireland of 876 post-primary students reported the following psycho-social outcomes of being the victim of cyberbullying [14]. They reported anger, feeling sad or ashamed. While in Canada victims of cyberbullying found it difficult to concentrate in school, affecting both their learning ability and their resultant success at school [15].

Before examining its relevance to bullying, understanding the concept of school climate is crucial for the school community. The DES Anti-Bullying Procedures for Primary and Post-Primary schools [1] purported the importance of positive school

climate implementation in anti-bullying policies. It stated that a cornerstone in the prevention of bullying, is a positive school culture and climate that is welcoming of difference and diversity and is based on inclusivity and respect. A school policy on bullying is most effective when supported by a positive school climate which encourages respect, trust, care, consideration and support for others. The procedures outline that a positive school culture and climate that is both inclusive and accepting of difference, and in addition, supports students to divulge and examine bullying behavior is essential. A positive school climate is associated with reduced aggression and violence among students [16] as well as reduced bullying behavior [17]. Research on bullying has emphasized the school climate as a factor which may influence bullying behavior in a school [18]. A positive school climate, where students feel confident reporting bullying, can have a dramatic effect on the levels of bullying in the school. Furthermore aggressive attitudes appear to play a role in students reporting of bullying incidences. High aggressive attitudes are associated with considerably less student help seeking behavior, and a poorer school climate [19]. Furthermore, students who held aggressive attitudes promoted a climate that appeared to be tolerant of bullying, suggesting that aggressive attitudes are linked to perceptions of school climate and hence the seeking of assistance for bullying incidences [20]. Of factors that affect a victim's decision to seek help, the strongest predictor was aggressive attitudes [21]. In the US, the relationship between school climate factors and bullying was examined, with high-risk elementary students reporting that adult support in school was an important predictor of within-class reduction of bullying, whereas high-risk secondary students reported peer support as a significant predictor of within-class reduction of bullying [22]. Support entrenched in a positive school climate inhibits bullying by providing necessary resources for positive youth development and encouraging young people to play by the rules and consider others fairly, while also offering an environment where victims feel they can stand up to and report this behavior in a safe and trusting environment [23]. For the purpose of this study school climate, was limited to these domains: Attitudes towards aggression, and willingness to seek help.

2. Method.

2.1 Participants & Procedures.

Participants comprised of one hundred and twenty two (n=122) students from a co-educational post-primary school. The sample consisted of sixty one male (50%) and sixty one female (50%) students between the ages of twelve and eighteen years (M = 15.14 years, SD = 1.75 years). Participants from each school year were recruited, sixty from Junior Cycle classes (1st-3rd years) and sixty-two from Senior Cycle classes (4th-6th years).

Using purposive sampling, this study employed a between groups, questionnaire design to investigate the relationship between students' perceptions of their school climate and student willingness to seek help for bullying. The self-administered questionnaires were administered by the researchers, during class time, in the teachers' presence. Consent was obtained from the school, parents and participants in accordance with the Psychological Society of Ireland's code of ethics.

2.2 Measures.

School Climate Bullying Survey [24] assessed bullying behaviors and different aspects of school climate among post-primary students. This 45-item self-report instrument is used for students between the ages of twelve and eighteen years. The questionnaire can be divided further into these 3 scales: Prevalence of Bullying, Attitudes towards Aggressive Behavior and Willingness to Seek Help for Bullying. These items all have Likert-type answer choices ranging from "Strongly disagree" to "Strongly agree". Cronbach's alpha for each scale was calculated to establish the reliability of the scale in this study which revealed a Prevalence of Bullying, alpha value of 0.67 or (α = .67), Aggressive Attitudes (α = .82) and Willingness to Seek Help (α =.85).

The Supportive Climate Scale [25] is a Likert scale which consists of 8 items asking students how much they "Strongly disagree" to "Strongly agree" that the adults in their school show respect and support for students in certain ways. Again to establish the reliability of the scale Cronbach's alpha was calculated with an alpha value of 0.89, indicating good internal consistency and hence reliability of the scale.

3. Results.

The first analysis of the relationship between a supportive "school climate" and "willingness to seek help" for bullying among junior cycle and senior cycle students, was investigated. A Pearson product-moment correlation coefficient was completed to further investigate the relationship between the variables and the differences between junior and senior cycle students. Preliminary analysis found no violation of normality, linearity and homoscedasticity. There was a strong, positive correlation between the two variables, with high levels of "willingness to seek help" associated with high levels of "perceived supportive climate". "Supportive climate" explains more of the variance in "willingness to seek help" for junior cycle students ($r=.67$, $n=60$, $p<.001$) than for senior cycle students ($r=.46$, $n=62$, $p<.001$).

Analyzing of "aggressive attitudes" and their relationship with "willingness to seek help" was then examined. A Pearson product-moment correlation coefficient found a moderate negative relationship between the two variables, with high levels of "aggressive attitudes" associated with low levels of "willingness to seek help", senior cycle students ($r=-.57$, $n=62$, $p<.001$) and junior cycle students ($r=-.56$, $n=60$, $p<.001$).

The final analysis was carried out using a stepwise multiple regression. The predictors were "aggressive attitudes" and "supportive climate", while the criterion was the overall willingness to seek help score. Preliminary analysis of tolerance scores, the scatterplot and the normal probability p-plot found no violations of normality, linearity multicollinearity and homoscedasticity. The results indicated that a "supportive climate" accounts for 34.4% (adjusted r2 value) of the variance in "willingness to seek helping" for bullying among secondary school students. After the entry of aggressive attitudes, the total variance explained by the model as a whole was 43.3%, which was statistically significant, ($F(2, 122) = 47.11$, $p<.001$). "Willingness to seek help" was

primarily predicted by perceptions of "supportive climate" to a slightly lower level by "holding aggressive attitudes", which can be seen in Table 1 below.

Table 1. Summary findings of the predicting variables.

Variable	R^2	Ad.R^2	Un. St. Beta	St. Error	St. Beta
Supportive Climate	.349	.344	.329	.069	.391
Aggressive Attitudes	.442	.443	-.372	.084	-.364

Note: Ad. R^2 = Adjusted R^2; Un. St. Beta = Unstandardised Beta; St.Error = Standard error; St. Beta = Standardised Beta

4. Discussion.

The results indicate that a positive relationship between a supportive climate and willingness to seek help for bullying exists. Supportive climate and aggressive attitudes were also predictors of willingness to seek help, with a supportive climate having the strongest contribution. The current study's findings support others who also reported a greater willingness to seek help for bullying in schools that had a greater supportive climate [26]. The results of the present study also noted the difference in perceptions of school climate among junior cycle and senior cycle students, and it was found that a supportive climate explains more of the variance in willingness to seek help for junior cycle than for senior cycle students. The findings indicate senior cycle students are less likely to seek help for bullying than junior cycle students. These results concur with research which demonstrated that students in lower grades were more likely to seek help for bullying than those in higher grades [21]. The reason young people did not report bullying was because they thought nobody would help them. Students thought they could handle the bullying themselves or that the bullying was not too serious which concurs with the present study's findings where 29% of students thought they could handle the bullying themselves while a further 25% believed the incidents were not serious enough to warrant reporting it [20]. Previous research found high aggressive attitude scores were associated with considerably less student help seeking behaviour, which was supported in the present research [19]. Furthermore, aggressive attitudes for senior cycle students were higher than junior cycle students, perhaps explaining the variance in willingness to seek help. The present study demonstrates that students, who feel engaged with their schools, will seek help for bullying incidences when they occur.

5. Conclusion.

The solutions to cyberbullying involve not only a whole school approach but a whole community approach. The overlap of traditional bullying and cyberbullying must be taken into account when it comes to developing and implementing policies in the prevention of cyberbullying. Future research needs to critically examine the complexity of the individual, group, and organizational factors that shape, and predict, violent behaviour in schools in order to more effectively prevent it.

References.

[1] Department of Education and Skills. (2013) *Anti-Bullying Procedure for Primary and Post-Primary Schools.*https://www.education.ie/en/Publications/Policy-Reports/Anti-Bullying-Procedures-for-Primary-and-Post-Primary-Schools.pdf. Accessed May 23rd.

[2] J. Cohen and V. K. Geier, *School climate research summary: January (2010)*. New York, NY https://www.schoolclimate.org/climate/schoolclimatebriefs.php

[3] J. Urbanski and S. Permuth. *The truth about bullying: What educators and parents must know and do*. (2009), R&L Education.

[4] P.K. Smith, J. Mahdavi, M. Carvalho, S. Fisher, S. Russell and N. Tippett. Cyberbullying: Its nature and impact in secondary school pupils. *Journal of Child Psychology and Psychiatry* **49,** (2008), 376-385.

[5] S. Livingstone, L. Haddon, A. Görzig and K. Ólafsson. Risks and safety on the internet. *The perspective of European children. Final findings from the EU Kids Online survey of* 9-16 year olds, (2010).

[6] M. O'Moore, Cyber-bullying: The situation in Ireland. *Pastoral Care in Education* **30**, (2012), 209-223.

[7] R. Slonje, P. K. Smith and A. Frisén. The nature of cyberbullying, and strategies for prevention. *Computers in Human Behavior* **29,** (2013), 26-32.

[8] S. Hinduja and J.W. Patchin. Bullies move beyond the schoolyard: preliminary look at cyberbullying. *Youth Violence and Juvenile Justice*, **4**, *(*2006a), 148-169.

[9] J. Dooley, J. Pyżalski and D. Cross. Cyberbullying versus face-to-face bullying. *Zeitschrift für Psychologie/Journal of Psychology* **217**, (2009), 182-188.

[10] M. O'Moore, and S.J. Minton. Cyberbullying: The Irish experience. In Tawse, C.Q.S., ed. *Handbook of Aggressive Behaviour Research* (2009). New York: Nova Science Publishers, Inc.

[11] B. O'Neill and T. Dinh. *Net Children Go Mobile. Initial findings from Ireland*. http://arrow.dit.ie/cserart/57/ (2014). Accessed May 23rd.

[12] P. Maycock, A. Bryan, N. Carr and K. Kitching. *Supporting LGBT Lives: A Study of the Mental Health and Well-Being of Lesbian, Gay, Bisexual and Transgender People,* (2009). Dublin: GLEN and BeLonG To.

[13] K. Rigby. *Addressing bullying in schools: Theory and practice,* (2003). Australian Institute of Criminology.

[14] L. Corcoran, I. Connolly and M. O' Moore. *Cyberbullying in Irish schools: an investigation of personality and self-concept,* (2010). Poster presented at The Always-on Generation: Risks and Benefits of New Technologies conference in Florence, Italy. Oct 21.

[15] T. Beran and L. Qing. Cyber-harassment: A study of a new method for an old behaviour. *Journal of Educational Computing Research* **32**, (2005), 265-277.

[16] A. Gregory, D. Cornell, X. Fan, P. Sheras, S. Tse-Hua and F. Huang. Authoritative school discipline: High school practices associated with lower bullying and victimization. *Journal of Educational Psychology* **102**, (2010), 483.

[17] M. Birkett, D. L. Espelage and B. Koenig. LGB and questioning students in schools: The moderating effects of homophobic bullying and school climate on negative outcomes. *Journal of Youth and Adolescence* **38**, (2009), 989-1000.

[18]

[19] S. Hinduja and J.W. Patchin. *School climate 2.0: Preventing cyberbullying and sexting one classroom at a time*, (2012). Corwin Press.

[20] S. Bandyopadhyay, D.G. Cornell and T.R. Konold. Validity of three school climate scales to assess bullying, aggressive attitudes, and help seeking. *School Psychology Review* **38,** (2009), 338.
[21] J.D. Unnever and D. G. Cornell. Middle school victims of bullying: Who reports being bullied?. *Aggressive Behavior* **30**, (2004), 373-388.
[22] F. Williams and D. G. Cornell. Student willingness to seek help for threats of violence in middle school. *Journal of School Violence* **5**, (2006), 35-49.
[23] N.A. Gage, D. A. Prykanowski and A. Larson. School climate and bullying victimization: A latent class growth model analysis. *School Psychology Quarterly* **29**, (2014), 256.
[24] N.G. Guerra, K. R. Williams and S. Sadek. Understanding bullying and victimization during childhood and adolescence: A mixed methods study. *Child Development* **82**, (2011), 295-310.
[25] D. Cornell and P. Sheras. *School climate bullying survey,* (2003). Charlottesville: University of Virginia, Virginia Youth Violence Project.
[26] G. Austin and M. Duerr. *Guidebook for the California Healthy Kids Survey. Part III: School Climate Survey for Teachers and Other Staff*. (2005). WestED.
[27] M. Eliot, D. Cornell, A. Gregory and X. Fan. Supportive school climate and student willingness to seek help for bullying and threats of violence. *Journal of School Psychology* **48,** (2010), 533-553.
[28]

Mutual Rule-Shaping with Parents to Form Adolescents' Healthy Smartphone Use

Jimin RHIM [a] Seyeon LEE [a], Seul LEE [a], Jung Whan NA [a] and Young Yim DOH [a,1]
[a] *Graduate School of Culture Technology, KAIST, Daejeon, South Korea*

Abstract. Smartphones have become an integral part of adolescents' lives. However, technology savvy adolescents' media culture has evolved rapidly, creating concerns regarding abusive smartphone usage. The purpose of this study was to find effective parental mediation in digital media context for adolescents' healthy smartphone usage habits that can be applied at home, because media consumption is inevitable. Two sessions of FGI were conducted. In the first FGI (n=21; parent: 21), we explored parents' experiences regarding their children's smartphone usage. In the second FGI (n=24; parent: 13, child: 11), experiences of digital media usage rules applied at homes from both adolescents' and parents' perspectives were examined. This phenomenological qualitative research revealed parents' concerns and difficulties they faced while applying media usage rules. Adolescents on the other hand sought for autonomy in terms of media use, yet realized the necessity of their responsibility.

Keywords. Adolescents, Healthy Smartphone Usage Habits, Parental Mediation, Parent-Child Relationship, Mutual Rule-shaping

1. Introduction

Smartphones, defined as handheld personal computers, have become one of distinguishing portable information and communications technologies [1]. According to report from Pew Research Center in 2015, 64% of American adults own a smartphone and ownership rate is especially high among young adults [2]. Another report shows that nearly 90% of population in age between 18 and 34 in the U.S. own smartphones [3]. These research indicate high penetration level of smart media culture, which means that smartphones have become an integral part of adolescents' lives. This new mobile technology diffusion is shaping teens' culture with preexisting social environment allowing them to express themselves and maximize independence [4], thus becoming more than mere tools [5], but one of dominant representation of self [6] or means to connect with others.

Technology savvy adolescents are quick to adopt to the new media culture, creating concerns regarding abusive smartphone usage. Media reports suggest that users are becoming more attached to their smartphones causing various side effects including both physical and social issues [6]. The purpose of this study was to find effective intervention points for parental mediation in digital media context to form

[1] Corresponding author, yydoh@kaist.ac.kr

adolescents' healthy smrtphone usage habits that can be applied at home, because media consumption is inevitable.

This study was conducted in two workshop sessions to inform parents of smartphone literacy, and understand what parents and adolescents feel as well as why they behave in the ways they do in terms of applying parental mediation in smartphone use contexts. The program was designed in the form of Focus-group interviews. The methodology allows comfortable sharing of thoughts and experiences in between participant since the group is formed within the age-range with similar interests [7]. Purposive sampling, selection of participants within population with the most information or interests in the topic [8], was implemented because it was an exploratory study to gather baseline understanding of smartphone mediation applied at homes.

2. 1st FGI - Parental Mediation in Digital Media Context

The main purpose of conducting the first session was to help parents understand teens' smartphone use. Then, parental mediation in digital media context in actual households were discussed as groups.

2.1 Participants

Some parents from a middle school located in Gyeonggi-do, South Korea participated in the first session of FGI. This school is an alternative school, where parents or students can participate in curriculum settings based on their interests. Parents who sought to understand adolescents' smartphone culture invited one of our researchers, a professional in the field of Digital Parenting as lecturer to facilitate the session. In 2014, December 21st, a total of 21 parents (all moms) with adolescents using digital media participated.

2.2 1st FGI Design

In the former half of the session, lecture titled '*Understanding Teens in the Digital Era: Learn the Language of New Generations*' was delivered. Main purpose of the lecture was to help parents understand the necessity and meaning of digital media for adolescents in the digital era in terms of teens' developmental contexts. In the latter session, *FGI* was conducted with the topic of applying parental mediation in digital context at home. Four groups consisting of five to six participants freely discussed these following topics: 1) concerns regarding adolescents' smartphone use, 2) smartphone parental mediation applied at home, 3) effectiveness of the rules, and 4) difficulties they faced in the process of applying such mediation methods. After the group discussion, entire participants had a chance to openly share their experiences.

2.3 Analyses

Five independent coders repeatedly read the transcripts from the session to identify regularities and commonalities among the participants' experiences. According to van

Manen [9], part of phenomenology research involves provision of description with interpretation of the process.

2.4 Results

Four distinctive themes emerged (Parents' Concerns about Adolescents' Smartphone Use; Parental Mediation in Digital Context at Home; Effectiveness of Currently Applied Smartphone Mediation; Difficulties Parents Faced During Rule Applications). Representative quotes for each themes and subthemes are listed in **Table1**.

Table 1. Descriptions of Subthemes for 1st FGI Session

Theme	Subthemes		Representative Quotes
Parents' concerns about adolescents' smartphone use	Health related concerns		*"I heard that playing digital games alter growing teens' brain …"*
	Adolescents' Smartphone overuse		*"I am worried that my child's life is constructed only around smartphone or computer."*
	Confusion due to lack of information		*"When he goes in his room, I have no idea what he is doing with his smartphone behind the closed door."*
Parental mediation in digital media context at home	Coercive methods		*"I change passwords for our home Wifi"* *"I told my teens to record the games they play and report to me about them."*
	Not fixed or conditional rules		*"We do not have specific rules, occasionally when I am worried, I have conversations with my teens to limit media usage after certain hours."*
	Having conversations about smartphone usage behaviors		*"Instead of limiting time, I tried to have conversations to keep the rules. If duration of game play is the problem, I would allow him to play certain rounds of game instead of limiting time."*
Effectiveness of Currently Applied Smartphone Mediation	Advantage or benefits		*"My daughter is interested in diet and she uses dieting game to exercise. She tries to encourage other family members to engage in the activity."*
	Disadvantage or side effects	Resistance of adolescents	*"My children do not agree with the rules. They would say why you are even meddling about such things as this."*
		Instigation of adolescents' dishonesty	*"When I try to keep my child within the boundary of rules, he would start to lie."*
		Reduction of adolescents' self-esteem	*"My child seemed to perceive himself as an unreliable person after lying about rules that he could not keep up with."*
Difficulties parents faced	Discrepancies between mother and father		*"My husband and I do not have consensus. Seems like my son is taking advantage of taking either side which benefits him the most."*

during rule applications	Gap in ideal and reality	*"Although I set the rules, they are ideals not realistic.*
	Giving up	*"I get tired of arguing with my teens so I give up on the rules that I have set up."* *"Even if I reset passwords or take away smartphones, somehow they always find out. I gave up."*

2.5 Conclusion of 1st FGI Session

Many parents had vague repulsion or negative attitudes toward smartphones before they understood what these activities meant for adolescents in their developmental stages. This often led to restrictive mediation which did not seem to resolve problematic smartphone usage but instead created further conflicts.

3. 2nd FGI- Comparison between parents and adolescents perspectives

The second session was conducted to understand adolescents' perceptions and provide opportunities for both parents and adolescents to form mutual understandings of smartphone intervention methods.

3.1 Participants

After four weeks from the 1st Workshop session, thirteen parent participants from the first session and their children joined together. A total of twenty-four (*parents*=13, *children*=11) participated.

3.2 2nd FGI Design

Separate groups for parents and adolescents were formed to conduct *FGI.* After discussing experiences and perspectives in groups for about forty five minutes, several participants volunteered to share what their group had discussed earlier.

3.3 Analyses

Five independent coders repeatedly read the transcripts form the workshop sessions to identify regularities and commonalities among the participants' experiences.

3.4 Results

Three distinctive themes (Effective Mediation; Ineffective Mediation; Implications) were formed from FGI results from the parent groups. Representative quotes for each theme and subtheme are listed in **Table 2.**

Table 2. Descriptions for Subthemes of Parents' Perspectives in 2nd FGI Session

Theme	Subthemes	Representative Quotes & Description
Effective mediation	Provide specific guidelines and set realistic achievable rules	- Allow digital media usage after finishing one's chores or to do list - Set guidelines (turn off PC before 11 pm and go to bed. Instead of using computer, read books before going to bed)
	Rules that allow children's autonomy	- Trust her by allowing her to self-control - Tell them how long they have spent on using digital media and let them decide on their own/Select time and contents and suggest/ Trust them to self-control media usage time
	Have conversations and set conversation-based rules	*"I felt the importance of family relations. The more I communicated with my children and they spent time with family, the less time they spent on using computers."*
	Suggest alternative activities	Give missions and induce or suggest specific activities.
Ineffective mediation	One-way or coercive mediation	- Limit application usage time or make her stop immediately. Take away smartphones. - Monitor what kind of contents my children use for how long.
	Inconsistent mediation	*"When both parents do not have consensus on smartphone mediation rules, whoever is on the child's side wins."* *"I only tell him to stop using, but do not take any actions."* *"Depending on how I feel, mediations change."*
Implications	No big difference	*"There were not many changes. However, I was confused whether I should tell my daughter to stop using digital media or wait until she finishes using it on her own."*
	Perception changes due to knowledge gain of digital media	*"By knowing what it is and how it can be used in a positive way could solve the problem."*
	Recognizing that differences exist between children	*"Unlike my first child, my second child did not use smartphone for about a month after it was broken, yet did not find it inconvenient."*

Almost every participants agreed that they expected least intervention with respect of their privacy. One participant mentioned that they only wanted help when they asked for help. Another participant answered that he wanted to set rules with their parents. Couple of participants agreed that they wanted specific guidelines from their parents.

Adolescents' expectations for parents in terms of smartphone use regulations are listed in **Table 3.**

Table 3. Expectations from the Adolescents' Perspectives

Desire for parents' intervention methods
- Application of least intervention - Respect their privacy - Promote their autonomy and give them help only upon request - Suggest specific guidelines or alternative activities - Set rules together

3.5 Conclusion of 2nd FGI Session

Before the session, not many families had the chances to have honest and open conversations about this topic. With the guide from facilitators, both parents and adolescents were able to reflect their smartphone use, which is the initial point for applying intervention.

4 General Discussions and Conclusion

The significance of this study was to guide parents to reflect their digital parenting method to increase awareness of parental roles for adolescents' healthy smartphone use. Furthermore, adolescents' recognized the importance of responsible smartphone uses. From the *FGI* sessions, it was found that when parents lacked clear understanding of adolescents' smartphone use in terms of their developmental stages, this created negative perceptions of smartphones which led to application of coercive mediation. Often times, this led to arguments. However, such foreseeable conflicts can be avoided through communication based on clear understandings. Open conversation and mutual rule-shaping among parents and children will be necessary to make adolescent's healthy smartphone habits.

However, the current study has several limitations which indicate directions for future research. Although purposive sampling is appropriate for an exploratory study in attempts to understand actual digital media mediations applied at homes, it cannot be concluded that they represent the entire populations with various family contexts. Therefore overgeneralization of the results should be avoided.

Despite the limitations, the current study moves a step further from previous research by elucidating actual difficulties or concerns from both parents and adolescents in terms of digital media regulations, an issue that affects their day-to-day lives. Future study should be designed to set an open conversation settings for parent and children to communicate about adolescents' smartphone use. In addition, it will be necessary to facilitate them to make mutually agreed usage rules reflecting the adolescent's characteristics and family contexts.

References

[1] A. Oulasvirta, et al., Habits make smartphone use more pervasive, Personal and Ubiquitous Computing, **16** (2012), 105-114.
[2] A. Smith, US smartphone use in 2015, Pew Research Center (2015), 18-29.
[3] A. Lipsman, Teens & Older Demos Driving Gains in U.S. Smartphone Penetration, comScore Inc, 2011

[4] Y. J. Park, My whole world's in my palm! The second-level divide of teenagers' mobile use and skill, New media & society, **17** (2015), 977-995.
[5] S. Lee, and S. Shyam Sundar. Cosmetic customization of mobile phones: Cultural antecedents, psychological correlates, Media Psychology **18** (2015), 1-23.
[6] E. Harmon, and M. Mazmanian. Stories of the Smartphone in everyday discourse: conflict, tension & instability. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, (2013), 1051-1060.
[7] F. Rabiee, Focus-group interview and data analysis, Proceedings of the nutrition society **63** (2004), 655-660.
[8] J. M. Guarte, and E. B. Barrios, Estimation under purposive sampling, Communications in Statistics—Simulation and Computation® **35** (2006), 277-284.
[9] M. Van Manen, Beyond assumptions: Shifting the limits of action research, Theory into practice, **29** (1990), 152-157.

An Investigation Into Anxiety In Virtual Reality Following A Self-Compassion Induction

Vincent RYAN[a,1] Robert GRIFFIN[a]
[a]*Institute of Art, Design and Technology, Dun Laoghaire, Dublin*

Abstract. Self-compassion practices may enhance virtual reality (VR) exposure therapy's effectiveness for social anxiety disorder. This study investigated if a self-compassion induction (i.e. compassionate letter writing) influenced self-reported anxiety in VR. 27 third level students were randomly assigned to one of two induction conditions (compassion or control) and verbalised their VR experiences. As hypothesised the VR experience increased state anxiety. However the compassion induction did not influence state anxiety. Thematic analysis of qualitative data revealed that participants had strong emotional responses to the main VR avatar and that this was related to mental states that were attributed to it. These results contribute to research suggesting that certain VR environments can be effective as social exposures in VR exposure therapy.

Keywords. Virtual reality exposure therapy, social anxiety, self-compassion

1. Introduction

Virtual reality exposure therapy (VRET) has been demonstrated to be as effective as conventional cognitive behavioural therapy (CBT) for treating social anxiety disorder (SAD) [1]. A necessary condition for exposure to be effective is for the fear response to be activated and worked with in therapy [2]. A range of VR social exposures have been used to treat SAD, including (among others) speaking to a VR audience, being in a VR office and being in a VR cafe [1]. VRET typically involves the following aspects: graduated exposure using virtual reality (VR), cognitive restructuring, relaxation training and biofeedback [3]. During treatment, graduated exposure is used to support increasing emotional regulation in the client. One framework that has also been identified as having potential benefits for working with SAD is self-compassion [4; 5]. Compassion can be defined as a sensitivity to suffering in oneself and others combined with a commitment to efforts to alleviate and prevent it [6]. Engaging in self-compassion practices such as compassionate letter writing have been demonstrated to assist with down-regulating the threat-focused emotional system, reduce anxiety and reduce self-criticism [6-8]. Research into the use of VR for enhancing self-compassion through embodied perspective taking has already begun [9], however, the potential for self-compassion to influence levels of anxiety experienced in VR has not been investigated to date. The present study investigated if a social exposure in VR led to a

[1] Corresponding author, vincentryan@hotmail.com

significant rise in self-reported anxiety. Furthermore it investigated if a brief self-compassion induction led to a lower rise in self-reported anxiety as compared to a neutral control induction.

2. Method

Twenty seven third level students, nineteen female and eight male, ranging in age from 18 to 56 (M = 27.08, SD = 10.92) participated. Written informed consent was obtained in all cases. Participants were randomly assigned to one of two groups (experimental or control). To begin with participants undertook a sample VR experience entitled "Ambient Occlusion Room" [10]. This comprised a room containing some simple furniture and was provided to familiarise them with the Oculus Rift DK2 (https://www.oculus.com/en-us/). Following this participants undertook an induction. Self-compassion participants watched a brief video on self-compassion by Kristin Neff [11] followed by a compassionate letter writing exercise [12] concerning a recent personal difficulty. Control participants watched a short cookery video followed by a letter-writing exercise concerning being a good cook. After the induction participants entered a VR exposure entitled "Coffee Without Words" [13] for approximately five minutes. The VR exposure was set in a cafe populated by a neutral-acting computer-controlled female avatar who was seated opposite (see Figure 1). The avatar did not speak and her range of behaviour was limited to moving her head and eyes in a pattern designed to approximate natural human gaze behaviour, occasionally looking at the participant in the eyes and occasionally looking around the room. An additional three greyed-out avatars were present in the background of the cafe. Participants had a static virtual male body. They could look around but could not leave the virtual table they were seated at. The audio was background cafe sounds rendered in stereo and played at a medium volume using PC speakers. All participants were instructed in using a think aloud protocol (TAP) while in VR [14]. A short semi-structured interview (SSI) was conducted after VR exposure. Participants' state anxiety levels were assessed using the STAI-6 [15] at three points: before induction, just before VR exposure and directly after VR exposure. Participants were also assessed on six factors (6Fs): level of experience with VR, sense of presence while in VR, sense of copresence while in VR, trait self compassion using the SCS-SF [16], trait social anxiety using the LSAS-SR [17] and cybersickness. Both VR experiences were created by Tore Knabe and are free to download from his website: http://tore-knabe.com/virtual-reality.

In order to test if there was an effect from the VR exposure and from the self-compassion induction a mixed ANOVA (SPSS version 22) was used. This combined a between groups factor with 2 levels (compassion versus control) with a repeated measure (time) with 3 levels: pre-induction, pre-VR exposure and post-VR exposure. Post hoc comparisons used the Fisher LSD test. An independent samples t-test was run comparing the two groups on the 6Fs. Pearson correlations assessed relationships between the 6Fs. Statistical significance was set at .05, two-tailed. Where appropriate, partial η^2 and Cohen's d statistic provided an index of effect size [18]. In addition, the verbal data gathered in the TAP and SSI was transcribed, coded and analysed in order to produce a thematic analysis.

Figure 1. Coffee Without Words: Social Exposure in VR.

3. Results

Participants typically had limited experience with VR. Trait self-compassion scores were in the mid-range (M = 3.18, SD = 0.72). Social anxiety scores (M = 42.37, SD = 18.51) were over the threshold indicating possible non-generalised social anxiety in the sample (i.e. >30) [19]. Four participants (14.8%) had a LSAS SR score greater than 60, with two happening to be in each experimental condition. Scores for sense of presence and co-presence were in the high range. Scores on cybersickness were in the low range.

Pearson correlations examined the relationships between the 6Fs. There was a statistically significant correlation between reported presence and copresence (r (27) = .516, p = .006) indicating a strong positive correlation [18]. There was also a strong negative correlation (r(27) = -.474, p = .012) between self-reported trait self-compassion and self-reported trait social anxiety. No other correlations were statistically significant. An independent samples t-test indicated that there was no significant difference between the two groups on the 6Fs.

The condition by time interaction was found to be not statistically significant: F(2,50) = 0.825, p = .444, partial η^2= .032. However, the main effect of time was found to be statistically significant: F(2, 50) = 3.510, p < .05, partial η^2= .123. The results of a post-hoc LSD test indicated that there was a statistically significant (p < .05) rise in state anxiety levels between the beginning of VR exposure (M = 28.52, SD = 11.35) and end of VR exposure (M = 35.52, SD = 10.37). Effect size (d) was calculated at .6, indicating a medium effect size [18]. State anxiety levels between pre-induction and

pre-VR exposure did not differ significantly. A thematic analysis [20] was conducted using the verbal data from the TAP and SSI. Four major themes emerged and are presented in Table 1.

Table 1. Thematic Analysis of the think-aloud protocol (TAP) and semi-structured interview (SSI) data

Theme (T)	Quotations
T1: An interesting, immersive, stimulating environment	"The detail is actually really impressive. I feel like I am in a real cafe" (TAP) "I thought it was brilliant. It was really life like and I really felt like I was a part of it " (SSI) "I was really taken aback by how intense I did feel" (SSI)
T2: A range of emotional responses, to the main avatar, tending towards discomfort	"Very anxious. It made me really uncomfortable" (SSI) "Yeah I feel really ashamed" (TAP) "I kind of felt like I was kind of like the villain like I had said something really offensive" (SSI)
T3: A tendency to attribute mental states to the avatar	"I am being ignored or she is distracted. I am not sure" (TAP) "I was wondering why she was feeling like that, almost like what did I do?" (SSI) "I don't know. She just seemed to judge me" (SSI) "My feeling developed the more I looked at the person in front of me and the way she was looking, was looking at me, I started to think that she was fed up or annoyed or didn't want to be there". (SSI) "She is kind of upset" (TAP) "I feel she's angry with me. Maybe I've said something inappropriate" (TAP)
T4: Feeling it is real but knowing it is not real	"She is looking around her. Looking at me in the eyes. It's really intense. It's really strange that it feels kinda real" (TAP) "It's very life like but not life-like if you know what I mean it's kind of like you'd know it's not real but you'd feel like you're kinda immersed in it" (SSI)

4. Discussion and Conclusion

The present study hypothesised that state anxiety would increase following time spent in a VR exposure. This hypothesis was supported by the data and this result contributes to a growing body of research that demonstrates that social exposures in VR can effectively provoke an anxiety response. In this case the social exposure was minimal: it comprised simply sitting for five minutes close and opposite to an avatar who exhibited varying gaze behaviour. It was also hypothesised that a self-compassion induction would lead to a lower increase in state anxiety as compared to a control induction. However, this was not supported by the data. As this study had a small sample size it may not have been sufficiently powered to find a significant effect. A different kind of self-compassion induction or one that incorporated additional elements such as repeating the compassion induction after VR exposure might have been effective. Furthermore, no manipulation check was made to see if the self-compassion induction was perceived to be effective or easy to use. The sample was characterised by moderate levels of non-generalised social anxiety, furthermore, a strong negative correlation was found between self-reported trait social anxiety and self-reported trait self-compassion. It has been reported [5] that people with SAD tend to be less self-compassionate than average, and that people with SAD have a greater than average fear of both negative and positive evaluation. Consequently as some

people can find it hard to be self-compassionate, it was possible that the more anxious participants in the self compassion induction may not have derived the anticipated benefit from the induction.

The thematic analysis revealed that participants found the VR environment engaging, stimulating and immersive (T1). This was in line with the higher-range scores for sense of presence and copresence. Higher presence in VR has been linked to higher anxiety levels; however, higher presence has not been linked to better treatment outcomes [1]. It has been suggested that once a certain threshold of both presence and anxiety is reached then this may be sufficient for treatment to progress [1]. At the same time participants expressed an emotional response to the main avatar that tended towards discomfort (T2). As already mentioned, in order for exposure therapy to be effective the fear response linked to the phobic situation needs to be activated and worked with [2]. It has been proposed that it is the active forming of safe associations and memories with a feared situation that leads to a phobia dissolving [21]. Attribution of mental states to the avatar was commonplace (T3) and in many cases this related to feeling judged or disapproved of by the avatar. The first three themes taken together seem to indicate that the rise in anxiety was connected to the presence of the main avatar. At the same time participants recognised that even though the VR environment felt real that it was not actually real (T4), perhaps creating a sense of distance and safety from the experience for some of them. It could be suggested that a VR environment such as the one used could help bring to the fore certain cognitive tendencies such as distorted or rigid thinking styles in clients, in a safe, controlled environment. In addition to self-compassion practices, constructs such as psychological flexibility as developed in Acceptance and Commitment Therapy (ACT) [22] as well as failure to mentalize leading to psychic equilivance as described in Mentalization Based Therapy (MBT) [23] offer potential frameworks for working with clients around such reactions. Furthermore, aside from distorted thinking, some social situations can be genuinely difficult and can bring up strong emotional responses. A VR environment such as the one used might be helpful with exploring “being in your own skin” and simply “being with” others, acting as a kind of “emotional sandbox” [24], potentially helping build awareness and tolerance for strong emotional responses.

Some limitations of this study need to be considered. The sample was a small one and was limited to third level college students. A similar study using a clinical population would be an advantage. Furthermore some participants may have experienced the so called “uncanny valley” response to the avatar [1]. Since this was not assessed it cannot be ruled out as a possible factor.

In conclusion this study demonstrated how a novel social exposure in VR involving simply being with an avatar can be anxiety-provoking. A brief self-compassion induction was used; however it did not have any significant effect on state anxiety. Participants exhibited a range of emotional responses and readily attributed mental states to the main avatar they encountered as if they were in the presence of a real person. Clinical implications are that a VR exposure such as the one used could additionally provide rich material for clients to explore with a therapist, in terms of working with anxiety responses, cognitive distortions, enhancing metacognitive ability, enhancing mentalization, as well as developing better emotional regulation.

References

[1] S. Bouchard, J. Bossé, C. Loranger, and E. Klinger, Social Anxiety Disorder: Efficacy and Virtual Humans, in: *Advances in Virtual Reality and Anxiety Disorders,* B. Wiederhold and S. Bouchard, eds., Springer, London, 2014, 187–210.

[2] E.B. Foa and M.J. Kozak, Emotional processing of fear: Exposure to corrective information, *Psychological Bulletin* **99**, (1986), 20–35.

[3] B.K. Wiederhold and M.D. Wiederhold, *Virtual reality therapy for anxiety disorders: advances in evaluation and treatment*, American Psychological Association, Washington, DC, 2005.

[4] P. Gilbert, Evolutionary Models: Practical and Conceptual Utility for the Treatment and Study of Social Anxiety Disorder, in: *The Wiley Blackwell Handbook of Social Anxiety Disorder,* J.W. Weeks ed., 2014, 24–52.

[5] K.H. Werner, H. Jazaieri, P.R. Goldin, M. Ziv, R.G. Heimberg, and J.J. Gross, Self-compassion and social anxiety disorder, *Anxiety, Stress & Coping* **25**, (2012), 543-558.

[6] P. Gilbert, The origins and nature of compassion focused therapy, *British Journal of Clinical Psychology* **53**, (2014), 6-41.

[7] R.L. Leahy, D. Tirch, and L.A. Napolitano. *Emotion regulation in psychotherapy: A practitioner's guide,* Guilford Press, New York, 2011.

[8] K.D. Neff and K.A. Dahm, Self-Compassion: What it is, what it does, and how it relates to mindfulness in: *Handbook of Mindfulness and Self-regulation,* B.D. Ostafin, M.D. Robinson, and B.P. Meier Eds., Springer, New York, 2015, 121-140.

[9] C.J. Falconer M. Slater, A. Rovira, J.A. King, P. Gilbert, A. Antley, and C.R. Brewin, Embodying compassion: A virtual reality paradigm for overcoming excessive self-criticism, *PLoS ONE* **9**, (2014), e111933.

[10] T. Knabe, Ambient Occlusion Room, *Virtual reality*. Retrieved 10 November 2015 from http://tore-knabe.com/virtual-reality

[11] K. Neff, Self Compassion Part 1 Kristin Neff. Retrieved 20 November 2015 from http://www.youtube.com/watch?v=Tyl6YXp1Y6M

[12] K. Neff, Exercise 3: Exploring self-compassion through writing. Retrieved 05 January 2015 from http://self-compassion.org/exercise-3-exploring-self-compassion-writing/

[13] T. Knabe, Coffee Without Words, *Virtual reality.* Retrieved 10 November 2015 from http://tore-knabe.com/virtual-reality

[14] D. Hevey, Think-Aloud Methods, in: *Encyclopedia of Research Design Vol. 1,* N.J. Salkind ed., Sage Publications, Inc, 2010,. 1504–1507.

[15] M.T. Marteau and H. Bekker, The development of a six-item short-form of the state scale of the Spielberger state-trait anxiety inventory (STAI), *British Journal of Clinical Psychology* **31**, (1992),. 301–306.

[16] F. Raes, E. Pommier, K.D. Neff, and D. Van Gucht, Construction and factorial validation of a short form of the self-compassion scale, *Clinical Psychology & Psychotherapy* **18**, (2010), 250–255.

[17] J. Oakman, M. Van Ameringen, C. Mancini, and P. Farvolden, A confirmatory factor analysis of a self-report version of the Liebowitz social anxiety scale. *Journal of Clinical Psychology* **59**, (2002), 149–161.

[18] J. Cohen, Statistical Power Analysis for the Behavioral Sciences, 2nd edn., Hillsdale, New Jersey: L. 1988.

[19] N.K. Rytwinski, D.M. Fresco, R.G. Heimberg, M.E. Coles, M.R. Liebowitz, S. Cissell, M.B. Stein, and S.G. Hofmann, Screening for social anxiety disorder with the self-report version of the Liebowitz social anxiety scale, *Depression and Anxiety* **26**, (2009), 34–38.

[20] V. Braun and V. Clarke, Using Thematic Analysis in Psychology, *Qualitative Research in Psychology* **3**, (2006), 77-101.

[21] S. Bouchard, B. Wiederhold, and J. Bossé, Arachnophobia and Fear of Other Insects: Efficacy and. Lessons Learned, in: *Advances in Virtual Reality and Anxiety Disorders,* B. Wiederhold and S. Bouchard, eds., Springer, London, 2014, 91-118.

[22] S.C. Hayes, J.B. Luoma, F.W. Bond, A. Masuda, and J. Lillis, Acceptance and commitment therapy: Model, processes and outcomes, *Behaviour research and therapy*, **44**, (2006), 1-25.

[23] P. Fonagy, G. Gergely, E. Jurist, and M. Target, *Affect regulation, mentalization, and the development of the self,* Other Press, New York, 2002.

[24] B. Rooney, Controlling emotions: movies & (virtual) reality | Dr Brendan Rooney, TEDxUCD Talks. Retrieved 10 March 2016 from http://https://www.youtube.com/watch?v=zvvZEIGNLo0

Cyberharassment and Cyberbullying; Individual and Institutional Perspectives

Emma SHORT [a,1] Antony BROWN[a] Jim BARNES[a], Marc CONRAD[a] Zhraa ALHABOBY[a] Melanie PITCHFORD[a], Liesl CONRADIE[a], Gavin STEWART[b] and Alexandra DOBOCAN[a]

[a]National Centre for Cyberstalking Research, University of Bedfordshire
[b]Research Insitute of Media Arts and Performance, University of Bedfordshire

Abstract. Research on finding a relationship between institutional policy and the proliferation of cyberstalking, cyberharassment and cyberbullying in young adults, is limited. It has been reported that stalking on university campuses has a different profile than stalking nationally because of the nature of their mate-seeking age, proximity of the perpetrator to its victim and the ease of accessing personal information. This study gathered data on the experiences of cyberstalking and attitudes to aggressive online communication from a student and staff population. Results suggest that online communication is ambiguous and there is a need for online norms, to which young people can adhere, university staff reported regular online abuse as part of their working lives. Participants were generally not aware if the university had an Acceptable Internet use policy (AIUP). Moreover, participants were sensitive to being harassed and while being aware of how they were affected by the online behaviour of others, there was less certainty of the effects of their own behaviour.

Keywords. Cyberstalking, cyberbullying, harassment, deviant online behaviours, AIUPs

1. Introduction

Causing distress to someone, by electronic means, has been referred to as cyberstalking or cyberbullying. Victims' reactions include fear, depression, stress, anxiety, lowered self-esteem and loss of trust in other people [1]. Even though the prevalence and incidence of aggressive online behavior remain undetermined, anecdotal reports suggest that the phenomenon appears to be expanding at a rapid pace, especially among young people [2].

The environment of education has dramatically changed in the last decade as the demand for a highly educated workforce is increasing and young people are expected to undertake a continuous learning process [3]. As a result, online learning is becoming an increasingly important part of higher education both on campus and in distance learning. Almost all HE institutions provide high-speed internet access in their residence halls. Students stay in touch with tutors and family via e-mail and most commonly communicate with friends via Instant Messaging (IM), which permits real time communication by sending short messages back and forth using the internet [4]. Conversely, there is evidence that internet use can result in negative experiences such

[1] Corresponding author, emma.short@beds.ac.uk

as "cyberaddiction'', identity theft, exposure to unwanted material, e-mail harassment, and cyberstalking [5]. As technology advances, so do the means by which people cause harm and distress to each other but the awareness of harm does not necessarily change alongside. Research suggests that harassment was perceived as normal: "Stalking was not viewed as a serious offense in this (cyber) form, despite the distress it caused to the victims, or expected from potential victims" [6].

The general aim of this study was to qualitatively expand understanding of attitudes to aggressive online behaviour. The specific research questions concerned the prevalence of online harassment amongst people who populate the Higher Education environment and to what extent policy awareness influences motivation to comply with acceptable online behavior. In addition normative explanations why individuals engage in online behaviour that distressed others was investigated.

2. Method

2.1 *Participant Demographics:*

The study utilized a self-selected sample of 103 anonymous participants all affiliated to an HE institution either as staff (academic 50%, or administrative 50%) or student member. 46.5 were women. 27.2 were members of staff, 28.2 were undergraduate students, 31.1% were PG students, 13.6% were recent graduates. Participants were aged 19-58 yrs (M=28).

2.2 *Questionnaire for the Survey*

The questionnaire contained questions recording demographics, The Classification of Aggressive Online Behaviour scale [7] and items to elicit the level of awareness of the AIUP within the individual's institution.

2.3 *Focus Groups*

25 Participants were invited to take part in 2 focus groups, 1 staff and 1 student (18-22 yrs). A semi-structured schedule was adhered to, which included questions relating to participants' use of social networking behaviours and their experiences. Academic members of staff as well as administrative members of staff participated in the staff focus group.

3. Results

3.1 *Policy and internet guidance*

Out of the 28 staff, (64%) were aware of an AIUP. Furthermore 51% of students, were aware of the existence of an AIUP. 55% of the respondents knew about the existence of an AIUP. Out of the complete sample, 67% of respondents had not accessed any guidance on how to use the internet, 61% (n=42) thought that any guidance on using the internet would not have been helpful.

3.2 *General findings on acceptability of behaviours*

Participants responded to questions about aggressive online behaviour. The responses are shown in table 1.

	A	U
One individual seeking and compiling information about other individual and using it to harass, threaten and intimidate him/her on- or off-line.	4.0%	96.0%
Repeated unsolicited e-mailing from one individual.	10.1%	89.9%
Repeated unsolicited Instant Messaging from one individual.	11.2%	88.8%
Electronic sabotage such as spamming and sending of viruses by one individual.	4.1%	95.9%
Theft of the individual's identity by other individual.	3.0%	97.0%
One individual subscribing another individual to services without his/her knowledge or permission.	3.1%	96.9%
One individual purchasing goods and services in another individual's name without his/her knowledge or permission.	5.0%	95.0%
One individual using different identities in an attempt to contact another individual on-line.	7.1%	92.9%
One individual sending or posting hostile material, misinformation and false messages about other individuals.	3.0%	97.0%
One individual tricking other internet users into harassing or threatening other individual (e.g. by posting my personal details on a bulletin board).	3.1%	96.9%
One individual making frequent (more than once a day) mobile phone calls or texts to other individual.	16.2%	83.3%

Table 1. Quantitative results on perceived acceptable (A) and unacceptable behavior (U)

3.3 *Qualitative results*

Eight overarching themes emerged from the analysis, 'how people are perceived online', 'unpleasant experiences happened in adolescence', 'not taking the online environment too seriously', 'reactions to negative online communication', 'people seeking attention', 'online norms are common sense', 'easily adapting to online platforms' and 'lack of awareness AIUP'. All of the respondents agreed that it is important how people perceive them online and they have to be careful about what they select to represent them on their various social networking profiles: *"you have to carefully select it because it is there for everyone to see. So you want to make a good impression, something like that. I think it happens subconsciously''.* When asked if they create an online persona, some of the participants agreed, although there was variation: *".you just select some parts of your personality and expose that''.* One participant reported that their profile was shaped by other people by means of tagging in pictures*"I think I would probably notice that 95% of my pictures on my Facebook are of me being drunk or are related to alcohol consumption'* 'Another participant

confessed that he felt embarrassed by past online presence as this does not represent him anymore *"It is embarrassing. And then I delete everything''.* These quotes suggest

young people are indeed concerned with how they appear to be online; in most cases they are aware that their self-image changes over time, but may be undisturbed by disparity as the online environment is not seen as *"such a serious matter'.*

All of the participants talking about different negative online experiences expressed that they had happened during adolescence and not while in HE. *'It is definitely a more mature environment, as we do not bully each other as we used to do in high school''* . Current experiences of mildly negative online behaviour were treated differently as they are more familiar with the internet and people only say *"mean stuff''* online because they "*experience a perceived power given by the fact they are behind a desktop rather than face-to-face".* Participants felt that when young and less knowledgeable they were more vulnerable to cyberbullying. *"I think as you get older you realise the things you should and should not do online, but I think that when we are younger we should be told about the dangers of the online environment''* Another finding on this particular theme was that female participants reported more frequent malicious communication in the online environment (mostly bullying) than male participants did.

The data also revealed a general tendency not take the online environment too seriously, *"Have we not all posted something we now regret? I have". "It was meant to be a joke, but looking back now, I regret having done it". "It is stuff you regret but it's not awful. You put something on and then you look back the morning after and you ask yourself why you put that on. But it's not mean, it's just embarrassing yourself''.* When asked how they felt about someone else posting using their identity their responses were inconsistent. *"If it's a close friend I would not mind that, but obviously if they are strangers...'', "It is not really something serious so it's not something you should be sympathetic about". "You just do it and then you think why did I do that? You do it to someone you know and you mock them for not being careful with their phone. Lack of common sense''.* However events were disclosed from their school online experiences which were perceived as more serious and had received interventions from police, school management and/or parents. However in a case where the participant reported the greatest degree of distress, no intervention was sought. *"I only then realised how serious the situation was and that I should have let someone know about what was going on but, I was young...what did I know?"*

Participants discussed how they reacted if they saw a negative post on their news feed, *"There was this girl in my high school and we started making fun of her on Facebook... there was someone that actually said guys, you are crossing a line and then everyone stopped with the nasty comments. We realised we had gone too far". "Sometimes I hold back or sometimes I would say 'you should not say that, this is stupid'. People always find out these kind of things, 'cause people talk to each other' "The only case I would say something is if they say something stupid or insolent, I would say something. This is really the only case you can say something''.* When asked if they would tell a friend that their online presence was aggressive, everyone agreed that they would do it but privately, in order to protect that person's reputation. When asked if they would intervene in a conversation where one of their close friends was bullied by another close friend, they said: *"I would probably just talk privately with them. If it is*

something that would make one of your friends look back, you would not add fuel to the fire. So you take it somewhere else. Privately' 'If it is someone that I do not particularly like, I would not go out of my way to save them''.

The above discussions lead to comments from participants and all female participants, indicating that they believed that some people who post negatively deserve to be bullied because they themselves seek attention. *"Yes, people might deserve what they are getting. Some people post stuff to seek for attention. They intentionally invite people to have an argument. Like some people would post something good heartedly and others would be bastards". "If there is someone that is constantly posting crap then I would probably like to see it blow up in their face. Cause people that just post rubbish are quite annoying. But then good heartedly people that just post an opinion and it blows in their face, I think that is quite different. I think it depends on who is being bullied''.* Some views were more extreme *"In some cases it is almost like girls invite for rape''.*
All of the participants, expressed the belief that women are in a more vulnerable situation than men are, when online. Moreover, there was a general consensus on the fact that males should deal with whatever issue they are facing on their own, that because they are men they should have the coping mechanisms and be able to resolve episodes of cyberbullying or cyberstalking.

Another theme that emerged was that online norms, amongst this age group are common sense. *"A few years ago, there was this guy that said something like 'I hate Islam'. Now, you just cannot say that sort of thing on Facebook. I don't think people think as they should do, when they post this kind of thing". "I don't think I would reveal my personal information online. I think that comes to common sense again".* All participants were asked if they had ever had any workshops, training or any other sort of guidance on the use of the internet and social media platforms. *"No, there was no-one telling me how to use the internet. But I think it's common sense. You know all those things you were told as a child, I think you can apply all of those to online social networking''. "My beliefs are similar except that we have been told in school about the dangers of social networks. General stuff like don't accept people you don't know". "My parents told me to be careful with what I post on my page and do not accept people I don't know''.*

When asked about adapting to new platforms, all of the participants confirmed they did customise their privacy settings on all of their social media accounts independently of guidance. *"I would have done it anyway''.* Two students said they have done so because of their parents' "*nagging*''. When asked what type of communication they use for university related work, the answers were: Facebook groups and mobile messaging: *"Everyone uses Facebook, it's easy'', "Everyone checks their Facebook at least once a day''.* They also used these platforms for course work *"I actually have a Facebook group for one of my projects. We use it to get in touch with each other and arrange meetings. I think it is useful''. "It is helpful at times (Facebook) if people actually bother to respond".*

Participants were generally not aware of the AIUP. Those who did knew there was "*something you have to agree to when you log onto the Wi-Fi''* network but they did not ever read it: *"No, I didn't read it but it's common sense. You cannot go online and*

do all sorts of stuff in public! 'To be honest, these days, who reads terms and conditions?' 'We don't do it just because generally people can't be bothered''. "Even when I signed for Facebook I didn't read the terms and conditions cause I didn't care''. When asked what an AIUP should contain participants commented "*I think it says it is your responsibility what you do online and that they can track you down if you misbehave' 'I don't know, I would expect to find a lot on how to conduct yourself on social networking sites to be honest' 'I am pretty sure you cannot add any of your teachers on facebook until you are out of university. As in graduated''.* Most did not believe knowledge of an AIUP would create a safe space. "*I don't think such a policy would prevent anyone from doing anything. I think no one would listen if university would say you can't do this and can't do that''. "I think it would have the reverse effect. If university tells you not to do something, then you want to do it''. : "I don't agree with it. having policies. Especially when going to uni. If you are an adult why would they put all of these regulations in place? If that is how you want to spend your 9 grand....Obviously you come here to get a degree and move your way up into the world so if you wanna come here and spam people for 9 grand and then get kicked out of uni...is that person's issue.'' "To an extent, you can do whatever you want. But there are so many ways you can dodge the rules and laws and whatever. I think it's just up to the person.''"I think people pretty much ignore it. Young people post anything without thinking or caring.''*

After reading the AIUP to the focus group, students were asked whether they felt bound by the AIUP in any way, or thought it acted as a deterrent, they all shook their heads. *"Before today I did not even know there was one so...'', "I think it has no power whatsoever.'',* "*I don't see uni as too much of an authority figure. Cause it's optional, cause I came to them...'', "I don't think this would stop people. Everyone would still find a way to do whatever they were doing.''* All participants felt that the policy was rather relaxed and to them it constituted no deterrent to their online behaviour on the university's premises, whilst using its network. Nevertheless, they all came back to the issue of morality and common sense "*you would not do this, you don't need a document to tell you that is bad'*", believing that they are fully capable of controlling their behaviour and act in such a way not to cause anxiety to anyone around them.

3.4 *Staff Focus Groups*

All 8 participants had had negative online experiences. Whilst all their experiences varied in intensity, the online communications they received all threatened a wider staff group or the institution as a whole, rather than a single person. Most situations involved hacking email accounts, addressing and distributing classified material to an entire address book, or spamming. Even though these experiences were regular and were serious in nature participants reported that there had been no protocol in place for dealing with the events and had to '*play it by ear'*. Members of staff reported that at times there had been tense communication between staff and this was perceived to be due to the fact that email communication differs to that of than face-to-face encounters: *"...this member of staff constantly bullies me though e-mail but when he comes to my office he's like a puppy. Of course, when he talks to the screen he can be more... but when face-to-face, he would not dare to say those things.'', "I think the internet gives you the false perception that you can hide your identity.'', "I think with e-mails and all that is written basically, you can say so many things in so many ways and when*

reading it, you might misinterpret what the person wants to say.'' When they were asked about the AIUP, only a third of them were aware of its existence, all of whom were academics in the Computer Science and Technology department.

4. Discussion

Results from this study indicated that students perceived that online harassment was most acute in their adolescent years. Furthermore, female participants reported more negative experiences online than the male participants. This finding is consistent with a study conducted by Rivers and Noret in 2010 [8] on a young population (11-13 years) of nasty/threatening emails and text messages. However, all respondents believed that being more mature reduced the incidence of aggressive online behaviour. Furthermore, members of staff reported mild online aggressive behaviour which they considered to be due to a lack of face-to-face interaction, and was more likely to facilitate aggression. This is supported by studies reporting online toxic disinhibition which suggests that anonymity and lack of eye-contact contribute to a person's aggressive behaviour online [9, 10]. Additionally, participants also reported that language in emails can be easily misinterpreted and a person is not always alert to their written linguistic choices [11]

Only a third of the staff members that took part in the focus group knew about the existence of an AIUP. When made aware of the AIUP most participants said that their behaviour will not change in light of this new knowledge. There was a perception that because university "*is optional''* for students, no such rules should be enforced, and should not attract consequences. Computer Science and Technology staff were all aware of the AIUP due to subject knowledge rather than a user of electronic communication. Findings suggest that most participants believed that that some of the people experiencing cyberharassment or cyberbullying, attract abuse because they are perceived to be seeking attention. Participants reported that individuals who post provocative comments and pictures of themselves online must be prepared to confront the negative comments they receive, and that repercussions may be inevitable. In addition they expressed the belief that women are more vulnerable than men in the online environment. A finding consistent with previous studies of malicious communications which suggested that females encounter a greater number of distressing experiences online than men [6, 8].

This study presents a qualitative account of why people may engage in unacceptable online behaviour and what may influence that behaviour .Furthermore, findings indicate that the adoption of an AIUP may not influence students' online behaviour, nor may they see it as facilitating a safe space. Lastly, it seems that young people are learning through consequences of their own behaviour. Limitations of the current study are acknowledged, whilst representative, the sample might lack in cultural and social representation being drawn from one HE institution only: so normative beliefs may be specific to this University.

References

[1] E. Short, A. Guppy, J.A. Hart, and J. Barnes, The Impact of Cyberstalking, *Studies in Media and Communication* **3** (2015), 23-37
[2] M. Madden, A. Lenhart, S. Cortesi, U. Gasser, M. Duggan, A. Smith, and M. Beaton, Teens, social media, and privacy, *Pew Research Center* **21** (2013), 2-86.
[3] M. Alavi and D.E. Leidner, Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues, *MIS quarterly* (2001), 107-136.
[4] J. Finn, A survey of online harassment at a university campus, *Journal of interpersonal violence* **19** (2004), 468-483.
[5] J. Finn and M. Banach, Victimization online: The downside of seeking human services for women on the Internet, *CyberPsychology & Behavior* **3** (2000), 785-796.
[6] E. Short and I. McMurray, Mobile Phone Harassment: An Exploration of Students' Perceptions of Intrusive Texting Behavior, *Human Technology* **5** (2009), 163-180.
[7] L. Sheridan, Email with attached presentation to Short E., April 2009.
[8] I. Rivers and N. Noret, 'I h8 u': Findings from a five - year study of text and email bullying, *British Educational Research Journal* **36** (2010), 643-671.
[9] N. Lapidot-Lefler and A. Barak, Effects of anonymity, invisibility, and lack of eye-contact on toxic online disinhibition, *Computers in Human Behavior* **28** (2012), 434-443.
[10] J. Suler, The online disinhibition effect, *CyberPsychology & Behavior* **7** (2004), 321-326.
[11] K.M. Douglas and R.M. Sutton, By their words ye shall know them: Language abstraction and the likeability of describers, *European Journal of Social Psychology* **40** (2010), 366-374.

Examining the Role of Facebook in College Social Adjustment for First Year Undergraduate Students

Audrey STENSON[a,b1] and Irene CONNOLLY, [a]
[a] *IADT, Dun Laoghaire, Ireland*
[b] *University of Wolverhampton, UK.*

Abstract. The role of Facebook in college adjustment and perceived online social support for first year undergraduate students attending an Irish Institute of Technology was examined. Data was collected online from first year students (N=117). College adjustment was measured using the College Adjustment Test (CAT) and perceived online social support was measured using the Interpersonal Support Evaluation List (ISEL-12) which was adjusted to measure perceived online social support specifically on Facebook. Overall there was no significant relationship found between groups of Facebook friends, actual and college friends, college adjustment and perceived online social support. Further investigation revealed significant effect between the number of Facebook friends and the positive affect of college adjustment. The reasons for the differences in results in comparison to existing literature were attributed to the college size, cultural differences and the overall lack of definition of groups of Facebook friends.

Keywords. Facebook, College Adjustment, social support

1. Introduction

College adjustment is a multi-faceted area, the number of challenges facing first year students can be over-whelming and starting college is considered to be a major challenge of emerging adulthood [1, 2]. In the transition to college, social adjustment is one aspect of college adjustment that requires students to become integrated into college life and create new social networks.

Research suggested that the most common reasons for undergraduate Facebook use were to overcome a major challenge in establishing a social support network, to further widen and reflect existing social networks to offline and online relationships and to reinforce past and new relationships [3, 4, 5, 6, 7]. However, Facebook has been negatively correlated to psychological well-being, college engagement, academic performance, and academic adjustment amongst first year students [5, 8]. Other research showed that Facebook users tended to have reduced loneliness, reported higher levels of perceived social support and were more likely to have a larger number of close social ties [1, 2, 4, 9, 10]. Negative correlations between the number of total Facebook friends, popularity and social support were also reported [11]. Smaller self-reported groups of Facebook friends such as close, actual and college friends revealed positive correlations with college adjustment and perceived social support [3, 12, 13]. close friends was positively correlated with perceived social support, and actual friends

[1] Corresponding author, audrey.stenson@iadt.ie

was found to be a predictor for social bridging capital [3, 12]. Generally, evidence suggested that smaller groups of Facebook friends, such as college and actual Facebook friends, yielded significant results in examining college adjustment and social support [11, 13]. The meaning of Facebook friend groups were defined differently in research. Close friends were those who participants considered to be close in their Facebook network [12] and actual friends were considered to be friends within college [3], whereas Facebook friends comprised of offline and college friends only [5].

Moderating for gender in relation to perceived social support and college adjustment is generally lacking in research [14]. Canadian and American research suggested that increased social support from friends predicted improved college adjustment for first year students, however, there was an unequal balance of gender [15]. Qualitative Irish studies suggested differently for females. They were more likely to admit feeling alienated, isolated or anonymous in first year and depended upon close friends and family for support [14, 16]. However, other research found that moderate social adjustment to college predicted persistence to graduation and females were more likely to graduate than males [18]. In addition females used Facebook more, had more Facebook friends and reported lower satisfaction with college and generally reported receiving higher levels of social support during stressful times [9]. Irish studies suggested that females placed more importance on maintaining existing relationships whereas males were more likely to make new connections in first year [16, 17].

Overall findings, in both Irish and International studies, suggested that females are less adjusted to college than males in first year. Females depended upon established relationships for social support and reported higher Facebook use than males. On the other hand, males seem more adjusted in first year but are less likely to graduate, possibly because high social adjustment can be a distraction from academic achievement [18]. The extensive review of literature highlighted the question if the number of Facebook friends plays a role in college social adjustment for first year undergraduate college students in an Irish institute.

2. Method

4.1 Participants & Procedures

There was one primary dataset of seven classes across four departments in two faculties, 117 students participated (50.4% males, 49.6% females) which equaled 20% of the first year student cohort in an Irish Institute of Technology. From an original sample size of 186 students, 59 subjects were excluded from the data due to non-completion of the survey such as lack of consent, lack of Facebook account, non-completion of the CAT or the ISEL-12 [19, 20]. All participants were between the ages of 18 to 44 years.

Data collection was conducted in November and December, to allow students time to get to know classmates. Upon online consent, participants could proceed to the online survey. They were presented with a series of questions including demographic data: age, gender, current living arrangements, department of study, place of origin, number of college Facebook friends, number of actual Facebook friends and finally psychological measures on college adjustment and social support.

4.2 Measures

The number of Facebook Friends: Participants reported on the number of college friends (M=36.96, SD=50.70) and the number of actual friends (M=194.99, SD=239.93). The number of college Facebook friends was defined by the number of college friends who are friends on Facebook. The number of actual Facebook friends was defined by the number of offline friends who are friends on Facebook.

College Adjustment Test: The CAT [19] is a reliable 19-item self-report measure of college adjustment (Cronbach's $\alpha = 0.79$). Each item is scored on a 7-point Likert scale ranging from 1 = "not at all" to 7 = "a great deal". This analyzed participant's various thoughts and feelings about college the week prior to taking the test.

Perceived Online Social Support: The ISEL-12 [20] is a valid and reliable 12 item multi-dimensional inventory used to measure perceived social support on a 4-point Likert scale where 1 = "Definitely False" to 4 = "Definitely True". Similar to previous research the questions in the scale were adjusted to specifically ask about Facebook friends, for example: "If I wanted to go on a trip for a day (for example, in the country or mountains), I would have a hard time finding a friend to go with me" was adjusted to "If I wanted to go on a trip for a day (for example, in the country or mountains), I would have a hard time finding a friend on Facebook to go with me" [10, 11]. The adjusted index was reliable (Cronbach's $\alpha = 0.814$).

5 Results

To overcome the issue of skewed independent variables, data analysis used the independent variables groups of 'low', 'medium' and 'high' based on the cumulative percent of the variable frequency tables: college Facebook Friends (Low: 2-21; Medium: 22-34; High: 35–406); actual Facebook friends (Low: 0-30; Medium: 32-150; High: 200-1000). Hypothesis 1 [H1], male students will show higher college adjustment than females based on the number of college Facebook friends. An ANOVA between groups of college Facebook friends and gender on overall college adjustment revealed a significant small effect between gender and college adjustment ($F(1,111)=8.042$, $p=.005$, partial $\eta 2 =.068$). Overall, there was no statistical significance between the number of college Facebook friends and gender on overall college adjustment ($F(2,111)=.306$, $p=.737$, partial $\eta 2 =.005$), therefore H1 was not supported. An ANOVA between groups of college Facebook friends, gender and positive affect revealed a significant small effect between the number of college Facebook friends and positive affect of College Adjustment ($F(2,111)=4.255$, $p=.017$, partial $\eta^2 =.071$), see Table 1 for more details

Table 1. ANOVA of Gender and College Facebook Friends on Positive Effect

Source	*df*	*F*	η	*P*
Gender	1	3.127	0.027	0.08
College Facebook Friends	2	4.255	0.071	0.017
Gender*College Facebook Friends	2	0.318	0.006	0.728

Note $p<0.05$

Hypothesis 2 [H2], female students will show higher college adjustment than males based on the number of actual Facebook friends. An ANOVA between groups of actual Facebook friends and gender on overall college adjustment was conducted. No significant effect was found (F(2,111)=.170, p=.844, partial η2 =.003), therefore H2 was not supported. To further investigate the differences in gender and the number of actual Facebook friends on college adjustment, an ANOVA revealed a significant small effect for gender and actual Facebook friends on college adjustment positive affect (*F*(2,111)=3.116, *p*=.048, partial η^2 =.053), see Table 2 for more details.

Table 2. ANOVA of Gender and Actual Facebook Friends on Positive Effect

Source	*df*	*F*	η	*p*
Gender	1	6.292	0.054	0.014
Actual Facebook Friends	2	1.209	0.021	0.302
Gender * Actual Facebook Friends	2	3.116	0.053	0.048

Note p<0.05

Hypothesis 3 [H3], female students will have higher perceived online social support than males based on the number of actual Facebook friends. An ANOVA between groups of actual Facebook friends, gender and overall social support was conducted and the effect approached significance (F(2,111)=2.779, p=.066, partial η2=.048), therefore H3 was not supported. Further investigation of the means suggested that males (N=6, M=41.83) showed higher perceived social support, when the number of actual Facebook friends was between 32 and 150 (medium group). In contrast, females (N=8,M=34.625), reported lower overall social support for the same group but marginally higher overall social support for the low and high groups.

Hypothesis 4 [H4], male students will have higher perceived online social support than females based on the number of college Facebook friends. An ANOVA of the number of college Facebook friends, gender and overall social support was conducted. The results revealed no significant effect (F(2,111)=.323, p=.724, partial η2 =.006), therefore H4 was not supported. To further investigate perceived online social support, an ANOVA between groups of college Facebook friends and gender revealed a significant small effect between gender and social appraisal (F(1,111)=4.829, p=.030, partial η2=.042). An analysis of the means showed that females (N=58, M=13.10) reported a marginally higher social appraisal score than males (N=59, M=11.83) based on the number of college Facebook friends.

6 Discussion

The findings of this study suggested that groups of Facebook friends did not play a significant role in overall college social adjustment for first year college students. On further investigation of college adjustment, results revealed that the number of actual Facebook friends and gender had a significant small effect on the positive affect of college adjustment. Results indicated that males have a higher positive affect score

than females based on the number of actual Facebook friends. This relationship contradicted previous research where more importance was placed on maintaining old friendships by females rather than males [18]. It could be suggested that actual friends are more important to males than college friends in college adjustment. The number of college Facebook friends was significant in the positive affect of college adjustment which was not gender specific. This result could be expected given that forging relationships early amongst peers resulted in better adjustment to college [14].

Significant effect was found between gender and social appraisal based on college Facebook friends which suggested that females show a marginally higher social appraisal score than males, which is in contrast to other studies where females are more likely to stay in touch with old friends [17]. However females reported higher social appraisal than males based on the medium and high groups of actual Facebook friends, which is in contrast to other studies where it was suggested that gender does not moderate social support [2].

The lack of significant findings may be attributed to a number of factors. Self-report mechanisms can be open to error, the reported number of actual Facebook friends may have been taken from the Facebook profiles [7]. It is also possible that the participants applied a heuristic based on their number of actual friends to gauge social support, research has suggested that the greater the number of friends then the more perceived social support [12]. Research has suggested some factors which affected predictors of college adjustment such as the student cohort and the size of the college [9]. Most of the existing research is American, subsequently the college and sample sizes are larger than Irish Institutes of Technology. There were differences in student bodies in existing literature and the current study, it is important to note that in the current study, the college is small and offers a diverse range of courses attracting a varied range of skill and interests [15]. Furthermore the Facebook variables in this study were not normally distributed, possibly due to the diverse range of students, gender distribution and courses in each department. Additionally, the timing of the survey may have been too late into the first term, it is possible that students had already established relationships with their peers in college, therefore college friends may have been considered actual friends. Earlier timing of the survey may have shown more of a distinction between the two groups of friends. It is also important to note that the differences in measures may have resulted in contradicting results for example, the ISEL-12 was adjusted to specifically measure online social support which differed to previous research [3].

Future research in this area should also take into account a college adjustment survey that is culturally specific to Irish third level students. The current study reported that 71% of all participants reported living in the family home and were not residing on-campus and therefore may have found it difficult to relate to the questions in the CAT [19]. Future studies could consider other popular social media sites amongst first year students. In addition, groups of Facebook friends should be defined.

7 Conclusion

This study is the first empirical Irish study in this area that could shed light on the use of social media in the role of college social adjustment amongst Irish first year undergraduate students. Overall, findings such as these may have implications for first year induction programmes insofar as highlighting gender differences in college adjustment and perceived online social support.

References

[1] M. Credé and S. Niehorster, Adjustment to college as measured by the student adaptation to college questionnaire: A quantitative review of its structure and relationships with correlates and consequences. *Educational Psychology Review* **24** (2012), 133–65.

[2] J.F. Mattanah, J.F. Ayers, B.L. Brand, L.J. Brooks, J.L. Quimby, and S.W. McNary, A social support intervention to ease the college transition: exploring the main effects and moderators. *Journal of College Student Development* **51** (2010), 93-108.

[3] N.B. Ellison, C. Steinfield and C. Lampe, Connection strategies: Social capital implications of Facebook enabled communications practice. New Media and Society **13** (2011), 873-92.

[4] C. Madge, J. Meek, J. Wellens and T. Hooley, Facebook, social integration and informal learning at university: 'It is more for socializing and talking to friends about work that for actually doing work'. Learning, Media & Technology **24** (2009), 141-5.

[5] M. Kalpidou, D. Costin and J. Morris, The relationship between Facebook and the well-being of undergraduate college students. Cyberpsychology, Behavior and Social Networking **14** (2011), 183–9.

[6] D.M. Boyd and N.B. Ellison, Social network sites: Definition, history and scholarship. Journal of Computer-Mediated Communication **13** (2007), 210-30.

[7] N.B. Ellison, C. Steinfield and C. Lampe, The benefits of Facebook "friends": Social capital and college students' use of online social network sites. Journal of Computer-Mediated Communication **12** (2007), 1143-68.

[8] D.C. DeAndrea, N.B. Ellison, R. LaRose, C. Steinfield and A. Fiore, Serious social media: On the use of social media for improving students' adjustment to college. Internet & Higher Education (2011).

[9] R. LaRose, D. Y. Wohn, N. Ellison and C. Steinfield, Facebook Fiends: Compulsive social networking and adjustment to college. Presented at IADIS Multiconference on Computer Science and Information Systems (2011), Rome Italy.

[10] A. M. Manago, T. Taylor and P.M. Greenfield, Me and my 400 friends: The anatomy of college students' Facebook networks, their communication patterns, and well-being. Development Psychology **48** (2012), 369-80.

[11] J. Kim and J.E.R Lee, The Facebook paths to happiness: Effects of the number of Facebook friends and self-presentation on subjective well-being. Cyberpsychology, Behavior and Social Networking 2011; 14:359-64.

[12] R.L. Nabi, A. Prestin and J. So, Facebook Friends with (health) benefits? Exploring social network site use and perceptions of social support, stress, and well-being. Cyberpsychology, Behavior, and Social Networking **10** (2013), 721-7.

[13] R. Gray, J. Vitak, E.W. Easton and N. Ellison, Examining social adjustment to college in the age of social media: Factors influencing successful transitions and persistence. Computers & Education **67** (2013), 193-207.

[14] L.D. Pittman and A. Richmond. University belonging, friendship quality and psychological adjustment during transition to college. Journal of Experimental Education **76** (2008), 343–61.

[15] L. J. Friedlander, G.J. Reid, N. Shupak, and R. Cribbie, Social support, self-esteem, and stress as predictors of adjustment to university among first-year undergraduates. Journal of College Student Development **48** (2007), 259-74.

[16] B. Redmond, S. Quin, C. Devitt and J. Archbold, A qualitative investigation into the reasons why students exit from the first year of their programme and UCD. (2011) www.ucd.ie/t4cms/Reasons%20Why%20Students%20Leave.pdf (accessed March 29, 2014)

[17] E. Eivers, R. Flanagan and M. Morgan, Non-completion in Institutes of Technology: An investigation of preparation, attitudes and behaviours amongst first year students. Educational Research Centre (2002). www.iotireland.ie/documents/144_Non-completion%20in%20ITs.pdf (accessed March, 29, 2014)

[18] M.G. Wintre and C.D. Bowers, Predictors of persistence to graduation: Extending a model and data on the transition to university model. Canadian Journal of Behavioural Science **39** (2007), 220-34.
[19] J.W. Pennebaker, M. Colder and L.K. Sharp. Accelerating the coping process. Journal of Personality and Social Psychology **58** (1990), 528-37.
[20] S. Cohen and H.M. Hoberman, Positive events and social supports of buffers of life change stress. Journal of Applied Social Psychology **13** (1983), 99-125.

Using and Intending: how personal intentions can influence the User Experience of interactive technologies

Stefano TRIBERTI [a,1] Andrea GAGGIOLI, [a,b] and Giuseppe RIVA [a,b]
[a] *Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy*
[b] *Applied Technology for Neuro-Psychology Laboratory, Istituto Auxologico Italiano, Milan, Italy*

Abstract. Usability and User Experience evaluations often collect users' opinions about products/technologies regardless of users' intentions. Specifically, in order to analyze quality features of a technology, random users can be interviewed about experienced/expected usability, emotional responses, mental workload after or before actual use. Nevertheless, according to the Perfect Interaction Model, an emergent framework in the field of User Experience, users' responses may vary depending on their tendency to perceive the technology as an opportunity to achieve their own personal goals. In order to test this hypothesis, seventy-one participants were asked to evaluate a website (specifically, a web service for honeymoon planning) in terms of expected usability, emotions and mental workload. Participants in the experimental group provided their evaluations identifying themselves with characters in fictional narratives containing an intention related to the main function of the website, while those in the control group evaluated it acting as impartial evaluators. Results showed that the participants in the experimental group evaluated the website as related to more intense emotions and higher mental workload. Moreover, an interaction effect appeared while considering gender: females in the experimental group considered the website less usable than control ones, while the opposite happened for males. The importance of taking into account users' intentions prior to User Experience and Usability evaluations is discussed.

Keywords. Usability, User Experience, Technology Evaluation, Perfect Interaction Model, Intention

1. Introduction

Both the academia and the industry share a growing interest in how to evaluate User Experience (UX) regarding products, technologies and services [1]. According to literature [1–3], UX evaluations encompass objective variables related to usability (e.g.: efficacy, effectiveness, learnability) and go beyond them, towards subjective hedonic and contextual variables related to actual and/or anticipated usage (e.g. emotions, pleasure, individual differences). Usability and User Experience evaluations are often conducted without regard to the personal concerns of users. That is, users are often chosen randomly [4–6], similarly to the sampling of psychological experimental

[1] Corresponding author, stefano.triberti@unicatt.it

research. Then, the users are asked to assess aspects of the technology or the interaction (experienced or expected usability, emotions, mental workload/cognitive effort) from a generic point of view.

According to emergent paradigms in the field of UX, such practice may be counterproductive regarding the obtainment of a reliable grasp of the users' attitude towards the products. The "Perfect Interaction Model" (PIM) [7–9] is based on the assumption that the product's characteristics should *dovetail* with the intentions/goals of the users. For instance, a website interface may be actually well-designed and generally usable: the icons are easy to be identified, the structure is easy to understand, and the user experiences no difficulty in navigating it. Despite this, the user may land on the website with a specific intention that is not consistent with the functions expressed by the website. Independently of the positive usability qualities of the website, the inconsistency between user's intentions and the website's functional characteristics may result in an overall negative user experience.

Indeed, users are characterized by distal intentions [9–11], that are, personal concerns and ultimate objectives, general and abstract, to be achieved throughout long periods of time. Such objectives influence the perception of everyday life events, especially orienting the detection of opportunities for action (affordances) in the external environment [9,12–14].

In the present work, it is hypothesized that the presence/absence in users of distal intentions consistent with the core function of a service to be evaluated can influence their final evaluations. For the sake of the experimental purposes, a web service for *honeymoon planning* has been chosen as an object for UX evaluation.

Honeymoon planning and buying is certainly an activity with notable value: usually, the customer views it as the once-in-a-lifetime travel, an occasion to celebrate his/her own love story with the significant other. Marketing research on the topic acknowledged that such an activity is usually the result of a careful decision making process [15], the most important criteria being safety, excellent quality of accommodation and an affordable cost. Indeed, the tension between feelings/desires and limited finances is a frequent reason for emotional distress [16]. For what regards online buying, it has been suggested that honeymoon customers would be positively-oriented towards websites that include environmental cues with an emotional appeal in their design [17].

Basing on these aspects, we expected that users with a personal concern/intention related to honeymoon planning (i.e.: to find the perfect vacation to take after an incoming wedding) will attribute more intense emotions (positive and negative) to the interaction with the website, and will allocate more cognitive resources to its exploration, than users acting as objective/impartial evaluators. Moreover, we hypothesized that also the website's usability properties could be perceived differently by users with a consistent distal intention.

2. Methods

Seventy-one volunteers (36 males, 35 females, age range 20-40, M=25.73 ; DS= 4.1) participated in the research. They were recruited thanks to public advertisements. None of them was aware of the specific purposes of the study. They signed an informed consent form in order to join the experiment.

The participants were asked to evaluate a honeymoon planning web service in terms of UX qualities. Specifically, the aspects evaluated by the participants were:

- *Expected Usability*, that is the user's impression about the technology being more or less usable basing on a limited exposure (usually prior to actual, in-depth use). Although expected usability may have controversial relations with experienced usability [18,19], it is considered a reliable measure about the use qualities of a product and it can be analyzed for both applied and research aims [20–22]. A measure of expected usability composed by 7 items on 7-points Likert scales [19] has been used, investigating aspects of the evaluated websites such as easiness to find information, clarity of the site's structure, learnability and memorability.
- *Emotions*, defined as the global emotional responses to the technological product as a stimulus. According to the importance for UX approaches of capturing the complexity of emotional responses [23,24], the participants first evaluated generic-emotional intensity [25] on a 7-points Likert scale, and then the degree to which they felt specific categories of emotions (namely joy, anxiety, interest, sadness, anger) on 7-points Likert scales, a method quite common in the literature since the research on emotional reactions to media contents [26].
- *Mental workload*, here defined as the felt cognitive fatigue experienced by the participants while analyzing the websites. It has been measured on a 10-points Likert scale, as it is done by the main instruments assessing this construct [27].

As an experimental manipulation, the participants evaluating the websites were split into two groups, one with a distal intention related to the concept of the evaluated website (experimental group), and the other with instructions to evaluate the website from the point of view of an impartial evaluator (control group). Since distal intentions are typically autonomously generated by people on long-lasting periods of time, it was impossible to promote them artificially. For this reason, in order to provide the experimental group with consistent distal intentions, the expedient of fictional narratives has been used, asking to the participants to provide their evaluations of the website identifying themselves within the fictional characters (table 1). Such a method is used in media and emotion studies [28], when the research aims at analyzing participants' responses to events/stimuli which cannot be reproduced in the laboratory.

Table 1. The narratives given to the participants: the experimental group had a distal intention consistent with the website to evaluate, while the control group identified within an impartial evaluator.

Distal Intention Narrative (Experimental Group)	Narrative of the Impartial Evaluator (Control Group)
"You are about to get married. You have promised to the partner that you would have chosen and planned the honeymoon, but so far you have not yet found a suitable option for your needs, and the clock is ticking! You decided to dedicate the entire day to looking for options on the internet, and now you have found this site. Your goal is to find an opportunity for an important trip, the once in a lifetime travel!"	*"You're a professional working with the evaluation of websites. Your job is to analyze websites to see if they are easy to use and understandable for users surfing the web. You've been hired to evaluate this website. Your goal is to observe it carefully, and provide a rational and objective evaluation of its comprehensibility and effectiveness."*

3. Results

Multivariate ANOVA has been run with Group and Sex as independent variables, and usability evaluation, emotions evaluations and mental workload evaluation as the dependent variables. Several differences emerged by Group, and they are showed in table 2. Specifically, the participants who identified within the fictional narrative with consistent distal intention, then evaluated the honeymoon web service as related to more intense emotions, higher joy, anxiety, interest and mental workload than did the control group.

Table 2. Differences among the dependent variables by Group (*= $p < .05$; ** = $p < .01$)

Variable	F	*P*	η^2	Distal Intention (mean ; S.D.)	Impartial Evaluator (mean ; S.D.)
Emotional Intensity**	8.766	.004	.116	4.20 ; 1.47	3.11 ; 1.43
Joy**	18.683	.000	.218	5 ; 1.28	3.5 ; 1.55
Anxiety*	4.742	.033	.066	2.6 ; 1.71	1.8 ; 1.52
Interest**	21.842	.000	.246	5.51 ; 1.4	3.8 ; 1.56
Anger	.952	.333	.014	1.45 ; 0.88	1.77 ; 1.55
Sadness	.268	.607	.004	1.54 ; 1.06	1.72 ; 1.42
Mental Workload**	20.484	.000	.234	6.08 ; 2.75	3.33 ; 2.11
Expected Usability	.780	.380	.012	35.28 ; 7.62	33.72 ; 8.12

Moreover, an interaction effect by group and sex emerged regarding usability evaluations: $F(1, 67)= 5.192$, $p= .026$, $\eta^2 =.072$. Females in the experimental group evaluated the website as less usable (mean=34.38, D.S:=6.71) than did the males (mean=36.64, D.S.=8.9), while the opposite happened in the control group: here, the females considered the website more usable (mean=36.94, D.S.=5.43) than did the males (mean= 30.84, D.S.=9.14).

4. Discussion and Conclusions

In the present research, two groups of users were asked to evaluate a specific technology, namely a honeymoon planning web service. The two groups had been exposed to two different fictional narratives designed to promote rather the identification within a distal intention/personal concern associated to the main function of the web service, or the identification within an objective, impartial evaluator who was not influenced by personal needs in his/her own judgment. The results showed that having a distal intention consistent with the functions of a technology to evaluate may influence UX evaluations. Specifically, those with the intention of actually planning a honeymoon projected intense positive emotions (Joy, Interest) onto a technology that represents the opportunity to advance towards the fulfillment of the pleasant distal intention. At the same time, they also experienced higher anxiety than the control group while interacting with the website, given the personal relevance of the objective to be achieved. This certainly highlights the complexity of emotions that could characterize the interaction with a technology, especially when the technology could represent an affordance to achieve objectives with a notable subjective relevance. Moreover, again the participants with a distal intention attributed more mental effort to the interaction

with the website, because of the need to carefully make use of its limited functions. The last result of the research is maybe more difficult to interpret: females in the experimental group considered the website less usable than control ones, while the opposite happened for males. This could maybe be related to computer self-efficacy, in that females usually consider themselves less skilled than males in using computer-related technologies [29]. For this reason, when asked to evaluate a website they were expected to use for relevant, personal concerns, they were more severe in evaluating its usability properties. However, the experimental manipulation of distal intention vs. impartial evaluation was not able to generate a significant difference for what regarded usability, and this apparently falsifies one of the research hypotheses. It is also possible that the use of fictional narratives and the recourse to expected usability have made not possible to capture the essence of the construct. Future research should (1) privilege groups of participants characterized by real distal intentions, and (2) analyze experienced usability, that is, usability evaluations after complete/in-depth interaction with the technology. For instance, real expert/impartial evaluators and real users of the website may be confronted in future studies on the topic.

Although preliminary, these results show that technology evaluation should be conducted with particular attention devoted to the choice of samples, also controlling for personal concerns (distal intentions) that may deeply influence an evaluation erroneously taken as generic and impartial by UX professionals.

Certainly the present study has its main limitation in the use of fictional narratives to "promote" distal intentions in the users. However, future research which would find a way to test the influence of specific "real" distal intentions of users on technology evaluations, could maybe discover an even stronger effect of them on users' final opinions.

References

[1] A.P.O.S. Vermeeren, E.L. Law , V. Roto, M. Obrist M, J. Hoonhoutì, and K. Väänänen-Vainio-Mattila, User experience evaluation methods. *Proceedings of the 6th Nordic Conference on Human-Computer Interaction Extending Boundaries - NordiCHI '10,* (2010), 521.

[2] V. Roto, E.L. Law, A.P.O.S. Vermeeren, and J. Hoonhout. User Experience White Paper: Bringing clarity to the concept of user experience. *Proceedings of the Seminar on Demarcating User Experience,* (2010), 12

[3] M. Hassenzahl, and N. Tractinsky, User experience - a research agenda. *Behaviour & Information Technology,* **25** (2006), 91–97.

[4] K. Hornbæk, Current practice in measuring usability: Challenges to usability studies and research. *International Journal of Human Computer Studies,* **64** (2006), 79–102.

[5] J.R. Lewis, Sample sizes for usability studies: additional considerations. *Human factors* ***36*** (1994), 368–378.

[6] M. Schmettow, Sample size in usability studies. *Communications of the ACM* **55** (2012) , 64.

[7] S. Triberti, and G. Riva, Engaging users to design positive tecnologies for patient engagement: The Perfect Interaction Model. In: G. Graffigna, S. Barello, S. Triberti, editors. *Patient Engagement: a consumer centered model to innovate healthcare*, De Gruyter Open, Berlin, 2015.

[8] S. Triberti, A. Chirico, and G. Riva, New technologies as opportunities for flow experience: a framework for the analysis. In: L. Harmat , F.Ø. Andersen, F. Ullén, J. Wright, and G. Sadlo, editors. *Flow Experience: Empirical Research and Applications*, Springer, New York, 2016.

[9] S. Triberti, and G. Riva, Being present in action: a theoretical model about the "interlocking" between intentions and environmental affordances, *Frontiers in Psychology,* **6** (2016), 2052.

[10] E. Pacherie, Towards a dynamic theory of intentions. In: S. Pockett, W.P. Banks, and S. Gallagher, editors, *Does consciousness cause behavior? ,* Mit Press, Cambridge, 2006.

[11] E. Pacherie, The phenomenology of action: a conceptual framework, *Cognition* **107** (2008), 179–217.

[12] W.W. Gaver, Technology affordances. *Proceedings of the SIGCHI conference on Human factors in computing systems Reaching through technology - CHI '91* (1991) , 79–84.
[13] V. Kaptelinin, and B. Nardi, Affordances in HCI: toward a mediated action perspective . *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems*, (2012). 967–976.
[14] K.B. Baerentsen, and J. Trettvik, An Activity Theory Approach to Affordance. *NordiCHI* (2002), 51–60.
[15] C.F. Lee, H.I. Huang, and W.C. Chen, The Determinants of Honeymoon Destination Choice—The Case of Taiwan. *Journal of Travel & Tourism Marketing* **27** (2010), 676–693.
[16] R.J. Kwortnik, and W.T. Ross, The role of positive emotions in experiential decisions, *International Journal of Research in Marketing* **24** (2007) , 324–335.
[17] A. Douglas, J. Mills, and R. Kavanaugh, Exploring the Use of Emotional Features at Romantic Destination Websites. In: M. Sigala, L. Mich, and J. Murphy, editors, *Information and Communication Technologies in Tourism 2007*, Springer Vienna, Vienna, 2007
[18] J.I. Kuijk, E.E. van Preijde, E.N. Toet, and H. Kanis, Expected versus experienced usability: what you see is not always what you get, *Assessment* (2009)
[19] M.T. Thielsch, R. Engel, and G. Hirschfeld, Expected usability is not a valid indicator of experienced usability, *PeerJ Computer Science* (2015) , 1–19.
[20] D. Belanche, L.V. Casaló, and M. Guinalíu, Website usability, consumer satisfaction and the intention to use a website: The moderating effect of perceived risk, *Journal of Retailing and Consumer Services* **19** (2012), 124–132.
[21] R. Emmanuele, and B. Simionato, Usability Perception. In: W. Green, and P.W. Jordan, editors, P*leasure with Products: Beyond Usability*, CTI, London, 2003.
[22] T. Keinonen, Expected usability and product preference, *Proceedings of the conference on Designing interactive systems processes practices methods and techniques DIS 97*, (1997).
[23] S. Mahlke, Studying affect and emotions as important parts of the user experience,*Workshop on the Role of Emotion in Human-Computer Interaction, HCI conference ,* (2005).
[24] T. Partala, and A. Kallinen, Understanding the most satisfying and unsatisfying user experiences: Emotions, psychological needs, and context, *Interacting with Computers* **24** (2012), 25–34.
[25] M.D. Robinson, and G.L. Clore. Belief and feeling: Evidence for an accessibility model of emotional self-report, *Psychological Bulletin* **128** (2002), 934–960.
[26] J. Rottenberg, R.D. Ray, and J.J. Gross, Emotion elicitation using films. In: J. Coan, and J. Allen, editors, *Handbook of emotion elicitation and assessment,* Oxford University Press, Oxford, 2007.
[27] S. Hart, and L.E. Staveland, Development of NASA-TLX (Task Load Index): Results of empirical and theoretical research, In: C.A. Hancock, and N. Meshkati, editors, *Human Mental Workload,* North Holland Press, Amsterdam, 1988.
[28] G.C. Cupchik, K. Oatley, and P. Vorderer, Emotional effects of reading excerpts from short stories by James Joyce, *Poetics* **25** (1998), 363–377.
[29] S. Cassidy, and P. Eachus, Developing the Computer User Self-Efficacy (Cuse) Scale: Investigating the Relationship between Computer Self-Efficacy, Gender and Experience with Computers, *Journal of Educational Computing Research* **26** (2002), 133–153.

SECTION V

CLINICAL OBSERVATIONS

Cybertherapy is a field that is growing rap-idly due to today's technology and informa-tion 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 rehabili-tation and distraction during painful or un-pleasant 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 Inter-net worlds are swiftly demonstrating their usefulness in cybertherapy applications.

Wiederhold & Wiederhold, 2004

Cue Exposure Treatment through Virtual Reality Reduce Cigarette Craving in Real Life Environments

Irene PERICOT-VALVERDE [a,1] Marta FERRER-GARCÍA[b], Joana PLA-SANJUANELO[b], Roberto SECADES-VILLA[a] and José GUTIÉRREZ-MALDONADO[b],
[a]*University of Oviedo, Spain*
[b]*University of Barcelona, Spain*

Abstract. Previous studies have shown that cigarette craving can be effectively reduced through virtual reality cue exposure treatment (VR-CET) in the laboratory. However, to date no study has analyzed the generalization of VR-CET effects in real world contexts. The main objective of this study was to explore the influence of VR-CET into real life. The results of this research show that cigarette craving towards smoking-related cues into real life was reduced after treatment. This finding provides evidence that VR-CET could improve extinction generalizability across contexts which could be critically important for the efficacy of smoking cessation treatments.

Keywords. Cigarette craving, Virtual Reality, Cue Exposure Treatment, Real World Contexts

1. Introduction

Cigarette smoking is a leading cause of preventable mortality and morbidity in the world. However, smoking prevalence remains extremely high: approximately 26% of the European Union population and 17% of United States population are current smokers [1,2]. The vast majority of smokers report that they would like to quit and almost half make a quit attempt each year. Nevertheless, most of those efforts fail [3]. Cigarette craving is usually considered a principal cause of compulsive smoking [4] and primarily responsible for the difficulties that people encounter when they are trying to quit, sometimes producing relapse [5]. Thus, a number of researchers have attempted to develop effective interventions to reduce cigarette craving. Smoking-related cues produce robust increases in craving among smokers [6], and even years after quitting, the presence of cues related to cigarette use can provoke craving in abstinent individuals.

[1] Corresponding author, ipericotvalverde@gmail.com

[1] Cue Exposure Treatment (CET) was developed to extinguish craving responses that produce exposure to drug-related cues in individuals with substance use disorders. Specifically, CET consists of controlled and repeated exposure to drug-related cues in absence of drug ingestion [7,8]. Traditionally, several modalities of cue presentation have been used to conduct CET such as *in vivo*, imaginary procedures, photographs and videos. An innovative and cutting-edge mode of CET application that has received increasing attention in the literature is the use of virtual reality (VR). Previous studies have shown that cigarette craving can be effectively reduced by applying CET through VR in laboratory settings [9,10]. However, to our knowledge, no study to date has analyzed the generalization of VR-CET effects into real life.

We sought to address this gap in knowledge by conducting an experimental study. The specific aim of the present research is to explore the influence of VR-CET on craving for cigarettes in real world contexts.

2. Method

2. 1. Participants

Participants were 32 treatment-seeking smokers who enrolled in a VR-CET for smoking cessation. Subjects were recruited using flyers and advertisements posted around the local community in two different cities of Spain, Barcelona and Oviedo. Inclusion criteria for the study were being aged 18 or over, meeting the diagnostic criteria for nicotine dependence according to the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM–IV–TR) [11] assessed using the Structured Clinical Interview for DSM-IV (SCID-I), being interested in quitting smoking, and smoking 10 or more cigarettes per day for the prior 12 months. Individuals were excluded if they were diagnosed with a current severe psychiatric disorder (such as dementia or a psychotic disorder), if they met criteria for abuse of or dependence on a substance rather than nicotine, or if they were currently involved in other smoking cessation treatment.

2.2. Instruments and measures

Participants' baseline sociodemographic and smoking-related characteristics were assessed during the intake session, which took approximately 90 minutes. The Fagerström Test for Nicotine Dependence (FTND) [12] and the Structured Clinical Interview (SCID-I) of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) [11] were used to assess nicotine dependence. A Micro Smokerlyzer (Bedfont Scientific Ltd., Rochester, UK) was also used to assess Carbon monoxide (CO) concentrations in expired air.

Cigarette craving was assessed at three different periods: 7 consecutive days before the treatment, 7 consecutive days after the first exposure session, and 7 consecutive days after the last exposure session.

During these three periods, participants were instructed to keep a continuous record of their level of craving each time they smoked a cigarette. Cigarette craving was recorded from 0 ("Not at all") to 10 ("Extremely") using self-monitoring forms.

2.3. Procedure

All participants attended a single intake session at the treatment research-clinic. During the session participants signed the informed consent form, provided a baseline CO sample, completed a brief clinical history form and provided data on smoking-related characteristics using the instruments described above. After participants completed the interviews and questionnaires, they were trained in the use of the self-monitoring forms and instructed to record their level of craving after each cigarette they smoked during the 7 days before treatment initiation and the 7 days after the first and last exposure session.

The VR-CET procedure involved one weekly treatment session for five consecutive weeks. The components of the VR-CET program were highly structured and included VR exposure therapy, physiological feedback consumption (expired CO levels) and brief advice and counseling about methods to quit smoking. Exposure sessions were applied individually and had a maximum duration of 30 minutes. Both physiological feedback and smoking advice with counselling were provided in a group-based format of 4 to 5 people immediately after the last individual exposure finished. More information regarding VR-CET procedures have been published in a previous report [10].

2.4. Statistical analysis

Descriptive analyses were performed with sociodemographic and smoking-related characteristics. Daily rating measures of cigarette craving were tabulated as the mean of each participant's craving ratings for a given day. Then, the average of craving for each time point was computed using daily mean ratings. A repeated-measures ANOVA was conducted to compare levels of cigarette craving at baseline, the first week of treatment and the last week of treatment. Tukey's post hoc comparisons were performed to explore which time points differed from each other. Effect sizes were calculated using Cohen's *d*, taking into account values for small (.2), moderate (.5) and large effects (.8) [13]. Data was analyzed with the statistical package SPSS for Windows (version 15, SPSS Inc., Chicago IL, USA).

3. Results

Sociodemographic and clinical characteristics of the sample are shown in Table 1.

Table 1. Sociodemographic and clinical characteristics (N=32)

	Mean ± SD/%
Age	39.8 ± 13.2
Females (% female)	75
Smoking duration (years)	19.9 ± 10.1
Cigarettes per day	17.7 ± 5.4
FTND	4.9 ± 1.9
CO level (ppm)	13.5 ± 6.6

Note: FTND = Fagerström Test for Nicotine Dependence; CO = Carbon Monoxide; ppm = parts per million.

Figure 1 shows mean daily cigarette craving at each time point. The average of craving experienced among participants the week before receiving treatment was 7.14 (SD = 1.38). The participants reported a mean craving score of 6.83 (SD = 1.77) the 7 days after the first exposure session and 6.37 (SD = 2.01) the 7 days after the last session. ANOVA results indicated that cigarette craving decreased significantly across the three point times ($F_{(2, 30)} = 3.887$, $p = .027$). Post-hoc comparisons showed that the differences were significant only between the baseline period and the last week of treatment ($p = 0.021$). Cohen's effect size value ($d = .44$) suggested a small to moderate significance.

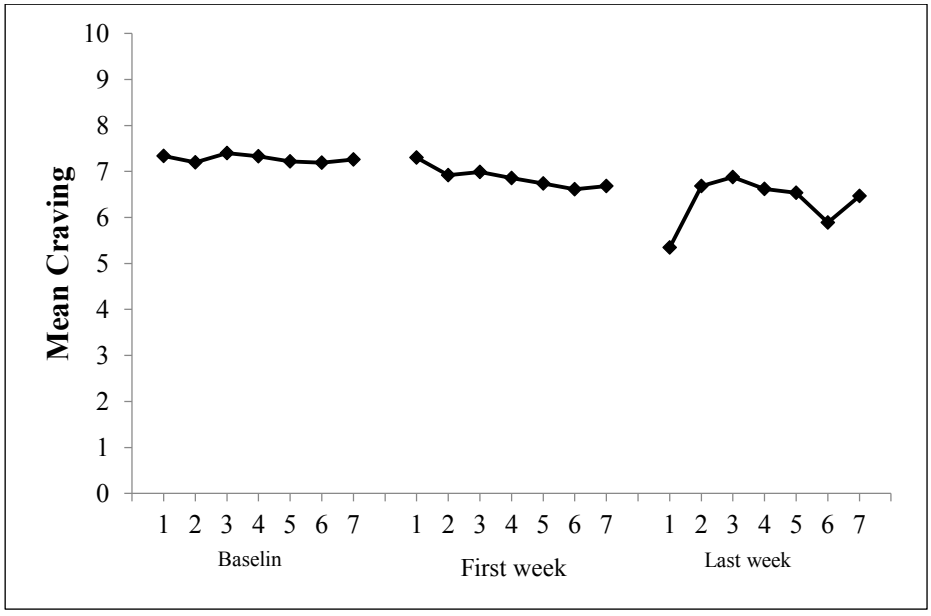


Figure 1. Mean craving during the 7 days before treatment initiation and the 7 days after the first and last exposure of session.

4. Conclusions

The main objective of this study was to explore the effect of VR-CET on cigarette craving in real world contexts. The results showed that participants exhibited significant reductions in cigarette craving towards smoking-related in the real life after treatment.

Several studies demonstrated that VR CET effectively reduce cigarette craving in the virtual world [9,10]. However, this is the first study to our knowledge to show that VR-CET has an effect on craving for cigarettes in real-world environments.

Previous studies using traditional methods of exposure such as *in vivo* or imaginal procedures failed to demonstrate the efficacy of CET [14]. Some authors have speculated that extinction generalizability might not occur if this procedure is conducted in only one context [15,16]. It is possible that prior research on CET using conventional methods of exposure did not demonstrate effectiveness due to exposure sessions were carried out primarily in a laboratory room across sessions [8]. Another factor that can explain the results obtained in prior studies could be that the cues used may lack ecological validity [17]. In this sense, most of these studies exposed participants to an isolated cue (i.e., cigarette pack) out of the typical context of consumption. In contrast to traditional procedures of exposure, VR offers the possibility to conduct exposure sessions to a wide variety of drug-related contexts that include complex cues as well as social interactions [18], thereby increasing the generalizability of extinction in multiple real life situations. The results of the current research demonstrated that the application of CET through VR is an effective procedure for reducing cigarette craving in smokers beyond the laboratory. Therefore, the use of VR-CET is proposed in order to improve conventional smoking cessation treatments.

Limitations in our study should be mentioned. The relatively small sample size makes it difficult to apply the generalization of the present results to other treatment-seeking smokers. Moreover, the lack of a control group does not eliminate the possibility that a confounding variable has affected the results.

Even with these limitations, however, this study demonstrated an effect of VR CET on cigarette craving in the real world. This finding provides evidence that VR-CET could improve extinction generalizability across contexts which could be critically important for the efficacy of smoking cessation treatments.

Acknowledgements

This work was supported by the Spanish Ministry of Science and Innovation (MICIIN) (ref. PSI2008-05938/PSIC) and the predoctoral grant from the Spanish Ministry of Economy and Competitiveness (ref. BES-2012-053988).

References

[22] European Commission, Attitudes of Europeans towards tobacco and electronic cigarettes, Special Eurobarometer 429, Brussels, 2015.

A. Jamal, D.M. Homa, E. O'Connor, S.D. Babb, R.S Caraballo, T. Singh, S.S. Hu, B.A. King, Current cigarette smoking among adults - United States, 2005-2014, *Morbidity and Mortality Weekly Report* **64** (2015), 1233-1240.

O. García-Rodríguez, R. Secades-Villa, L. Flórez-Salamanca, M. Okuda, S.M. Liu, C. Blanco, Probability and predictors of relapse to smoking: Results of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), *Drug and Alcohol Dependence* **132** (2013), 479-485.

K.S. Bagot, S.J. Heishman, E.T. Moolchan, Tobacco craving predicts lapse to smoking among adolescent smokers in cessation treatment, *Nicotine & Tobacco Research* **9** (2007), 647–652.

I. Berlin, E.G. Singleton, S.J. Heishman, Predicting smoking relapse with a multidimensional versus a single-item tobacco craving measure, *Drug and Alcohol Dependence* **132** (2013), 513–520.

M.D. Skinner, H.J. Aubin, Craving's place in addiction theory: contributions of the major models, *Neuroscience & Biobehavioral Reviews* **34** (2010), 606-623.

B.L. Carter, S.T. Tiffany, Meta-analysis of cue-reactivity in addiction research, *Addiction* **94** (1999), 327-340.

[23] C.A. Conklin, S.T. Tiffany, Applying extinction research and theory to cue-exposure addiction treatments, *Addiction* **97** (2002), 155-167.

C.S. Culbertson, S. Shulenberger, R. De La Garza, T.F. Newton, A.L. Brody, Virtual reality cue exposure therapy for the treatment of tobacco dependence, *Journal of Cybertherapy and Rehabilitation* **5** (2012), 57–64.

[24] I. Pericot-Valverde, S. Secades-Villa, J. Gutiérrez-Maldonado, O. García-Rodríguez, Effects of systematic cue exposure through virtual reality on cigarette craving, *Nicotine & Tobacco Research* **16** (2014), 1470-1477.

American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders (4th ed., text revision), American Psychiatric Publications, Washington, DC, 2000.

T.F. Heatherton, L.T. Kozlowski, R.C. Frecker, K.O. Fagerström, The Fagerström Test for Nicotine Dependence: A revision of the Fagerström Tolerance Questionnaire, *British Journal of Addiction* **86** (1991), 1119–1127.

J. Cohen, Statistical power analysis for the behavioral sciences (2nd ed), Lawrence Erlbaum Associates, Hillsdale, NJ, 1988.

R. Niaura, D.B. Abrams, W.G. Shadel, D.J. Rohsenow, P.M. Monti, A.D. Sirota, Cue exposure treatment for smoking relapse prevention: a controlled clinical trial, *Addiction* **94** (1999), 685-695.

L.M. Gunther, J.C. Denniston, R.R. Miller, Conducting exposure treatment in multiple contexts can prevent relapse, *Behaviour Research and Therapy* **36** (1998), 75–91

J.J Chelonis, J.L. Calton, J.A. Hart, T.R. Schachtman, Attenuation of renewal effect by extinction in multiple contexts, *Learning and Motivation* **30** (1999), 1–14.

P.S. Bordnick, K.M. Graap, H. Copp, J. Brooks, M. Ferrer, B. Logue, Utilizing virtual reality to standardize nicotine craving research: a pilot study, *Addictive Behaviors* **29** (2004), 1889-1894.

[25] I. Pericot-Valverde, L.J. Germeroth, S.T. Tiffany, The Use of Virtual Reality in the Production of Cue-Specific Craving for Cigarettes: A Meta-Analysis, *Nicotine & Tobacco Research* **18** (2016), 538-546.

Virtual Reality Environments to rehabilitation Attention deficits in schizophrenic patients

Filippo LA PAGLIA [a,1] Caterina LA CASCIA [a], Rosalinda RIZZO [a], Margherita SANNA [a], Flavia CANGIALOSI [a], Lucia SIDELI [a], Antonio FRANCOMANO [a], Giuseppe RIVA [b] and Daniele LA BARBERA [a]

[a] *Department of Experimental Biomedicine and Clinical Neuroscience, University of Palermo, Italy*

[b] *Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano, Milan, Italy*

[b] *Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy*

Abstract. Cognitive dysfunction is regarded as a core feature of schizophrenia. Patients with schizophrenia showed poor performance on tasks that require vigilance or sustained attention. The study aimed at developing a Virtual Reality cognitive training to improve the selective, divided and sustained attention. Two clinical samples of patients with schizophrenic disorder were involved: an experimental group treated with pharmacological therapy and Virtual Reality cognitive training; a control group received pharmacological therapy and Integrated Psychological Treatment. Both VR training and IPT were associated with improved performance in sustained attention tasks. After the training, the experimental group showed improvements in planning and divided attention. This preliminary investigation suggests that virtual reality training may improve cognitive functioning in patients with psychosis.

Keywords. Virtual Reality, Schizophrenia, Cognitive Rehabilitation, Sustained Attention.

1. Introduction

Cognitive dysfunction is regarded as a core feature of schizophrenic disorders. Schizophrenia affects transversally all the neurocognitive domains, in particular the functions related to the 'hypofrontality', such as executive functions, speed processing, memory, and attention [1].

Literature described moderate to severe deficits across several domains, including attention, working memory, verbal learning and memory, and executive functions. Cognitive impairment usually arise at the onset of psychosis, is stable throughout the course of the disease, and has been consistently associated with poor social problem solving [2, 3]. Impaired attention is considered to be a fundamental cognitive deficit in patients with schizophrenia [4, 5]. Patients with more severe attention deficits are less successful in psychosocial rehabilitation programs as their impaired attention increases

[1] Corresponding author, filippo.lapaglia@unipa.it

the difficulty in information processing, and they may not be able to sustain attention for the session duration [6]. Patients with schizophrenia showed poor performance on tasks that require vigilance, quick responses, or sustained attention [5]. These deficits tend to be stable during episodes of active psychosis as well as remission periods and, therefore, are considered to be vulnerability markers of the disease. Attention impairments correlate with maladaptive functioning [7, 2] and poor response to specific rehabilitation programs, such as social skills training [8].
Recently, Virtual Reality [9, 10, 11] provides opportunities to overcome some of the current limitations of cognitive rehabilitation programs providing valuable scenarios and ecologically valid tasks. The added value of Virtual reality in cognitive rehabilitation, compared to the traditional approaches, are the customization on user's needs; the possibility to graduate the task's difficulty; the high level of control; the ecological validity; and the reduced costs [12, 13, 14]. This study investigated the feasibility of Virtual Reality in improving selective, divide and sustained attention. Specifically, we developed, via the NeuroVr 2.0 software [15], three different virtual environments with a hierarchical sequences of tasks, designed to train specific attention domain.

2. Methods

2.1 Participants

The study involved two clinical samples of patients affected with schizophrenic disorders, diagnosed according to the DSM 5 criteria. The experimental group received a cognitive training based on virtual reality; the control group received Integrated Psychological Treatment (IPT). Additionally, both groups were treated with pharmacological therapy. Demographic information of the sample is reported in Table 1. Patients were recruited from the outpatient Unit of Psychiatry of Palermo University Hospital.

Table 1. Clinical samples

	Experimental group	**Control group**
N	9	6
Age (Mean ± SD)	29 ± 12.05	35 ± 9.9
Gender, male (n, %)	6, 66.6%	6, 100%
Treatment	• Pharmacological therapy • Cognitive training based on virtual reality (once a week)	• Pharmacological therapy • IPT: Integrated Psychological Treatment (once a week) • Other activities such as music therapy, individual/group to improve social skills and autonomy in daily life in a community center

2.2 Instruments and procedures

Before and after the training, all the participants were tested with extensive neuropsychological assessment, to obtain an accurate overview of their cognitive functioning and to compare the performances of the two groups. In particular, the following test were employed: the Mini Mental State Examination to test general cognitive functioning (MMSE), the Frontal Assessment Battery (FAB) to assess executive functions, the Trail Making Test (TMT, Forms A, B and B-A) to assess the sustained and divided attention, the Tower of London test (ToL) to assess planning, the Memory Battery to test brief and long term memory, and the Wisconsin Card Sorting Test (WCST) to test cognitive flexibility. The test scores were corrected for age, education level and gender, when appropriate.

2.3 Interventions

After the neuropsychological evaluation, the experimental group was exposed to a VR attention training consisted of hierarchical sequences of tasks (starting from a single-task condition and ending with successive multiple tasks) settled in three different virtual environment, whose characteristics are below described (Figure 1):

1. Park (sustained attention task): the subject was asked to catch footballs presented at irregular intervals of time, in order to reduce the expectation effect;
2. Valley (selective attention task): the participant was required to identify and pick up a particular type of flower. The increasing difficulty of this task – consisting of four different subtasks – was related to the different characteristics of the target stimulus (first any pink flower, secondly only white and red poppies, then only yellow daisies) and with the complexity of the background (poor of flower vs. rich of flower valley);
3. Beach (selective and divided attention task): the subject had to pick up a particular type of bottles (first only glass bottles, then both green glass bottles and red-cap bottles). Moreover, he was alerted to any calls and loudspeaker announcement: when a voice announced the kiosk's opening time, he had to stop his activity, go to the kiosk, and have a meal.

Figure 1. Virtual environment- park, valley, beach

The use of these three different virtual environments with different interactivity levels and very similar to the real participants' living contexts, allowed us to train a wide variety of functional activities in a laboratorial context. The Virtual Reality cognitive rehabilitation intervention was implemented in 10 individual sessions, on a weekly base. Each session had the duration of approximately 90 minutes and was guided by a predefined protocol. At the first and last sessions, we assessed the following items:

- time of execution;
- total errors;
- request of assistance;
- need for the therapist's interventions;
- "sustained attention" throughout the sequence of the task, not distracted by other stimuli;
- "divided attention" between the different components of task
- "maintained sequence of task";
- "self-corrections" and the "absence of perseveration";
- "maintained task objective to completion".

In order to access to virtual environments we used software the Neuro-VR vers. 2.0, head mounted displays, trackers, a computer and a joypad.
The control group was exposed to 10 group sessions of Integrated Psychological Therapy (IPT) [16], 1 time per week. IPT is a group therapy program for schizophrenia patients and it is based on the assumption that basic deficits in cognitive domains have a pervasive effect on higher levels of behavioral organization, such as social skills as well as social functioning. The IPT is organized in 5 subprograms, arranged in a hierarchical order, according to complexity of the functions. The first 3 subprograms, Cognitive Differentiation, Social Perception, and Verbal Communication, represented the cognitive training components, including abstract reasoning, conceptual organization, basic perception and communication skills training. The fourth and fifth components represent the behavioural level of social interaction and are similar to other skills training programs.

2.4 Statistical analyses

Social and clinical characteristics of the groups were compared using Fisher's exact test and Mann-Whitney test. Wilcoxon test was used to compare pre- and post-training cognitive performances both within the experimental and the control group.

Table 1. Pre- and post-training difference in neuropsychological tests

Test-retest	Experimental (n=9)	Control (n=6)
MMSE	z= -2.232, p= 0.026*	z= -0.210, p= 0,833
ToL	z= -2.032, p= 0.042*	z= -1.225, p= 0.221
TMT-A	z= -2.134, p= 0.033*	z= -1.363, p= 0.173
TMT-B	z= -2.075, p= 0.038*	z= -2.207, p= 0.027*

*Significant p<0.05

3. Results and conclusions

At baseline, groups were similar in terms of gender, age, education level, and degree of cognitive impairment (data not shown). Both VR training and IPT were associated with improved performance in the divided attention task (TMT-B). By contrast, our preliminary findings showed that VR training was additionally related with better general cognitive functioning (MMSE), and with improved planning (TOL), and sustained attention (TMT-A) (see Table 1).
Moreover, using our *ad hoc* observational grid, it was found that – after the virtual cognitive training – the experimental group showed:

- reduced time of execution (41.99 ± 28.89 vs. 21.93 ± 11.82; Wilcoxon z test = -2.666, p= 0.008);
- decreases request of assistance (5.77 ± 6.51 vs. 0.77 ± 1.71; Wilcoxon z test = -2.371, p= 0.018);
- decreases needs of the therapist's intervention (51.55 ± 113.49 vs. 26.77 ± 69.22; Wilcoxon z test = -2.666, p= 0.008);
- decreases number of omissions (4.66 ± 5.22 vs. 1.44 ± 2.50; Wilcoxon z test = -2.032, p= 0.042);
- improvement in sustained attention (8.44 ± 2.18 vs. 8.00 ± 1.93; Wilcoxon z test = -2.000, p=0 .046).

These new data, consistent with a previous study [10], provide support for the feasibility of virtual reality training in improving cognitive functions in psychotic patients. We think that some characteristics of VR, such as simulation of daily life situations, might significantly improve traditional cognitive rehabilitation programs, by making them more interesting for patients affected by psychosis and by fostering the transfer of cognitive skills in daily life experience.

References

[1] P. Brazo et al., Impairments of executive/attentional functions in schizophrenia with primary and secondary negative symptoms, *Psychiatry Research*, **133**, *1*, (2005), 45–55.
[2] M.F. Green, What are the functional consequences of neurocognitive deficits in schizophrenia? *American Journal of Psychiatry*, **153 (**1996), 321-330
[3] M. F. Green, R. S. Kern, D. L. Braff, J. Mintz, Neurocognitive deficits and functional outcome in schizophrenia: are we measuring the "Right Stuff"? *Schizophrenia Bulletin*, **26, 1** (2000),119-136.
[4] M. Fioravanti, O. Carlone, B. Vitale, M. E. Cinti, L. Clare, A meta-analysis of cognitive deficits in adults with a diagnosis of schizophrenia. Neuropsychol Rev **15**(2), (2005), 73–95
[5] K. Neuchterlein, M. E. Dawson, J. Ventura, D. Miklowit, G. Konishi, Information-processing anomalies in the early course of schizophrenia and bipolar disorder. Schizophr Res; **5**(3), (1991), 195–196
[6] W. D. Spaulding, D. Reed, M. Sullivan, C. Richardson, M Weiler, Effects of cognitive treatment in psychiatric rehabilitation, *Schizophrenia Bulletin*, **25** (1999**)**, pp. 657-676.
[7] W. Spaulding, Assessment of adult-onset pervasive behavior disorders. In: Cummero, A.; Adams, H.; and Calhoun, K., eds. Handbook of Behavior Assessment. 2nd ed. New York, NY: John Wiley & Sons, 1986
[8] P.W. Corrigan, C. J. Wallace, M. L. Schade and M.F. Green, Cognitive dysfunctions and psychosocial skill learning in schizophrenia. *Behavior Therapy,* 25 (1994), 5–15
[9] D. Freeman D. Studying and treating schizophrenia using virtual reality: a new paradigm. Schizophr Bull. **34** (2008), 605-10.

[10] F. La Paglia, C. La Cascia, R. Rizzo, L. Sideli, A. Francomano, D. La Barbera, Cognitive Rehabilitation of Schizophrenia Through NeuroVR Training. *Studies in Health Technology and Informatics* **191** (2013), 158–162
[11] F. La Paglia, C. La Cascia, R. Rizzo, F. Cangialosi, M. Sanna, G. Riva, D. La Barbera, Cognitive Assessment of OCD Patients: NeuroVR vs Neuropsychological test. *Studies in Health Technology and Informatics* **199** (2014), 40–44
[12] G. Castelnuovo, C. Lo Priore, D. Liccione, Experience with V-STORE: Considerations on Presence in Virtual Environments for Effective Neuropsychological Rehabilitation of Executive Functions. *CyberPsychology & Behavior*, **6**, (2003), 281-287.
[13] F. La Paglia, C. La Cascia, P. Cipresso, R. Rizzo, A. Francomano, G. Riva, D. La Barbera, Psychometric assessment using classic neuropsychological and virtual reality based test: A study in Obsessive-Compulsive Disorder (OCD) and Schizophrenic patients. *Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering* **100** (2014), 23–32
[14] D. La Barbera, L. Sideli, F. La Paglia, Schizophrenia and virtual reality: a review of clinical applications. Journal of Psychopathology, **16**, (2010), 78–86
[15] G. Riva, A. Gaggioli, A. Grassi, S. Raspelli, P. Cipresso, F. Pallavicini, C. Vigna, A. Gagliati, S. Gasco, G. Donvito.: NeuroVR-2 a free virtual reality platform for the assessment and treatment in behavioral health care. Studies in Health Technology and Informatics. **163**, (2011) 493-5
[16] Brenner HD, Roder V, Hodel B, & Corrigan P. *Integrated Psychological Therapy for Schizophrenic Patients.* Toronto: Hogrefe and Huber. Publishers, Göttingen, 1994

The potential of virtual reality technologies to support people with an autism condition: A case study of acceptance, presence and negative effects

Nigel NEWBUTT [a,1] Connie SUNG [b] Hung Jen KUO [b] Michael. J LEAHY [b]
[a] *University of the West of England, Bristol, UK*
[b] *Michigan State University, Michigan, USA*

Abstract. There has been much potential and discussion about the application of virtual reality technologies (VRTs) using head-mounted displays (HMDs) for users with autism However, very few, if any studies, have yet to explore and investigate the acceptance, presence and ecological validity of these platforms. On the other hand, literature is well developed in areas such as virtual environments [18], virtual worlds [9], [19] and virtual reality [20], but few have considered the resurgence in head-mounted displays for autistic users. Many of the affordances associated with VEs and VWs may be applied HMDs and VRTs and so are also seen a potential opportunity for people with autism to tackle challenges faced on a daily basis. We present findings from a study conducted in the United States that worked with a HMD (Oculus Rift) and 29 participants with an autism condition. We ran the experiment in two phases. Phase I considered acceptance of this wearable technology; looking at issues of sensitivity. Phase II consider sense of presence, immersion, ecological validity and negative effects [16]. Concluding with pre- and post- anxiety measurements [17]. The paper will discuss the quantitative findings of the study.

Keywords. Virtual reality technology, autism, head-mounted display

1.**Introduction**

Achieving independence and gainful employment can be especially challenging for the 40% of individuals with an autism spectrum disorder (ASD) who have a co-occurring intellectual disability (IQ<70) [1], [2], [3]. The nature of these co-occurring disabilities requires very explicit and carefully sequenced skills training in order for them to be successful in the future. To date, however, there is a paucity of independent living and vocational skill interventions described in the research literature for individuals with severe ASD or ASD/ID. The skills deficits, along with the lack of empirically derived interventions, create a critical gap as independent living and vocational skills are closely tied to quality of life for individuals with ASD/ID [4], [5], [6], [7]. Therefore, it is crucial to develop innovative strategies to address related training needs and provide evidence-based interventions to individuals with ASD/ID. One such innovation is the

[1] Corresponding author, nigel.newbutt@uwe.ac.uk

use of virtual reality technology (VRT) to help develop personal, social, functional, and pre-vocational/vocational skills. Standen and Brown [8], for example, have discussed the role of vocational training (among other uses of VRT for people with IDs) and

noted that: 'only one study so far has investigated the contribution that virtual environments might make to increase the employment opportunities for people with intellectual disabilities' (p. 275). Since then, a number of studies have examined the role VR can play in developing vocational skills [9], [10], [11], [12] and have each reported positive findings in the feasibility and efficacy of VR used by populations with ASD to aid job-interviewing skills.

2. Virtual Reality Technologies for people with autism

Virtual Reality (VR) provides opportunities to practice dynamic and real-life social interactions, which has been used previously and shown to be an effective intervention tool for people with autism. Its utility is likely due to several unique characteristics

Virtual Reality also represents real-life experiences in a safe, controllable manner that allow for repeated practice and exposure. It is a unique setting where individuals can explore and act without feeling threatened or frightened of real-world consequences, or they can make mistakes without fear of dangerous, real, or humiliating consequences. This is particularly important for an autism population in learning tasks and can also provide naturalistic environments with unlimited social scenarios and has been shown to replicate social conditions effectively [13].

The computer-mediated role-play might present a vital opportunity for individuals to experience different perspectives, which, in turn, might nurture more general skills in mental simulation. Responses to different scenarios can be practiced before, during or after being taught. Tasks can also be repeatedly presented and practiced in a consistent way without the fatigue; an issue sometimes associated with task repetition by human instructors [14]. The ease of repetition of the task could facilitate rote learning of social rules in a specific context before moving on to allow practice of the skill in a different context. VR also offers immediate, real-time feedback about performance and can be tailored to each individual and monitored to test his or her ability to perform certain tasks over time based on progress [15].

3. Current Study design and procedure

The current study involved using a head-mounted display (Oculus Rift ™), headphones and an input device (game-pad). As Figure 1 highlights, the study involved a portable device (PC Laptop) with the previously mentioned equipment.

The population of the study included individuals with ASD who were interested in securing an employment opportunity. It is important to emphasize their desire for receiving an employment opportunity since the intention of the study was to explore the suitability of using the VR technology as an intervention for vocational rehabilitation. A total of 29 participants with ASD were recruited from a private non-profit community rehabilitation organization (CRO) in a Midwestern state in the United State of America. Ethical considerations of the study were paramount; especially due to the preliminary nature of the study. Ethical processes of the University were followed and approval granted for the researchers to conduct the study.

Figure 1. Equipment used in the current study

The study involved two phases. Phase 1, during which the 29 participants viewed three virtual environments wearing the HMD and headphones. The first was a virtual cinema, the second a virtual café and the third a tour of an Africa Savannah (driving a Jeep). After the participants completed the first phase of the study, they were invited to participate in phase 2 of the study, which took place few days after phase 1. Eleven participants were selected for phase two. During this phase, two longer and more intense VR scenarios were presented to the participants who wore the same set of VR equipment, and this time the session lasted for approximately 25 minutes. Specifically, these two scenes included: (1) an Apollo 11 mission in a space rocket and (2) a Tuscan Village/house tour (walking and interacting with objects). Table 1 provides an overview of the participants involved.

Table 1. Demographic characteristic of the participants who took part in Phase I and II of the study

	ASD group in Phase I (N=29)	ASD group in Phase II (N=11)
Demographics		
Mean age (SD)	32.02 (9.88)	29.77 (8.66)
Gender (%male)	76% (n=22)	91% (n=10)
Vocational History		
Full-time employed	34% (n=10)	27% (n=3)
Part-time employed	66% (n=19)	73% (n=8)
Formal ASD diagnosis		
Autistic Disorder (%yes)	55% (n=16)	64% (n=7)
Asperger's (% yes)	34% (n=10)	18% (n=2)
PDD-NOS (% yes)	10% (n=3)	18% (n=2)
Intellectual Ability		
IQ score mean (SD)	83.58 (23.69)	86.63 (30.70)

A selection of assessment instruments was used to help better understand the participants' overall enjoyment and psychological status from the use of the head-mounted display. Specific instruments included: (a) demographic questionnaire, (b) the Independent Television Commission-Sense of Presence Inventory (ITC-SoPI; [16]), and (c) the State-Trait Anxiety Inventory (STAI; [17]). ITC-SoPI was used to measure the subjective effects experienced by an individual within the virtual environment (i.e., presence of 'felt'), and STAI was used to assess participants' level of "state anxiety" (i.e., anxiety about an event; in this case the HMD VR environment) and "trait anxiety" (i.e., anxiety as a personal characteristic in general). In terms of the ITC-SoPI, a score of 1 indicated low immersion, presence and ecological validity with a score of 5 indicating a higher sense of presence. A score of 1 for negative effects indicated a report of low negativity.

4. Results

Twenty-nine participants all agreed to wear the VR head-mounted display during phase one (100%). Specifically, 86% (n=25) of the participants completed all three different virtual scenarios. Four participants requested to discontinue the experience after the virtual café scenario. Upon the completion of phase one, participants were asked to return for the phase two. Among 29 participants, 23 (79%) agreed to come back for the phase two. All Eleven participants who were selected for the phase two agreed to participate in the study (100%), and all of them completed two scenarios from the phase two. In relation to overall acceptance and enjoyment of the VR HMD, all participants reported a score of 3.0 or above (1 = not enjoy at all to 5 = enjoy the most), with a mean score of 4.32 (SD=0.69). As for the likelihood of using VR-HMD again, the majority of the participants (with the exception of two participants) reported a score of 3.0 or above (1 = not likely to 5 = most likely), with a mean score of 3.92 (SD=1.98).

In relation to immersive experience, the participants reported that the spatial presence was above average (M=3.8; SD=0.62) with both engagement and ecological validity reporting high scores (M=4.1; SD= 0.57 and M=4.0; SD=0.33, respectively). In addition, participants reported low negative effects from the use of VR HMD (M=2.0; SD=0.34). Specific to psychological influence from the use of the VR HMD, we did not find any anxiety-provoking situation from the use of the VR HMD.

5. Discussion and implication

This study provided several important insights to the two questions that we sought to address: a) is it safe for the individuals with ASD to use HMD VR interfaces (wearable-technology), and b) would individuals with ASD accept and enjoy the experience in the virtual environment? Answering the first question, the participants of the given study expressed a general acceptance of wearing VR HMD during the experiment. In addition, most of them stated that they would be interested in trying more in the future. However, although the majority of the participants gave positive feedback during and after the VR experience, there were still some negative comments.

These comments mainly focused on the visual effect of the VR experience, in which some stated that the visual effect can make people dizzy at time, and others claimed that the graphic was not smooth enough. There were still others commenting on the VR HMD which should be made to fit better and more comfortable. While these concerns were important to hear, these issues can be resolved with the advancement and adjustment of the equipment. For instance, users can feel dizzy when using a HMD due to its low or fluctuating frame-per-second rate. However, using a more sophisticated graphic card with a highly specified computer can often solve this problem. In addition, Oculus Rift, which was used in the study, was still in the beta phase (SDK 2) and so was not fully tested and commercially available. Feedback like this can be useful for the modification of HMD VR experiences to help design experiences to better suit users' comfort levels.

In addition, we did not find a significant change in anxiety level among the participants pre and post the use of the HMD. This is encouraging when considering individuals with ASD tend to resist new experiences. For most of the participants in the study, this was their first time wearing a VR HMD. While they did not necessarily feel comfortable wearing a VR HMD, they did not feel it intimidating either. As a conclusion, ASD users appeared to not experience sensory issues from the use of VR HMD [20].

Lastly, participants reported high spatial presence, engagement and ecological validity within the VR environment. In other words, the experiences viewed through the HMD were seen as 'real' and could happen in real life. This is an important indicator if we are to continue investigating the use of VRTs for populations with ASD. After all, generalization of learning and integration into real life is the ultimate purpose for the intervention.

6. Summary

While on the one hand the results tend to reveal that HMDs and VRT might be a good fit for users with an ASD, on the other hand they should be interpreted with some caution. Here we refer to the small sample included in our study, the subjective and exploratory nature of our work, dosage (or exposure) to the VRTs, and the selection criteria for Phase II of the study. We would also suggest future work match/compare results with typically developing users to help to better contextualize findings.

Notwithstanding the limitations of this work (not aligned to typically-developing users, some possible selection bias, non-targeted interventions), the findings provide some insights to the manner in which people with autism experience HMD VRTs. As such, and due to the possible wide-spread uptake of these evolving technologies, we suggest HMD VRTs could stand to have a large and meaningful impact on how people with an ASD learn and test various skills in situ settings and could be developed as a way to overcome some challenges faced by these populations.

This study was funded by the Engineering and Physical Science Research Council Research Council (EPSRC) and a Digital Economy Sustainable Society Network+. Grant number [EP/K003593/1] awarded to the first author of this article.

References

[1] E.J Mash and R.A. Barkley, *Child Psychopathology*, New York: The Guilford Press (2003).
[2] L. Wiggins, C. Rice and J. Baio, Developmental regression in children with an autism spectrum disorder identified by a population-based surveillance system, Autism: *The International Journal of Research and Practice*, **13** (2009), 357-374.
[3] M. Yeargin-Allsopp, C. Rice, T. Karapurkar, N. Doernberg, C. Boyle and C. Murphy, C, Prevalence of Autism in a US Metropolitan Area, *Journal of the American Medical Association*, **289** (2003), 49-55.
[4] P. Howlin, S. Goode, J. Hutton and M. Rutter, Adult outcome for children with autism, *Journal of Child Psychology and Psychiatry*, **45** (2004), 212–229.
[5] G.I. Orsmond, M.W. Krauss and M.M. Seltzer, Peer relationships and social and recreational activities among adolescents and adults with autism, *Journal of Autism and Developmental Disorders*, **34** (2004), 245–256.
[6] L. Pellicano, A. Dinsmore and T. Charman, A future made together: Shaping autism research in the UK, available at: http://www.ioe.ac.uk/research/88499.html (accessed 20 May, 2015).
[7] P.A. Rao, D.C Beidel and M.J. Murray, Social skills interventions for children with Asperger's syndrome or high-functioning autism: A review and recommendations, *Journal of Autism and Developmental Disorders*, **38** (2008), 353–361.
[8] P.J. Standen and D.J. Brown, Virtual reality in the rehabilitation of people with intellectual disabilities: Review, *Cyberpsychology & Behavior,* **8** (2005), 272–282.
[9] M.R. Kandalaft, N. Didehbani, D.C. Krawczyk, T.T. Allen and S.B. Chapman, Virtual reality social cognition training for young adults with high-functioning autism, *Journal of Autism and Developmental Disorders,* **43** (2013), 34–44.
[10] M.J. Smith, E.J. Ginger, K. Wright, M.A. Wright, J.L. Taylor, L.B. Humm and M.F. Fleming, Virtual reality job interview training in adults with autism spectrum disorder, *Journal of Autism and Developmental Disorders*, **44** (2014), 2450–2463.
[11] M.J. Smith, M.F. Fleming, M.A. Wright, M. Losh, L.B. Humm, D. Olsen and M.D. Bell, Brief report: Vocational outcomes for young adults with autism spectrum disorders at six months after virtual reality job interview training, *Journal of Autism and Developmental Disorders*, **45** (2015), 3364-3369.
[12] D.C. Strickland, C.D. Coles and L.B. Southern, JobTIPS: A transition to employment program for individuals with autism spectrum disorders, *Journal of Autism and Developmental Disorders*, **43** (2013), 2472–2483.
[13] S. Wallace, S. Parsons, A. Westbury, K. White, K. White and A. Bailey, Sense of presence and atypical social judgments in immersive virtual environments: Responses of adolescents with autism spectrum disorders, *Autism*, **14** (2010), 199–213.
[14] J.J. Cromby, P.J. Standen, J. Newman and H. Tasker, Successful transfer to the real world of skills practised in a virtual environment by students with severe learning difficulties, Proceedings of the 1st International Conference on Disability, Virtual Reality and Associated Technologies (IDCVRAT), Reading, UK, (1996).
[15] G.C. Burdea and P. Coiffet, Virtual Reality Technology (2nd ed.), John Wiley Inc., & Sons, New York, (2003).
[16] J. Lessiter, J. Freeman, E. Keogh, and J. Davidoff, A cross-media presence questionnaire: The ITC-Sense of Presence Inventory, Presence: Teleoperators and Virtual Environments, 10 (2001), 282–297.
[17] C.D. Spielberger, R.L. Gorssuch, P.R. Lushene, P.R. Vagg, and G.A. Jacobs, Manual for the State-Trait anxiety inventory, Consulting Psychologists Press, Palo Alto, 1983.
[18] S. Parsons and S. Cobb, State-of-the-art of virtual reality technologies for children on the autism spectrum, European Journal of Special Needs Education, 26 (2011), 355–366.
[19] N. Newbutt, Exploring communication and representation of the self in a virtual world by young people with autism, PhD thesis, University College Dublin, Ireland, (2013).
[20] D.C. Strickland, L.M. Marcus, G.B. Mesibov and K. Hogan, Brief report: Two case studies using virtual reality as a learning tool for autistic children, *Journal of Autism and Developmental Disorders,* **26** (1996), 651–659.

Using virtual reality for cue-exposure therapy in a case of bulimia nervosa

Joana PLA-SANJUANELO [a,1] Marta FERRER-GARCÍA [a], Ferran VILALTA-ABELLA [a], José GUTIÉRREZ-MALDONADO [a], Alexis ANDREU-GRACIA[b], Antonios DAKANALIS[c] , Neli ESCANDÓN-NAGEL[a] , Fernando FERNANDEZ-ARANDA[d], Osane GOMEZ-TRICIO[e], Joan RIBAS-SABATÉ[b], Giuseppe RIVA[f,g], Isabel SÁNCHEZ[d] , and Virgínia TENA[h].

[a] *Department of Personality, Assessment, and Psychological Treatments. Universitat de Barcelona, Spain*

[b]*Department of Psychiatry and Mental Health, Igualada General Hospital, Spain*

[c]*Department of Brain and Behavioral Sciences, University of Pavia, Italy*

[d]*Department of Psychiatry, University Hospital of Bellvitge-IDIBELL and CIBEROBN, Spain*

[e] *Department of Psychiatry, University Hospital Joan XXIII, Spain*

[f] *Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy.*

[g] *Applied Technology for Neuro-Psychology Lab., Istituto Auxologico Italiano, Milan, Italy*

[h] *Centro ABB Tarragona, Spain*

Abstract. This case study describes the use of a virtual reality-based cue-exposure therapy (VR-CET) for a patient diagnosed with bulimia nervosa (BN) who was resistant to standard cognitive behavioral therapy (CBT). After six VR-CE booster sessions, both anxiety and food craving dropped significantly. No binging and purging episodes were reported at the end of the treatment. Patient's mood and confidence to change were also improved. Finally, both eating symptoms and food craving were reduced at the end of the VR-CET. These results support the use of VR-CE as an effective component for the treatment of BN to reduce bulimia symptoms, body dissatisfaction and craving, especially in patients resistant to conventional treatments.

Keywords. Virtual reality, cue-exposure therapy, food craving, clinical sample, bulimia nervosa, binge eating

1. Introduction

Cognitive-behavioral therapy (CBT) has been considered the treatment of choice for both bulimia nervosa (BN) and binge eating disorder (BED) [1] and there is strong research support for its efficacy. However, a significant percentage of patients do not improve, despite treatment [2].

Cue-exposure therapy (CET) has been proposed as an effective intervention for binge eating behavior. CET eliminates the association between stimuli related to binge eating and the craving and anxiety responses, which are experienced simultaneously in the presence of binge-related cues and usually lead to a new binge episode [3,4].

[1] Corresponding author, joanapla@ub.edu

Previous studies have shown that CET is especially effective in reducing food craving, anxiety and binge behavior and, therefore, in improving the patient's overall health. Furthermore, it has been proposed as an effective alternative for patients who do not improve with CBT and pharmacological therapy [4,5,6]. Traditionally, these studies applied in vivo exposure, in which patients were exposed to their preferred binge-inducing food; they were encouraged to look at, smell and touch it in order to trigger an urge to binge, but they were required not to act on this urge. Despite its benefits, in vivo CE application has several constraints that have hindered its implementation in clinical practice, such as logistical difficulties, the time required to carry it out or the need for natural environments where patients usually binge.

Virtual reality (VR) has been proposed as a new way to apply CE for the assessment and treatment of people suffering from eating disorders (ED) [7]. The studies published so far provide evidence on the ability of VR exposure to generate emotional responses similar to those expected in real life situations, such as anxiety and depression, and body image disturbances [8, 9]. Furthermore, VR seems to be an effective technology for eliciting food craving after exposure to food cues in VR scenarios [10, 11].

Recent research has also demonstrated the effectiveness of VR as a therapeutic tool to normalize eating patterns in a case of BN, with results indicating significant reductions in ED symptoms and the suppression of binges and purges [12]. In view of these promising findings, the present study aims to test the effectiveness of virtual reality based cue-exposure therapy (VR-CET) for a BN patient resistant to conventional CBT treatment.

2. Methods

2.1 Patient data

R is a 44-year-old divorcee and single mother, diagnosed with BN purgative subtype (DSM-5) [13]. The onset was at age of 16 years, but she sought psychological treatment for the first time at 30. R underwent various treatments during 10 years without showing any improvement. Six months ago, she started a new outpatient treatment (fluoxetine and CBT) because she had continued to deteriorate and acknowledged that the problem was interfering with her relationships and her health. Because of her poor response to this intervention (after 12 individual CBT sessions), she was offered the opportunity to try VR-CET.

At the assessment, R's body mass index (BMI) was 20.70. She recorded the persistence of binges, followed by self-induced vomiting, two times per day. She also presented body checking behaviors (pinching around the collarbone), distorted body image (overestimation of one's own body size), and symptoms of depression and anxiety.

2.2 Assessment

Frequency of bingeing and purging episodes was assessed during the two weeks prior to beginning the VR-CE booster sessions, and during the two weeks after the end of the cue-exposure sessions.

Bulimia (B), Body Dissatisfaction (BD) and Drive for Thinness (DT) subscales of the Eating Disorder Inventory-3 (EDI-3) [14] and the State and Trait Food Craving Questionnaires (FCQ-S/T) [15] were also administered at baseline and at the end of the last treatment session to assess self-reported craving for food and ED symptomatology.

In each VR-CE session, subjective anxiety and craving were recorded using a Visual Analog Scale (VAS) that ranged from 0 (not at all) to 100 (extreme) at the beginning, each minute, and at the end of the VR exposure session. Two values of cue-induced craving and anxiety were used for the present study: the highest value reported during each exposure session, and the final value reported at the end of each session.

2.3 VR-based cue-exposure booster sessions

The VR-CE booster sessions consisted of six 60-minute (maximum) exposure sessions (two sessions per week for three weeks) [16]. In the first session, self-reported craving for food and ED symptomatology were assessed (FCQ-S/T and EDI-3 subscales respectively). The patient was also exposed to various types of virtual foods in different virtual environments (kitchen, dining-room, bedroom, and cafeteria) in order to assess the food craving and anxiety experienced in each situation. This information was used to develop a proper exposure hierarchy in accordance with her specific characteristics and needs. Throughout the five remaining sessions, R was exposed to the corresponding virtual environment and food in accordance with the hierarchy constructed. During exposure, the patient could interact within the virtual environments in real time and could move around the scenario, sit at a table, and handle the food displayed using the keyboard and the laptop's mouse (food could be lifted, rotated and zoomed in to the face but could not be eaten). Exposure finished when reported subjective anxiety decreased by 40% in relation to the level when entering the virtual environment.

Virtual environments were displayed in a 3D laptop with specific software capable of creating a stereoscopic effect that is duly processed by polarized glasses. Headphones were also used. Exposure sessions were conducted in a quiet darkened room to increase the sense of immersion in the virtual scenarios. The therapist remained behind the patient during the assessment so as not to interfere with the task but to be available in the event that she required assistance.

3. Results

Figure 1 shows the difference between the highest value and the final value of cue-induced anxiety and cue-induced food craving in each exposure session (intra-session evaluation) and across the five VR-CE booster sessions (inter-session evaluation). Throughout the VR sessions, as well as in each exposure session, both anxiety and food craving gradually decreased. Specifically, there was a pronounced decline from Session 3 onwards; finally the patient achieved quite low scores in both highest and final values during the last two sessions, particularly regarding anxiety scores. When comparing final values of craving and anxiety in the last VR-CE session (s.4 and s.5) the data show that, unlike anxiety values, craving values did not reach a score of 0 (absence of food craving). Actually, certain levels of craving were expected to remain after

treatment, given that previous research showed that participants without ED also report food craving when exposed to both virtual and real food [10, 17].

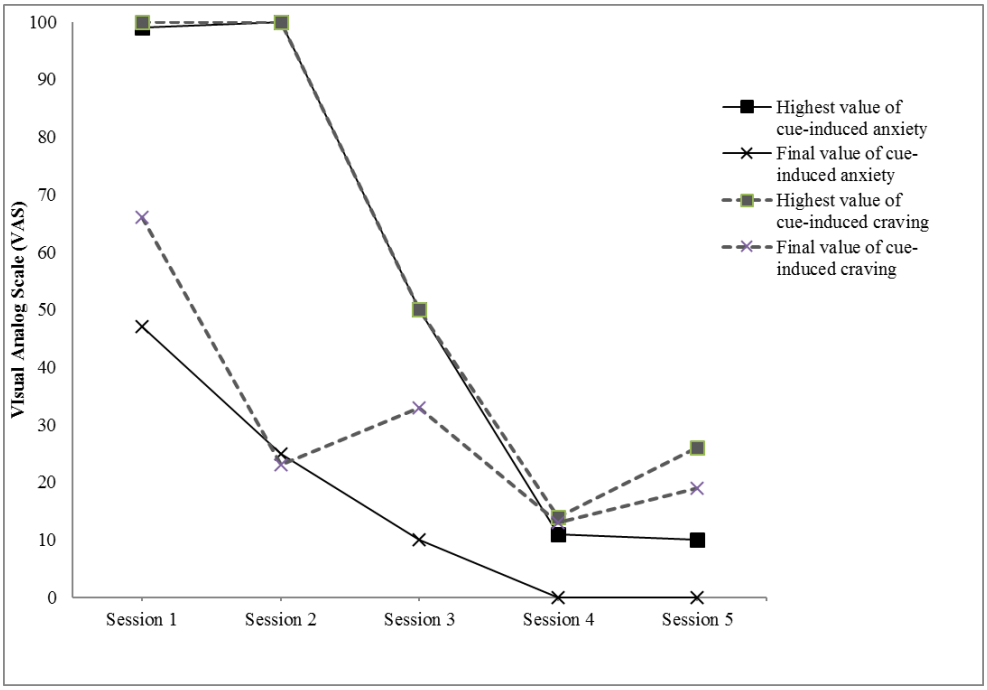


Figure 1. Highest and final values of cue-induced anxiety and craving responses across the VR-CE sessions.

ED symptomatology also showed a general improvement after VR-CET (Table 1). R gradually normalized her eating patterns, and bingeing and purging episodes were eliminated completely at the end of the treatment. Moreover, when comparing the pre- and post-scores of ED symptoms assessed by the EDI-3, there was a notable improvement in Bulimia (B) and Body Dissatisfaction (BD) subscales. In particular, the pre-score on the B subscale indicated a high level of psychopathology, placing the patient in the high clinical range before booster sessions, while the post-score on the B subscale was in the low clinical range (from 30 to 3) [14], probably reflecting the recession of bingeing and purging episodes. Although not explicitly treated, BD also dropped notably (from 40 to 17), probably indicating a reduction in her dissatisfaction with her body size and shape [14]. However, there was no change in the drive for thinness (DT). In fact, this aspect was not addressed during VR-CET. There was also a notable decrease in trait and state cravings for food (FCQ-S/T) at the end of the VR-CET. This result is particularly relevant considering the rationale of CET [18]: if it is possible to reduce the trait and state craving induced by food via VR-CET, subsequent bingeing may be reduced.

Table 1. Pre-Post Measures of VR-CE booster sessions

	PRE	POST
binges and purges	2 times per day	0
EDI-3 Bulimia	30	3
EDI-3 Body Dissatisfaction	40	17
EDI-3 Drive for Thinness	23	23
FCQ-T	194	64
FCQ-S	55	15

Finally, R also recorded feeling more upbeat, confident and less tense when exposed to real food after finishing VR-CE booster sessions. These relevant changes were also reflected in her physical appearance: her skin color improved, she looked healthier, and was taking more care of her appearance.

4. Conclusions

The aim of this case study was to assess the effect of VR-CET for reducing bulimia symptoms and cue-induced anxiety and craving in a BN patient who had failed to respond to standard CBT treatment.

Our results show that the VR-CE booster sessions helped to reduce the patient's bulimia symptoms, body dissatisfaction and food craving. Likewise, purging and bingeing episodes were extinguished at the end of the treatment. Regarding intra- and inter-session evaluation, both cue-induced anxiety and craving were notably reduced during each VR-CE session and across the series of five sessions. According to the patient's own account, at the end of the treatment she could be exposed to feared social situations and could eat normal portions of food without feeling anxious. It is worth noting that in the first (assessment) session, R told the therapist that she was not confident about her ability to control her impulse to eat her preferred bingeing foods. In this regard, we stress that VR allows exposure to real life-like virtual environments [7], maintaining ecological validity and increasing the opportunities of generalization.

In accordance with previous studies that used VR to normalize eating patterns in anorexia nervosa [19] and BN [12] patients, the VR-CET component also showed its effectiveness for normalizing eating patterns and improving both eating and emotional symptoms in a BN patient resistant to conventional CBT.

In summary, this study provides evidence of the use of VR-CET as a valid, useful tool for enhancing CBT in BN patients. Future studies should continue this line of research in larger controlled samples, and should also consider possible mediators of change such as motivation toward change, cue-reactivity, and sense of presence.

Acknowledgements
This study was supported by the Spanish Ministry of Science and Innovation (Project PSI2011-28801: "Tratamiento de la bulimia nerviosa mediante exposición a señales con realidad virtual").

References

[26] National Institute of Mental Health (NIMH). Eating disorders. In *Eating disorders: About more tan food (No. 11-4901),* 2014. Avaiable at: www.nimh.nih.gov/health/publications/eaing-disorders/eating-disorders.pdf
[27] H.C. Steinhausen, S.Weber, The outcome of bulimia nervosa: findings from one-quarter century of research, *The American Journal of Psychiatry,* **166** (2009), 1331-1341.
[28] J. Pla-Sanjuanelo, M. Ferrer-García, J.Gutiérrez-Maldonado, G. Riva, A. Andreu-Gracia, A. Dakanalis, (...) L. Sanchez-Planell, Identifying specific cues and contexts related to bingeing behavior for the development of effective virtual environaments, *Appetite*, **87** (2015), 81–89.
[29] E. Martinez-Mallén, J. Castro, L. Lazaro, E. Moreno, A. Morer, E. Font, J. Julien, M. Vila, J. Toro, Cue exposure in the treatment of resistant adolescent bulimia nervosa, *International Journal of Eating Disorders*, **40** (2007), 596-601.
[30] J. Toro, M. Cervera, M. H. Feliu, N. Garriga, M. Jou, E. Martinez, E. Toro, Cue exposure in the treatment of resistant bulimia nervosa, *International Journal of Eating Disorders*, **34** (2003), 227-234.
[31] A. Koskina, I. C. Campbell, U. Schmidt, Exposure therapy in eating disorders revisited, *Neuroscience & Biobehavioral Reviews*, **37**(2013), 193-208.
[32] J. Gutiérrez-Maldonado, B. K. Wiederhold, G. Riva, Future Directions: How Virtual Reality Can Further Improve the Assessment and Treatment of Eating Disorders and Obesity, *Cyberpsychology, Behavior, and Social Networking,* **19** (2016), 148-153.
[33] M. Ferrer-García, J. Gutiérrez-Maldonado, A. Caqueo-Urízar, E. Moreno, The validity of virtual environments for eliciting emotional responses in patients with eating disorders and in controls, *Behavior Modification*, **33** (2009), 830-854.
[34] A. Gorini, E. Griez, A. Petrova, G. Riva, Assessment of the emotional responses produced by exposure to real food, virtual food and photographs of food in patients affected by eating disorders, *Annals of General Psychiatry*, **9** (2010), 30.
[35] M. Ferrer-Garcia, J. Gutierrez-Maldonado, J. Treasure, F. Vilalta-Abella, Craving for Food in Virtual Reality Scenarios in Non-Clinical Sample: Analysis of its Relationship with Body Mass Index and Eating Disorder Symptoms, *European Eating Disorders Review*, **23** (2015), 371-378.
[36] M. Ferrer-Garcia, J. Gutiérrez-Maldonado, M. Agliaro-López, X. Lobera-Espi, J. Pla, F. Vilalta-Abella, Validation of VR-based Software for Binge Eating Treatment: Preliminary Data, *Studies in health technology and informatics*, **199** (2013), 146-150.
[37] M. Roncero Sanchis, C. Perpiñá, Normalizing the eating pattern with virtual reality for bulimia nervosa: a case report/Normalización de la ingesta con realidad virtual en la bulimia nerviosa: un caso clínico, *Revista Mexicana de Trastornos Alimentarios/Mexican Journal of Eating Disorders*, **6** (2015), 152-159.
[38] *Diagnostic and statistical manual of mental disorders.* American Psychiatric Association. Fifth ed. Arlington, VA: American Psychiatric Publishing, 2013.
[39] *EDI 3: Eating disorder inventory-3: Professional manual*. D. M. Garner. Psychological Assessment Resources, 2004.
[40] A. Cepeda-Benito, D.H. Gleaves, M.C. Fernández, J. Vila, T.L. Williams, J. Reinoso, The development and validation of Spanish versions of the State and Trait Food Cravings Questionnaires, *Behavior Research and Therapy* **38** (2000), 1125-1138.
[41] Clinicaltrials.gov. *Virtual Reality Based Cue-exposure Treatment for Bulimia Nervosa - Full Text View - ClinicalTrials.gov*. [online] Available at: https://clinicaltrials.gov/ct2/show/NCT02237300 [Accessed 26 Apr. 2016].
[42] A. Tetley, J. Brunstrom, P. Griffiths, Individual differences in food-cue reactivity. The role of BMI and everyday portion-size selections, *Appetite*, **52** (2009), 614–620.
[43] A. Jansen, A learning model of binge eating: cue reactivity and cue exposure, *Behaviour research and therapy*, **36** (1998), 257-272
[44] C. Perpiñá , A. Ferrero, C. Carrió, M. Roncero, Normalization of the eating patterns in a patient with anorexia nervosa, purgative subtype, with the support of a virtual environment. A case study, *Annuary of Clinical and Health Psychology*, **8** (2012), 21-28

Virtual Reality Therapy for the Treatment of Combat-Related Posttraumatic Stress Disorder: A Case Report 10 Years Post Combat Deployment

Dennis Patrick WOOD [a,1] , Brenda K. WIEDERHOLD[a]
Mark D. WIEDERHOLD[a], James A. SPIRA[b]

[a] *Virtual Reality Medical Center, San Diego, CA*
[b]*Department of Psychiatry, University of Hawaii School of Medicine, Honolulu, HI*

Abstract: Important challenges confronting DOD/military and the Department of Veterans Affairs medical care are that of maintaining or increasing the 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. In this report, we describe the outcome of VR-GET, for the treatment of combat-related PTSD, in a warrior who experienced no treatment for his PTSD for the 10 years following his return from combat duty.

Keywords: Virtual Reality Graded Exposure Therapy (VR-GET), Veterans Administration (VA), Department of Defense (DOD), Posttraumatic Stress Disorder (PTSD), mild Traumatic Brain Injury, Sentinel Events

1. Introduction

Posttraumatic Stress Disorder (PTSD) is a significant problem in active duty warriors returning from combat in Iraq and Afghanistan and also for combat veterans who have left the military [1-7]. 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 [1-9]. Hoge has also suggested that the VA adopt a number of strategies to improve the mental health care engagement and treatment for veterans needing services for PTSD [5].

Virtual Reality Graded Exposure Therapy with arousal control (VR-GET) is a promising, patient centered "strategy" and intervention that has been evaluated in active-duty service members as an early intervention treatment for warriors, diagnosed

[1] Corresponding author, dpwcapt@aol.com

with combat-related PTSD and having been successfully treated within months of having returned to the United States from the combat theater [10 – 13]. As an exposure therapy, VR-GET assists a patient in "learning" to manage fears and anxieties related to his or her combat-traumas (i.e., Sentinel Events) in a controlled, simulated environment which is generated using virtual reality (VR). 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 nervous system control using

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 (HMD) and Headphones facilitate the immersion in the VR-GET simulated combat environment.

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 [13]. One VR-GET Case Study described a Second Class male Navy Corpsman successfully reducing his PCL-M score by 20% following 10 VR-GET Sessions [10]. Another VR-GET Case Study described a Second Class female Navy Seabee successfully reducing her PCL-M score by 65% following 20 VR-GET Sessions [11].

Recently, a male U.S. Navy Officer, diagnosed with PTSD and mild traumatic brain injury (mTBI), was referred for VR-GET by his Primary Care Provider (PCP). In 2006, this Officer completed six (6) months of a combat deployment to Iraq. Following his having returned to the United States, at the conclusion of his combat deployment and reporting to his new U.S. Navy Command, he reported to his PCP that he was experiencing symptoms consistent with PTSD and mTBI. He was also experiencing profound difficulties with Initial Insomnia, Middle Insomnia and Terminal Insomnia. This Navy Officer informed me that his PCP and his "Shipmates" had reassured him that his PTSD symptoms "would reduce and get better over time". Hence, this Navy Officer did not pursue a referral for treatment of his PTSD until 2015.

Following is the report of the VR-GET, with physiological monitoring, with his male Navy Officer.

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

2. Method

A 51 year old, male, U.S. Navy Officer was referred to and volunteered for VR-GET. This participant met the DSM-IV-R [14] criteria for chronic PTSD. This participant's comorbid diagnoses included: mTBI, High Cholesterol and Rheumatoid Arthritis. Prior to this participant's referral for VR-GET, his PCP had prescribed Ambien to assist with improving his sleep. This U.S. Navy

- Upon arrival in country, traveling from BIAP to Mosul, we were packed at night into a C-130 and flew lights out for the entire trip. I remember being in full battle gear, pressed in so tightly with our gear, weapons, and each other that I couldn't move and barely breathe. Multiple bouts of claustrophobia and panic flushed over me throughout the trip and my best effort was to pray to God and sing hymns to myself to keep from going completely out of control.

- At approximately 1500 on March 13, 2006, traveling in a large convoy, my vehicle was struck with a Complex Improvised Explosive Device (IED) attack launched approximately two kilometers from the south gate of the Mosul Air Base. The convoy also encountered machine gun fire from the insurgency. The IED was planted along the right hand side of the road and detonated as my vehicle came alongside the IED. There was a loud explosion, a large fireball, the vehicle was blown sideways and rocks flew everywhere. The vehicle was not rendered inoperable and we executed an evasive maneuver to get away from the point of attack. The gunner above me received only minor injuries, when in fact, he should have been killed by the force of the blast.

- At approximately 0800 hours, 27 April 2006, a suicide bomber detonated a ball-bearing filled vest among a group recruits for the New Iraqi Army. The detonation occurred approximately one kilometer from Al Kasik's Entry Control Point (ECP) in area designated for the recruits to be prescreened to ensure that they were the confirmed recruits. A total of sixty-five recruits were killed or injured by the blast. Twenty-seven recruits died at the scene and nine recruits died after medical evacuation as a result of their wounds. I was scene leader and assisted with the collection of evidence. When I arrived

Figure 3. A few of the Sentinel Events reported by the case study participant while deployed to Iraq.

Officer has served 25 years in the Navy and he has been married three times and divorced twice. He completed a 6 month combat tour to Iraq in 2006. Following this participant's referral for VR-GET and in consultation with his PCP, the PCP discontinued this participant's Ambien and initially prescribed Trazodone (100mg/qhs) and subsequently he additionally prescribed Lexapro (10mg/qday) to assist with improving the participant's sleep quality and improving his mood. Prior to starting VR-GET, this participant completed a structured psychiatric interview, the Posttraumatic Stress Disorder Checklist-Military (PCL-M), the Beck Anxiety Inventory (BAI) and Patient Health Questionnaire-9 item (PHQ-9). This participant's VR-GET followed the VR-GET guidelines previous described [10-13]. Importantly and in keeping with the VR-GET guidelines, the participant's Sentinel Events were incorporated into his VR-GET.

Following 15 VR-GET sessions, the participant again completed the PCL-M, BAI and PHQ-9.

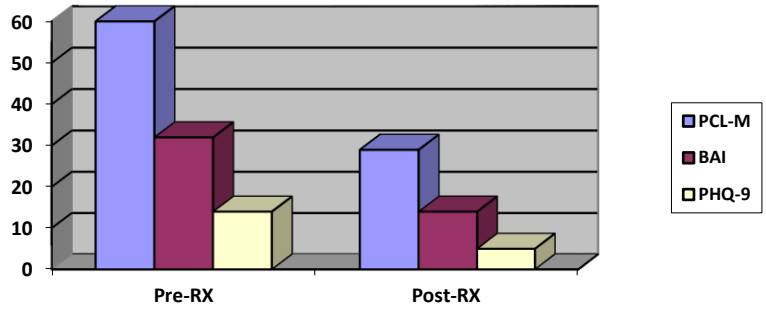


Figure 4. Results for PCL-M, BAI and PHQ-9 administered Pre VR-GET and Post VR-GET

3. Results

Following 15 VR-GET sessions, the participant's symptom severity decreased measurably. He is sleeping 6 – 8 hours a night, with 20 minutes or less sleep onset difficulties four to five nights a week. This participant is continuing in VR-GET for an additional 5 sessions and his post 20-VR-GET session symptom severity will be reported during CYPSY21.

4. Conclusions

Virtual Reality Graded Exposure Therapy (VR-GET) led to measurable reductions in PTSD, anxiety and depression symptoms in our participant and our participant reported easily tolerating the VR-GET combat environments. These measurable reductions on PTSD, anxiety and depression were assisted with the prescription of psychotropic medications. As with other VR-GET participants, our participant described becoming engaged in the graded exposures of the VR simulations/combat-environments and in spite of a busy and hectic active duty Navy position, he was able to consistently keep his scheduled consultations. Of note, this Case Report is the first to describe the utilization of VR-GET more than 5 years post-combat deployment. Other reports describing VR-GET have documented treatment having occurred either proximal to return to the United States following a combat tour [9] or proximal to having returned to the United States following a most recent combat deployment, but with the participant's first combat deployment having been 4 years prior to VR-GET [10]. With the possibility that Virtual Reality Therapy and VR-GET can assist with reducing combat-related PTSD symptom severity many years after a combat tour or combat tours needs to be assessed more inclusively. Such an assessment may lead to the inclusion of Virtual Reality Therapy and VR-GET as being "strategies" that DOD and VA could adopt to improve the mental health care engagement and treatment for veterans needing services for PTSD. Lastly, during CYPSY21,VR-GET treatment limitations and treatment insights, gained from our discussion with our participant, will be presented.

References

[1] D. C Arthur, S. MacDermid, K. C. Kiley, The achievable vision: report of the Department of Defense Task Force on Mental Health, June 2007. Defense Health Board, Falls Church, VA.

[1] B. C. Kok, B. K. Herrell, J. L. Thomas, C. W. Hoge. Posttraumatic stress disorder associated with combat service in Iraq and Afghanistan, *Journal of Nervous and Mental Disease* **200** (2012), 444 – *450*.

[2] T. Tanielian, L. H. Jaycox. Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery, Rand Corporation Monographs, 2008.

[2] E. C. Ritchie, M. Owens. Military Issues, *Psychiatric Clinics of North America* **27** (2004), 459 – 471.

[3] C. W. Hoge. Risks associated with untreated PTSD in veterans: implications for improving mental health care engagement and treatment, *Federal Practitioner* **30** (2013), Suppl. 3; 3S – 12S.

[4] M. J. Roy, K. B. Highland, M. A. Costanzo. GETSmart: guided education and training via smart phones to promote resilience, *Studies In Health Technology and Informatics* **219** (2016), 123 – 128.

[5] K. A. Hepner, E. M. Sloss, C. P. Roth, H. Krull. Et. al., Quality of care for PTSD and Depression in the military health system, Rand Corporation, Santa Monica, CA, 2016; downloaded on May 2, 2016 from: www.rand.org/topcs/post-tramatic-stress-disorder.html.

[6] R. Forsten, B. Schneider. Treatment of the stress casualty during Operation Iraqi Freedom One, *Psychiatric Quarterly* **76** (2005), 343 – 350.

[7] M. D. Howard, R. P. Cox. Collaborative intervention: a model for coordinated treatment of mental health issues within a ground combat unit, *Military Medicine* **173** (2008), 339 – 348.

[8] D. P. Wood, J. A. Webb- Murphy, K. Center, R. McLay, D. Reeves, et., al., Combat-related post-traumatic stress disorder: a case report using virtual reality exposure therapy with physiological monitoring, *Cyberpsychology & Behavior* **10** (2007), 309 – 315.

[9] D. P. Wood, J. A. Webb- Murphy, K. Center, R. McLay, R. Koffman, S. Johnston, et. al., Combat-related post-traumatic stress disorder: a case report using virtual reality exposure therapy with physiological monitoring with a female seabee, *Military Medicine*, **174** (2009), 1215 – 1222.

[10] D. P. Wood, J. A. Webb- Murphy, R. N. McLay, B. K. Wiederhold, J. L. Spira, S. L. Johnston, et., al., Reality graded exposure therapy with physiological monitoring for the treatment of combat related post-traumatic stress disorder. In J. D. Westwood et al. (Eds.), Medicine Meets Virtual Reality 18 Proceedings 2011*,* pp.696 – 702; IOS Press: Washington, D.C.

[11] R. N. McLay, D. P. Wood, J. A. Webb-Murphy, J. L. Spira, M. D. Wiederhold, J. M. Pyne, B. W. Wiederhold, A randomized, controlled trial of virtual reality exposure therapy for post- traumatic stress disorder in active duty service members with combat-related PTSD, *CyberPsychology, Behavior and Social Networking* **14** (2011), 223– 229.

[12] American Psychological Association: Diagnostic and Statistical Manual of Mental Disorders, Ed 4, Washington, DC, American Psychiatric Association, 1994.

SECTION VI

WORK IN PROGRESS

It is important to emphasize the importance of developing technological strategies (such as artificial intelligence or augmented real-ity) 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 experi-ence increasingly more competitive, creative, and capable in the task of helping others. Of course, this has significant ethical implica-tions, which will also need to be explored at greater depth.

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

Transformative Interactions: Designing Positive Technologies to Foster Self-Transcendence and Meaning

Andrea GAGGIOLI[a,b,1] , Alice CHIRICO [a], Stefano TRIBERTI [a], Giuseppe RIVA [a,b]

[a] *Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy*
[b] *Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano, Milan, Italy*

Abstract. In the last years, there has been a growing interest in the role of self-transcendent positive emotions – such as awe, elevation and admiration – in fostering wellbeing and personal development. In particular, recent studies suggest that the experience of these emotions can promote self-improvement, prosocial behaviour and feelings of spirituality. The goal of this contribution is to introduce *Computer-Mediated Self-transcendence* (CMST) as a possible new research pathway in Positive Technology, which refers to the use of interactive technologies for promoting, facilitating or enhancing emotional peak experiences. Specifically, we suggest that the goal of CMST can be achieved by combining virtual reality, videogames and the languages of art, to design mediated transformative experiences that include emotional and epistemic affordances. We describe some early examples of CMST and discuss opportunities and challenges of this approach.

Keywords. Emotions, Self-transcendent, Virtual Reality, Videogames, Positive Technology

1. Introduction

In the last decade, a growing community of researchers has started to investigate how interactive technologies can be used to help individuals, groups and institutions to flourish, leading to the emergence of a new area in cyberpsychology - *Positive Technology*. Positive Technology's ultimate objective is to use technology to facilitate positive change, by creating novel opportunities for learning and insight [1]. Its central assumption is that it is possible to design interactive experiences that (i) support positive emotional states ("hedonic technologies"); (ii) promote opportunities of engagement and flow ("eudaimonic technologies"); (iii) foster social integration and connectedness ("interpersonal technologies").

In the present contribution, we propose a new research direction in Positive Technology – *Computer Mediated Self-Transcendence* – which is concerned with the question of how interactive technologies may be used to promote self-transcendent emotional experiences.

[1] Corresponding author, andrea.gaggioli@unicatt.it

2. Self-transcendent experiences

Among the many experiences that make worth living, self-transcendent experiences occupy a special place. These are out-of-the-ordinary life moments that allow individuals experiencing something greater of themselves, reflecting on deeper dimensions of their existence, shape lasting spiritual beliefs, and enhance feelings of connectedness. The exploration of self-transcendent experiences was pioneered by William James, in his study of the phenomenon of religious conversion. In his groundbreaking work "The Varieties of Religious Experience", James noted how these transformative experiences can foster a range of feelings including the loss of all worry, the perception of knowing truths not known before, a sense of newness, and cleanness in world [2].

Later, Abraham Maslow introduced the concept of "peak experience" to describe a moment of elevated inspiration and enhanced well-being [3]. According to Maslow, a peak experience can permanently affect one's attitude toward life, even if it never happens again. Maslow suggested that peak experiences can bring about several beneficial effects, including a more positive view of the self, other people, and the world, as well as renewed meaning in life, thus supporting the process of self-actualization. Further, Maslow observed that peak experiences can be triggered by specific settings and activities, such as listening to music, being in nature (particularly in association with water, wild animals, sunsets, and mountains), meditation, prayer, deep relaxation, and physical accomplishment [3].

In recent years, positive psychology researchers have developed a first taxonomy of "prototypical" self-transcendent emotional experiences [4, 5]. These include *awe* (a feeling that combines intense pleasure, surprise, connectedness and vastness with feelings of fear and uncertainty), *elevation* (the emotional response to acts of virtue and moral beauty), and *admiration* (the feeling produced by exemplars of talent and skill).

Although these emotions are considered positive in nature, they differ from other positive emotions (such as pride and amusement) as they are elicited by stimuli that are not primarily concerned with the self's goals [6]. A further defining feature of self-transcendent emotional experiences is that they often induce a sense of self-diminishment, due to the encounter with something more powerful than us (awe), or with someone whose virtue exceeds common standards (elevation), or whose ability overcomes our expectations (admiration). Previous research has suggested that self-transcendent emotional experiences can bring about several benefits for individual wellbeing and personal development. For example, it has been shown that they can promote prosocial behavior [7, 8] and elicit spiritual beliefs [9].

3. Towards Computer-Mediated Self Transcendence

Given the essential role that self-transcendent emotional experiences play in wellbeing and in personal development, could interactive technologies be used to elicit or enhance them? Our hypothesis is that by combining immersive virtual reality (VR), video-gaming technologies and the languages of art, it is possible to create novel powerful ways to induce self-transcendent experiences. VR allows simulating "possible

worlds" and "possible selves" and even generating conditions that break the laws of nature, i.e., by manipulating bodily self-consciousness [3], or inducing the illusion of owning a different body [10]. On the other hand, videogames can create compelling interactive storytelling scenarios which engage the participant in creative learning spaces, where they can challenge taken-for-granted ways of knowing and being. In particular, elsewhere [11] we argued that two key elements – which we defined "*transformative affordances*" - are crucial for designing self-transcendent experiences using interactive media. These are (i) *emotional affordances*, and (ii) *epistemic affordances*.

Emotional affordances are perceptual cues that are aimed to elicit a deep emotional involvement in the user, i.e. by inducing exceptional appraisals of admiration, wonder, elevation, awe, etc. Emotional affordances are designed to re-create the basic "aesthetic dimension" of a self-transcendent experience, which otherwise would be very difficult to encounter/reproduce in real-world contexts. For example, using VR it is possible to re-create the feeling of vastness that astronauts perceive during space flight, or to induce in the participant the illusion of being in a different body to enhance the process of social-perspective taking.

Epistemic affordances are cognitive cues that are meant to provide the participant with the opportunity to integrate/build new knowledge structures. These are, in essence, structured narratives conceived to trigger reflection and transformative insights. Epistemic affordances might be either represented by explicit messages (i.e., in the case of elevation, by providing explicit examples of moral virtues represented by a character) or be conveyed through implicit or evocative contents, that is, symbolic-metaphoric situations (i.e. one bright and one dark path leading from a crossroads).

From this perspective, epistemic affordances are meant to create open-ended "experiments of the self", for example, simulated dilemmatic situations that situate the participants in disorientation and puzzlement, which are also turning points out of which new inspirations may arise.

In the following paragraphs, we illustrate some preliminary examples of how interactive media can be used to promote self-transcendent emotional experiences using emotional and epistemic affordances.

3.1 Awe

Awe is a multifaceted emotion in which fear is blended with astonishment, admiration and wonder. Awe experiences are associated with well-being [9, 12] as well as altruistic and other prosocial behaviors [13]. Keltner and Haidt [14] identified two prototypical elicitors of awe: perceived vastness (something that is experienced as being much larger than the self's ordinary frame of reference) and a need for accommodation, defined as an "inability to assimilate an experience into current mental structures" (p. 304). Accommodation refers to the Piagetian process of adjusting cognitive schemas that cannot assimilate a new experience [15]. According to Keltner and Haidt, accomodation can be either successful, leading to an enlightening experience (associated with an expansion of one's frame of reference); or unsuccessful (when one fails to understand), leading to terrifying and upsetting feelings. Keltner and Haidt suggest that nature, supernatural experiences, and being in the presence of powerful or celebrated individuals are frequent elicitors of awe; however, human arts and artifact – such as songs, symphonies, movies, plays, paintings and architectural buildings (skyscrapers, cathedrals, etc.) are also able to induce this feeling.

A pioneering example of how interactive technologies can be used to induce awe is provided by a project by Gallagher et al. [16]. These authors used mixed-reality simulations to elicit the experiences of awe and wonder reported by astronauts during space flight. Gallagher et al. created a virtual simulation (the "*Virtual Space Lab*") resembling the International Space Station workstation, which was designed to expose subjects to simulated the earth and deep space (including physical structure plus simulated visuals). Results indicated that, despite some limitations, the Virtual Space Lab was able to induce awe experiences similar to those reported in the astronauts' reports. Albeit preliminary, these results show promise for using a simulation technology in a laboratory to study experiences such as awe and wonder, which would be otherwise very difficult to investigate (because unfeasible or too expensive) in real-world contexts.

3.2 Elevation

Elevation is the emotional response to acts of virtue and moral beauty. It is a strong, moving positive emotion, characterized by a unique psychophysiological correlate, the so-called "lump in throat" [17]. Elevation is interesting from the point of view of CMST, in that it directly promotes behavioral change. Specifically, people experiencing elevation are motivated to embody moral virtues and to replicate the moral behaviors they have witnessed [17, 18]. Moreover, pursuing virtues has positive effects on overall well-being, in that it helps to find meaning in life and improves other self-transcendent emotions such as awe and admiration.

Recently, video games have been identified as a potentially effective medium to promote elevation experiences. On the one hand, they can feature moral virtues represented by compelling characters, the players directly interact or identify with, so that the players are more likely to reflect on moral/immoral actions after the exposure [19, 20]. On the other hand, being interactive technologies, video games allow players to experiment with moral behavior [21]. For instance, video game players could perform moral choices multiple times in the secure context of the virtual simulation, witnessing consequences and reflecting on their impact on others and society.

A specific asset of video game technology for CMST is related to the use of *narratives* [22] in that the mediated representation of moral contents requires the construction of fine contexts, encompassing aims and actions of multiple characters.

This stresses the level of complexity needed for the design of future CMST tools to promote elevation, in that their fundamental features exceed technical development and probably entail high-level screenplay writing skills. Thus, understanding the role of complex narratives and morality/virtue representations in CMST media stands out as a key challenge for future research.

3.3 Admiration

Admiration is the "*regard for someone or something considered praiseworthy or excellent*" [23] (p.2), and it was often studied in relation to awe and elevation.

Compared with elevation, admiration resulted as a non-moral emotion, elicited in response to skills or talent challenging actual standards [24]. Differently from awe, the "active" nature of this emotion has been emphasized, which supports the intention to praise and emulate the object of admiration [23]. Most researchers agree with the

prosocial potential of this emotion and considered it a stronger motivational driver orienting us towards other people [5, 24], supporting cooperation, and social communication [25, 26]. With the rising of online communities, such as virtual worlds, the elicitation of this emotional experience may play a crucial role. Indeed, admiration can strengthen feelings of genuine connectedness in mediated interactions [27] by promoting a sense of social presence (i.e., the feeling of being with Others in a mediated of natural environment) among users. We hold that admiration may be a further promising field of application of CMST, which is also linked to a group-based perspective of analysis.

4. Conclusion

We introduced Computer-Mediated Self-transcendent (CMST) as a new research direction in Positive Technology, referring to the use of computers in supporting, facilitating or enhancing emotional peak experiences.

Specifically, we have argued that the goal of CMST can achieved by combining virtual reality, videogames and the languages of art to design experiences that include both emotional and epistemic affordances. We believe that CMST holds significant potential, not only to advance the field of Positive Technology, but also to explore how interactive technologies could be used beyond "utilitarian" or "entertaining" purposes, for the fulfillment of more essential psychological and spiritual needs of human beings.

References

[1] G. Riva, et al., Positive technology: using interactive technologies to promote positive functioning. *Cyberpsychology, Behavior, and Social Networking*,. **15**(2012). 69-77.

[2] W. James, *The varieties of religious experience: A study in human nature*. in *Gifford Lectures on Natural Religion, University of Edinburgh, Edinburgh, Scotland; The chapters in this text were presented at the aforementioned lectures in 1901-1902.* 1902. Longmans, Green and Co.

[3] A.H. Maslow, and K.D. Pi, *Religions, values, and peak-experiences*. Vol. 35. 1964: Ohio State University Press Columbus.

[4] J. Haidt, *The moral emotions.* Handbook of affective sciences, **11(**2003) 852-870.

[5] I. Schindler, Zink, J. Windrich, and W. Menninghaus, Admiration and adoration: Their different ways of showing and shaping who we are. *Cognition & emotion* **27**(2013) 85-118.

[6] J. Haidt, and D. Keltner, *Appreciation of beauty and excellence*, in *Character strengths and virtues*, C. Peterson and M.E. Seligman, Editors. 2004, American Psychological Association: Washington, DC. 537-551.

[7] K.S. Cox, Elevation predicts domain-specific volunteerism 3 months later. *The Journal of Positive Psychology*, **5**(2010) 333-341.

[8] S. J. Schnall, Roper, and D.M. Fessler, Elevation leads to altruistic behavior. *Psychological science*,**21** (2010) 315-320.

[9] P. Van Cappellen, V. Saroglou, Self-transcendent positive emotions increase spirituality through basic world assumptions. *Cognition & emotion*, **27**(2013), 1378-1394.

[10] T.C. Peck, S. Seinfeld, S.M. Aglioti, and M. Slater, Putting yourself in the skin of a black avatar reduces implicit racial bias. *Consciousness and cognition*,. **22**(2013), 779-787.

[11] A. Gaggioli, *Transformative Experience Design*, in *Human Computer Confluence. Transforming Human Experience Through Symbiotic Technologies*, A. Gaggioli, Ferscha, A., Riva, G., Stephen Dunne, Isabelle Viaud- and Delmon, Editors. 2016, De Gruyter Open: Berlin. 96-121.

[12] M. Rudd, K.D. Vohs, and J. Aaker, Awe expands people's perception of time, alters decision making, and enhances well-being. *Psychological science*,. **23**(2012), 1130-1136.

[13] P.K. Piff, Dietze, M. Feinberg, D.M. Stancato, and D. Keltner, Awe, the small self, and prosocial behavior. *Journal of personality and social psychology*, **108**(2015), 883.

[14] D. Keltner, and J. Haidt, Approaching awe, a moral, spiritual, and aesthetic emotion. *Cognition & Emotion*,. **17**(2003), 297-314.
[15] J. Piaget, and B. Inhelder, *The psychology of the child*. 1969: Basic Books.
[16] S. Gallagher, L. Reinerman-Jones, B. Sollins, and B. Janz, Using a simulated environment to investigate experiences reported during space travel. *Theoretical Issues in Ergonomics Science*, **15**(2014) 376-394.
[17] M.B. Oliver, T. Hartmann, and J.K. Woolley, Elevation in response to entertainment portrayals of moral virtue. *Human Communication Research*. **38**(2012), 360-378.
[18] V. Huta, and R.M. Ryan, Pursuing pleasure or virtue: The differential and overlapping well-being benefits of hedonic and eudaimonic motives. *Journal of Happiness Studies*, **11**(2010) 735-762.
[19] K. Pohl, *Ethical reflection and emotional involvement in computer games*. in *Proceedings of the Philosophy of Computer Games Conference 2008*. 2008.
[20] S. Triberti, *This Drives Me Nuts! How gaming technologies can elicit positive experiences by means of negative emotions*, in *Integrating Technology in Positive Psychology Practice*, P.C. D. Villani, A. Gaggioli, & G. Riva Editor. 2016, IGI Global Hershey, PA.
[21] S. Triberti, D. Villani, and G. Riva, Moral positioning in video games and its relation with dispositional traits: The emergence of a social dimension. *Computers in Human Behavior*, **50 (**2015**)**, p. 1-8.
[22] T. Baranowski, D. Thomson, and R. Buday, Story Immersion of Videogames for Youth Health Promotion: A Review of Literature. *Games for Health Journal*, **1**(2012), 199-204.
[23] D. Onu, T. Kessler, and J.R. Smith, *Admiration: A Conceptual Review.* Emotion Review, 2016: p. 1-13. DOI: 10.1177/1754073915610438.
[24] S.B. Algoe, and J. Haidt, Witnessing excellence in action: The 'other-praising'emotions of elevation, gratitude, and admiration. *The journal of positive psychology,* **4**(2009), 105-127.
[25] A.J. Cuddy, S.T. Fiske, and P. Glick, The BIAS map: behaviors from intergroup affect and stereotypes. *Journal of personality and social psychology*, **92**(2007): 631.
[26] D. Onu, T. Kessler, and J.R. Smith, *Inspired by the outgroup: A social identity analysis of intergroup admiration.* Group Processes Intergroup Relations, 2016. DOI: 10.1177/1368430216629811.
[27] S. Triberti, A. Chirico, & G. Riva, *New technologies as opportunities for flow experience: a framework for the analysis*, in *Flow Experience: Empirical Research and Applications* F.Ø.A. L. Harmat, F. Ullén, & J. Wright Editor. 2016 Springer: New York.

Online and Offline life: key factors for a functional use of the Internet

Martina BENVENUTI[a,1] and Elvis MAZZONI[a]
[a] *ALMA MATER STUDIORUM - University of Bologna*

Abstract. Starting from the concepts of functional organ and inverse instrumentality, we present an ongoing research whose purpose is to analyze the use of social Web during the lifespan. Specifically, the research explores processes that underline a problematic use of the social Web compared with those that develop and improve human abilities through the functional use of the Internet.

Keywords. Internet, Online Life; Offline Life; Functional Organ; Inverse Instrumentality, Problermatic Internet Use, Functional Internet Use.

1. Introduction

In the last decades the increased availability and the increasingly rapid and constant technological development have led to significant changes in the people's way of life in many countries of the world [16]. The immediacy of Web communications have forever changed the history of human relationships, making millions of people prefer virtual to the face to face communication [13]. With the passing of time, the Internet has evolved rapidly into an everyday tool that has allowed the development of new applications that facilitate and enable not only communication but also other activities [10;17]. Indeed, in the last few years new generation devices like smartphones and tablets allow us to be always connected. Considering this, Web 2.0 requires a lot of our attention during its use and we are frequently distracted from tasks in which we are involved during daily activities. The integration between being Online and Offline is an important part of the psychology of human being [19]. In some cases, it is possible to find a balance between these two aspects of human life and the Web is functional to work, to study and to carry out daily activities. In other cases, people run the risk of pursuing behaviors that lead to problematic use [5] or inverse instrumentality [6], i.e. the regulation of human behavior in an expectant manner by means of technological artefacts.

Starting from these concepts the theoretical perspective of the research is based on the assumption that the Internet is not good or bad but it could become a problematic device or an empowering tool depending on how it is used and the reasons behind its use, like any other cultural artifact made by humans. For these reasons the objective of the study is to explain which processes make a massive and pervasive use of the Web to be a functional organ, i.e. a source of empowerment [11] or a source of problematic use (inverse instrumentality) during the lifespan.

[1] Corresponding author, martina.benvenuti2@unibo.it

2. Factors connected to the use of the Internet

Many scholars have inquired which factors play a role into the use of the Web in general or some specific Web application, and one of the most important is the self-esteem. However various studies have suggested an inverse relationship between self-esteem and problematic Internet use [8;22], while other studies have shown that this relationship is not so straightforward. [23] found that people characterized by greater extroversion and higher self-esteem perceive themselves more popular both in Online life and in Offline life (hypothesis of social enhancement). On the other hand, people with less self-esteem are perceived as less popular both on the Web and in real life (hypothesis of social compensation). This idea inspired the study of Kuss and Griffiths who shows that low and high self-esteem would not affect much the frequency of use of the Web, as the reasons for its use. One possible hypothesis to explain these results is that if individuals do not receive adequate social support in daily life, in order to compensate for this shortage, tend to create a parallel life to activate contacts and build relationships.

Despite social support may seem a phenomenon inseparable from face-to-face relationships, some studies have shown that Online social support plays an important role on people's life. Using the constructs of social support Online and social support Offline, Wang and Wang [21] have investigated whether the way people relate to their contacts affects or not the Internet Addiction Disorders (IAD). The results show that having a higher amount of relations and greater support Online increases the risk of IAD, while more support in Offline life is negatively correlated with this addiction. The explanation given by the authors is that the construction of bonds predominantly Online means that you can rely mainly on people in the Online world implying a growing need to stay connected.

This last result introduces some dynamic aspects that plays an important role in Online life, i.e. self-regulation and self-control. One of the most common experiences during the time spent Online is the unawareness of time passing. The term cognitive absorption [1] means a strong involvement with five dimensions (temporal dissociation, focused immersion, enjoy, control, curiosity). If, on the one hand, self-control and self-regulation allow to manage actively a situation, on the other hand, the mindfulness of what you are doing allows for constant monitoring on the progress of the situation. The term mindfulness defines precisely the presence or absence of attention relatively to what happens in the present [20]. Since mindfulness plays an important role in maintaining a certain amount of attention and avoid negative behaviors, we can certainly speculate an effect of this factor, combined with self-regulation, on the problematic use of the Internet as well as on cognitive absorption.

3. The use of the Internet during the lifespan: a cross-sectional research

The study will investigate whether the previously described factors play a role to move the balance from Problematic Internet Use (PIU) to Functional Internet Use (FIU). To achieve this objective, we spread an Online questionnaire, made by Qualtrics platform, in many social networks (Facebook, Twitter, Google +) and a Website appositely created hosted the questionnaire[32]. This allowed us to collect data from 746 adolescents, 635 emerging adults [2] and 687 adults. Specifically this study has two goals: describing and comparing the use of Web artifacts in the three age groups and investigating and comparing the connection between Problematic Internet Use, Mindfulness, Self-Esteem, Self-Control, Cognitive Absorption, Online and Offline social support in the three age groups.

3.1 Method

The research uses a cross-sectional design that has been approved by the Alma Mater Studiorum - University of Bologna ethical committee. The questionnaire has been made after an evaluation of existing instrument and it has been conceived to take account of a broad amount of variables. The main criteria for the scales choice were: their validity, their brevity and the theoretical background. A part of the questionnaire has been devoted to questions asking the daily time spent Online during work and free time, the time spent being reachable by the Web, the kind of devices used and the relative time spent with them. Moreover, other category of questions concerning the most used Web tools, the time per day dedicated to them and the number of checks per day.

3.2 Measures

The questionnaire includes items related to dimensions which could be ideally divided in three sections: demographic measures, dimensions of the Offline life and further items analyze dimensions related to the Online one. Since the research is ongoing, in the following paragraphs, only the scales which are relevant for the objectives of this paper will be described in detail. Concerning the demographic measures, respondents were asked to define their: gender, age, nationality, country of residence, profession, educational qualification and relationship status. The Offline Social Support has been analyzed by the Offline Social Support Scale created by Wang and Wang [21] and adapted by Leung and Lee[14], while the Online Social Support has been analyzed by the same items, with appropriate modification to analyze Online contexts. The problematic use of the Internet has been measured by the Generalized Problematic Internet Use Scale 2 [3]. The scale was recently validated in Italian [7]. The mindfulness has been measured by the Mindfulness Attention Awarness Scale (MAAS) [4] and validated by MacKillop and Anderson [15].
Finally, cognitive Absorption scale [1] is used as measure of Internet engagement.

[32] https://sites.google.com/site/onlineliferesearch/

3.3 Results

The total respondents are 2068. The adolescents are 746 (391 females and 355 males), the emerging adults are 635 (412 females and 223 males) and the adults are 687 (530 female and 157 male). Following the objective of the study in the Table 1 are shown the differences between the three age groups in the factors analyzed.

Table 1. ANOVA

	Adolescents		**Emerging Adults**		**Adults**		***p***
	M	SD	M	SD	M	SD	
PIU	3.14	1.43	2.77	1.25	2.03	1.06	.000*
Online Social Support	3.33	1.04	3.12	1.00	2.64	1.04	.000*
Mindfulness	4.11	0.77	4.06	0.69	4.32	0.71	.000*
Cognitive Absorption	4.51	0.99	4.20	0.84	4.21	0.89	.000*
Offline Social Support	3.86	0.82	3.93	0.76	3.87	0.75	.277
Self-Control	41.6	8.13	42.4	7.22	46.8	7.09	.000*
Self-Esteem	21.5	3.33	21.51	3.48	22.57	2.76	.000*

**Significant values $p \leq 0.05$*

Adolescents show a Problematic Internet Use, an Online Social Support, a Cognitive Absorption significantly higher than the other age groups. Emerging adults show a Problematic Internet Use and an Online Social Support significantly higher than adults. Adults show Mindfulness, Self-Esteem and Self-Control significantly higher compared to emerging adults and adolescents.

4 Discussion

The aim of the present study is to investigate which dimensions play a role in the Functional Internet Use (i.e. its positive integration in everyday life) or in the Problematic Internet Use (that has been conceptualized as inverse instrumentality) in the lifespan. From this point of view, one of the most important aspect to takes into account is the motive behind the use of certain Web technologies. Online behaviors could be a way to compensate for deficiencies in the Offline life and, consequently, the usage of Internet could lead to negative outcomes. On the other hand, if the Internet becomes a tool to enhance and improve one's abilities in the Offline life, its use would have positive effects.

Results of the analysis seem to support this views. For adolescence, Online Social Support is essential to maintain and construct social capital. Also in the emerging adults Online Social Support play an important role during transitions from school to university or work, or from university to work and this could suggest some types of problematic Internet use. This critical aspect of the Online social support is not present for adults, characterized by a more stable situation (having already passed through the

school and university period) even though some aspects of their life is changing. Moreover, for adults Mindfulness, Self-Esteem and Self-Control seem to play an important role in contrasting the Problematic Internet Use. From this point of view, it seems that adults with high self-esteem, high self-control, and high mindfulness don't manifest Online behaviors that lead to a dysfunctional use of the Internet with negative fallouts in Offline life. Adults having high self-esteem perceive himself as having high social support primarily Offline, but also Online, and this preserves them from trying to construct Online a network of relations simply cause they have a lack of relations in Offline life.

The Social Enhancement hypothesis [23] explains that "those with more developed Offline social networks enhance them with more extensive Online social networks", whereas the Social Compensation hypothesis suggests that "those who perceive their Offline social networks to be inadequate compensate for them with more extensive Online social networks". In other terms, the Online environment would allow people with strong Offline social network to improve them, by allowing them to integrate their two networks (Offline and Online) and enhancing their capacity to connect further people and being connect with their already existing social capital.

5 Conclusions

The paper aims to fill a gap in the studies dealing with the understanding of the relationship between Online and Offline life, trying to balance the excessive imbalance on the pathological side of human-technology relation stressed by most part of scientific literature. This perspective, that was born into the wider field of positive psychology [18], could have important implications to improve the effectiveness of certain human functions in everyday contexts, thanks to the attention placed on the awareness of the negative and positive aspects of the Internet. The results described, by highlighting some key factors that can play an important role in a better integration of Online and Offline life, show also which dimension have to be developed to prevent people from the negative effects of the Problematic Internet Use. Working on the development of Mindfulness, Self-Control and Self-Esteem of adolescents will lead to future emerging adults and adults with the ability to integrate positively Internet applications in their daily life to achieve their developmental and career goals.

References

[1] R. Agarwal & E. Karahanna, Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly* **24** (2000), 665-694.

[2] J. J. Arnett, Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist* **55** (2000), 469–480.

[3] S.E. Caplan, Theory and measurement of generalized problematic Internet use: a two-step approach, *Computers in Human Behavior* **25** (2010), 1089–1097.

[4] K. W. Brown & R. M. Ryan, The benefits of being present: mindfulness and its role in psychological wellbeing, *Journal of Personality and Social Psychology* **84** (2003), 822–848.

[5] R. A. Davis, A cognitive-behavioral model of pathological Internet use, *Computers in human behavior* **17** (2001), 187-195.

[6] H. Ekbia & B. A. Nardi, Inverse instrumentality: How technologies objectify patients and players, in P. Leonardi, B. Nardi & J. Kallinikos, *Materiality and organizing: social interactions in a technological world.* Oxford, Uk: Oxford University Press, 2012.

[7] G. Fioravanti, C. Primi & S. Casale, Psychometric evaluation of the generalized Problematic Internet Use Scale 2 in an italian sample, *Cyberpsychology, Behavior and Social Networking* **16** (2013), 761-766.

[8] G. M. Johnson, Self-esteem and use of the Internet among young school-age children. *International Journal of Psychological Studies 3*(2) (2011), 48-53.

[9] A., Kaplan & M., Haenlein, Users of the world, unite! The challeges and opportunities of Social Media. *Business Horizons* **53** (2010), 59-68.

[10] H.. Khang, J. Kim, & Y. Kim, Self-traits and motivations as antecedents of digital media flow and addiction: The Internet, mobile phones, and video games. *Computers in Human Behavior* **29** (2013), 2416-2424.

[11] V. Kaptelinin, Computer-mediated activity: Functional organs in social and developmental contexts. In: B. Nardi, *Context and consciousness: Activity theory and human-computer interaction*, Mit Press, 45-68, 1996.

[12] D. Kuss & M. Griffiths, Addiction to social networks on the Internet: A literature review of empirical research. *International Journal of Environment and Public Health* **8** (2011), 3528-3552.

[13] S. Lee, How do people compare themselves with others on social network sites?: The case of Facebook. *Computers in Human Behavior* **32**, (2014), 253-260.

[14] L. Leung & P. S. Lee, Multiple determinants of life quality: The roles of Internet activities, use of new media, social support, and leisure activities,*Telematics and Informatics* **22** (2005), 161-180.

[15] J. MacKillop & E. J. Anderson, Further psychometric validation of the mindful attention awareness scale (MAAS), *Journal of Psychological Behavior Assessment* **29** (2007), 289-293.

[16] E., Ngai, S., Tao & K., Moon. Social media research: Theories, constructs, and conceptual frameworks. *International Journal of Information Management* **35** (2015), 33-44.

[17] H. Odaci, & Ö. Çıkrıkçı, Problematic Internet use in terms of gender, attachment styles and subjective well-being in university students, *Computers in Human Behavior* **32** (2014), 61-66.

[18] G. Riva, R. M. Banos, C. Botella, B. K. Wiederhold & A. Gaggioli, Positive technology: using interactive technologies to promote positive functioning, *Cyberpsychology, Behavior, and Social Networking,* **15** (2012), 69-77.

[19] S. Turkle, *Alone together: Why we expect more from technology and less from each other,*Basic books, New York, NY, 2012.

[20] H. Walach, N. Buchheld, V. Buttenmüller, N. Kleinknecht & S. Schmidt, Measuring mindfulness - the Freiburg mindfulness inventory (FMI), *Personality and Individual Differences* **40** (2006), 1543-1555.

[21] E. S.-T. Wang & M. C.-H. Wang, Social Support and Social Interaction Ties on Internet Addiction: Integrating Online and Offline Contexts, *Cyberpsychology, Behavior, and Social Networking* **16** (2013), 843-849.

[22] L. Widyanto, M. Griffiths, An empirical study of problematic Internet use and self-esteem. *International Journal of Cyber Behavior, Psychology and Learning (IJCBPL) 1*(1) (2011), 13-24.

[23] J. Zywica & J. Danowski, The faces of Facebookers: Investigating social enhancement and social compensation hypotheses; predicting Facebook™ and Offline popularity from sociability and self-esteem, and mapping the meanings of popularity with semantic networks, *Journal of Computer-Mediated Communication* **14** (2008), 1-34.

Identifying Psychological Themes in the Legend of Zelda Video Game Franchise: A Dissemination.

Derek LAFFAN [a,1]
[a] *Dún Laoghaire Institute of Art, Design and Technology, Co. Dublin, Republic of Ireland.*

Abstract. The Legend of Zelda (LoZ) is a video game series inclusive of many psychological themes found in the storylines. Three psychological themes identified in the present article include: music learning in the "*Ocarina of Time"*, personality change in "*Majora's Mask"*, and Jungian archetypes in "*Wind Waker"* and "*Skyward Sword"* LoZ **titles**. Each theme is supported with reference to psychological theory and contributes to existing theme identification outlined by fans and researchers alike.

Keywords: Video-gaming, themes, music learning, personality, archetypes.

1. Background to the "Legend of Zelda" Video Game Franchise

The *Legend of Zelda* (LoZ) is a video game series designed and produced by Nintendo. LoZ is primarily a role playing game (RPG), one of the most enjoyed video game genres worldwide [1]. The LoZ storylines usually involve a character called *Link*, who sets out on a pre-destined journey to save the land of *Hyrule* from the evil desert king, *Ganondorf*. Various LoZ titles that include this storyline are "*Ocarina of Time*", "*Zelda II: The Adventure of Link*" and "*Wind Waker*" Though other LoZ variations exist and have alternative storylines such as saving the world from a cursed moon ("*Majora's Mask*") or escaping an island full of monsters ("*Link's Awakening*").

This popular video game series has been a fan favourite since 1986 when the first LoZ title "*The Legend of Zelda*" was released on the *Nintendo Entertainment System*. Games Radar placed various LoZ titles in the top 100 of the greatest video games of all time, with "*Wind Waker*" securing second place [2]. It can be argued that LoZ is not just entertaining, but is also enriched with psychological themes [3]. Identifying psychological themes found in video games, further demonstrates the role of applying psychology in popular culture, and also demonstrates how video game developers use psychological phenomena to conceptualize storylines in game design [4].

2. Identifying Psychological Themes

The LoZ games contain many psychological themes that individuals are exposed to every time they play. Although when gaming in general, the individual is already

[1] Corresponding author, derek_oracle@hotmail.com

experiencing a variety of "*effect based*" psychological phenomena, such as goal attainment, overcoming obstacles and problem solving, volitional play, and processing feedback [5]. Whereas, the psychological phenomena in LoZ identified in the present article are considered "*theory based*", or rather as illustrations of certain psychological phenomena studied in psychology.

Previous attempts have been made to explain certain psychological phenomena in LoZ video games. For example, one article examined the personality of the residents of *Clock Town* in *Majora's Mask* and the psychological implications of the layout of *Clock Town* itself [6]. Another article evaluated how the concept of death is portrayed throughout the LoZ franchise, and highlighted the impact of the death theme in the LoZ video games on children who may not have comprehended the concept of death in real life [7]. Arguably the theme explorations of in earlier articles [6, 7] are lacking in theoretical and empirical sources found in psychological research, however can be considered as fan-based attempts to comprehend and relate to themes and storylines in the LoZ video games.

It is to be noted that identifying psychological themes in the LoZ video game franchise, appears to currently stand as an interpretive and subjective analysis on behalf of the individual or individuals who identify and interpret these themes. However, in an effort to relate closely to theoretical aspects of psychology (i.e. theories, effects, studies etc.), identified themes in the present article will be supported by select psychological phenomena found in mainstream psychological literature.

3. Evaluating Identified Psychological Themes

The psychological themes identified in the present article are based upon signature appearances in related LoZ video games. These themes include: music learning in "*Ocarina of Time*" personality change in "*Majora's Mask*" and Jungian archetypes found in "*Wind Waker*" and "*Skyward Sword*." These three psychological themes are thus evaluated.

3.1. Music Learning

In "*Ocarina of Time*" (OOT), a new musical concept to the LoZ series was introduced that involved using the control pad to play a musical instrument; the ocarina. Playing the ocarina is an integral and fundamental part of OOT gameplay. *Link* has to use the ocarina to show his connection to the *Hyrule Royal Family*, communicate with allies such as *Saria* and *Navi*, teleport to various dungeon locations, create rainstorms, turn night into day, call upon the horse *Epona*, and communicate with the dead. In order to play the ocarina, the individual must use the control pad buttons and play the songs correctly from memory in a specific order.

Playing the ocarina may give the individual a sense of understanding music composition and performance. This is an important aspect in relation to music education. For example, video games have been described as the ultimate education tool for music learning because of how accessible and engaging video games are [8]. Music based games have the ability to make "work" feel like "play", and thus pose as an educational advantage in order to encourage young people to learn about music [9]. One of the key processes that makes video games engaging for music learning is flow, a process of optimal performance and occurs when people are deeply engaged in an activity so intensely that everything else becomes oblivious [10], has been considered a rationale for including games in the music classroom [11].

3.2. Personality Change

Similarly as in OOT, "*Majora's Mask*" (MM) requires the individual to use the ocarina to progress through the game. However, it can be argued that a more prominent psychological theme emerges in MM — personality change. The storyline of MM involves an evil *Skull Kid* who takes possession of the demonic *Majora's Mask* and puts a curse on the moon to destroy the earth in three days. *Link* must progress through the game collecting and using a variety of masks in order to obtain the *Majora's Mask* from *Skull Kid* before the three days are up.

How personality may be associated with MM is in the meaning of the concept of personality. The word "persona" literally means mask [12] and is a basis for the concept of personality. When psychologists talk about personality, they normally mention how stable, internal, consistent, and how different factors that explain people's behaviour are [13]. In the context of MM, putting on the *Deku Mask* for instance, transforms *Link* into a *Deku Shrub* and only allows him to use certain functions (stable), those functions can only be used when *Link* wears the *Deku Mask* (internal). *Link* will act like a *Deku Shrub* every time he wears the *Deku Mask* (consistency), and will act differently in certain situations if he wears another mask (different).

This personality change theme is also evident in the behaviours of *Skull Kid*, the primary antagonist of MM. *Skull Kid* is seen as a happy-go-lucky and mischievous character until he comes across the *Mask Man* and steals the *Majora's Mask*, which is cursed. When *Skull Kid* puts on the mask his personality changes drastically. *Skull Kid* begins displaying acts of selfishness, violence, and narcissism. The personality formation of *Skull Kid* has previously been examined in a blog posted on the *Zelda Dungeon* fan site [14]. The author explains *Skull Kid's* personality is represented by the *Moon Children* who can be found inside the moon. However, it is difficult to determine whether the *Moon Children* actually represent the personality of *Skull Kid* before or after. *Skull Kid* wears the mask because of the complex behaviours that are associated with wearing the mask, and the pre-existing behaviours associated with *Skull Kid* in previous LoZ video games.

3.3. Jungian Archetypes

Nonetheless, *Skull Kid* himself is a notable recurring character in the LoZ video games. *Skull Kid* is often seen as a joker who plays tricks on *Link* throughout the video game series. In the personality theories of Carl Jung, the joker is an archetype of an individual's collective unconscious [15]. Archetypes refer to repressed unaware behaviours, which can appear as images and illustrations portrayed in the media [15]. If this theory is to be supported in the LoZ video games, then it can be argued that the recurring characters may be representing archetypes of *Link*'s collective unconscious. Many of the LoZ video games have recurring characters such as *Link, Princess Zelda, Skull Kid, Malon, Talon, Epona, Ganondorf, Navi*, and the *Great Deku Tree*. Each character may represent a specific archetype of *Link*'s collective unconscious. *Ganondorf* may act as the "shadow" — an archetype associated with the darker side of personality. The shadow represents jealous, primitive, and uncivilized behaviours that most people would not use to describe themselves.

Additionally in "*Wind Waker*" a character called *Tetra*, is perceived as competitive towards her male pirate counterparts, and embraces certain perceivable "masculine-like" behaviours such as flexing her muscles and out performing other

pirates. This may be evident in a quote by *Tetra* below, who at the time was with her "*swabbies*" trying to steal bombs from the bomb shop:

Tetra: "Alll right! Fine! Have it your way! We can leave town tomorrow, you big babies. But we're setting sail at first light, so no sleeping in! Understood?"
Pirates: (yelling) "Aye-aye!"

Tetra may be considered as the "animus" archetype. Carl Jung described the animus as the repressed masculine personality features that females possess.

The flipside of the animus archetype, is the "anima" archetype. In "*Skyward Sword*" the character *Ghirahim*, the prime villain, may represent this anima archetype. *Ghirahim* can be considered as a controversial character as he licked *Link*'s face in an effort to be villainous and distracting. As a reaction to this, many LoZ fans took to magazines such as *Zelda Informer*, to discuss how Nintendo portrayed *Ghirahim* as an outdated offensive stereotype of a homosexual character [16]. However, the Jungian archetype of the anima, which has been bestowed upon *Ghirahim* in a previous article [3], may refute these claims of stereotype, and portray *Ghirahim* as the intended character that he was meant to be.

4. Conclusion

As the psychological themes of music learning, personality change, and Jungian archetypes were identified and explored in the context of various LoZ video games, some limitations of this article must be noted. "*Ocarina of Time", "Majora's Mask", "Wind Waker"* and *"Skyward Sword"* are LoZ video games that were released from 1998 onwards. It is possible that other psychological themes may explain the aforementioned psychological phenomena more satisfactorily, as several LoZ video games existed prior 1998 and future LoZ video games are panned to be released. Should this be the case, other researchers are invited to critique the identified psychological themes [3] with references to theory and empirical studies that support their principle arguments.

Future LoZ theme identification articles could also focus on how the educational aspects (such as music learning in OOT) impacts children's learning in classroom settings. Additionally, future articles could also identify how LoZ video games have played either a supportive or hindering role in the personality formation of individuals. Either way, it remains that the LoZ video game series continues to be a much anticipated and popular video-game series, and will continue to be a source of psychological phenomena that enriches and promotes many psychological schools of thought.

References

[1] *Essential facts about the video game industry,* Entertainment Software Association, 2014, Retrieved from http://www.theesa.com/wp-content/uploads/2014/10/ESA_EF_2014.pdf
[2] *Top 100 best games of all time*, Games Radar, 2015, Retrieved from http://www.gamesradar.com/best-games-ever/
[3] D. Laffan, Identifying core psychological themes in the Legend of Zelda video game series: A focus on music learning, personality change and jungian archetypes.*Computers in Entertainment*, 2015, Retrieved from https://cie.acm.org/articles/identifying-core-psychological-themes-legend-zeld video-game-series-focus-music-learning-personality-change-and-jungian-archetypes/
[4] E. Adams, *Fundamentals of game design (3rd eds.)*. Pearson Education Inc, United States of America, 2014.

[5] J. McGonigal, *Reality is broken. Why games make us better and how they can change the world*. Johnathon Cape, London, 2001.
[6] W. Westfall, *Psychology of majora's mask: Clock town. The why button.* 2013,Retrieved from http://www.thewhybutton.com/2013/01/psychology-of-majoras- mask-clock-town.html.
[7] C. Smith, Death in the Legend of Zelda. *Link's hideaway*, 2012, Retrieved from http://www.linkshideaway.com/2012/4/29-death-in-the-legend-of-zelda/
[8] E. Hein, Music games in education. *Learning, Education and Games Volume One: Curricular and design considerations,* 2014, Retrieved from http://press.etc.cmu.edu/files/Learning-Education-Games_Schreier-etal-web.pdf
[9] S. Dillon, *Music, meaning and transformation: Meaningful music making for life*. Cambridge Scholars Publishing. Newcastle, UK. 2007.
[10] M. Csíkszentmihályi, *Flow: The psychology of optimal experience*. Harper Perennial Modern Classics, New York, 2009.
[11] L. Lamont, Emotion, engagement and meaning in strong experiences of music performance, *Psychology of Music* **40** (2012), 574-594.
[12] G. N. Martin, N. R. Carlson, and Buskist, W*, Psychology (3rd ed.)*. Essex, England: Pearson Education Limited, United States of America, 2007.
[13] L. Child, Personality in culture. In E. Borgatta and W. W. Lambert (Eds.). *Handbook of Personality Theory and Research (pp. 80- 101)*. Rand McNally. Chicago, Illinois. 1968.
[14] Freddie, Majora's mask: The psychology of the moon children. *Zelda Dungeon.net Articles*, 2011. Retrieved from http://www.zeldadungeon.net/2011/08/majoras-mask- the-psychology-of-the-moon-children/.
[15] F. Fordham, An introduction to Jung's psychology: Archetypes, *Mambo Open Source*, 2004, Retrieved from http://www.abuddhistlibrary.com/Buddhism/F-%20Miscellaneous/General%20Miscellaneous/An%20Introduction%20to%20Jung's%20Psychology/III.pdf.
[16] Zelda Informer. *Is Ghirahim offensive?* 2012. Retrieved from http://www.zeldainformer.com/news/is-ghirahim-offensive#.VamQPvlViko.

Group Aggression and Bullying through Complex Systems Agent Based Modeling

George MUDRAK [a,1] and Sudhanshu Kumar SEMWAL[a]
[a] *University of Colorado, Colorado Springs, CO, USA*

Abstract. Bullying is a devastating activity with lasting and sometimes permanent consequences. It occurs with individuals and groups, across peoples, ages, schools, workplaces, cultures and nations. While bullying is a ubiquitous behavior of people, it remains difficult to study as conducting live experiments is out of the question for moral and ethical reasons. However, computer simulation models can be created to model the natural social and humanistic systems. Agent based modeling is one approach that can provide verification of theories, insight into social interactions, testing of 'what-if' scenarios and the gem of complex systems modeling, emergent behaviors. All of this can be done within a virtual world of virtual people. This paper will discuss our approach to modeling gang bullying and the results from our simulations along with identification of future opportunities.

Keywords. NetLogo, simulation, complex system, bullying, aggression, emergence, gang bullying, gangs, cliques, collaboration, modeling, attack gangs, defensive gangs.

1. Introduction

Wang et. all, states that bullying is a specific form of intentional, unwanted and repeated aggression, that involves a disparity of power between the victim and perpetrator(s) [1] and StopBullying.gov defines bullying as unwanted, aggressive behavior among individuals that involves a real or perceived disparity in power, occurring more than once or has the potential to happen more than once [2]. We merge both these definitions to define bullying as intentional, unwanted, repeated and aggressive behavior among individuals or groups that involves a real or perceived disparity in power between the perpetrator(s) and victim(s).

Bullying can be found throughout the world, across all cultures, is not restricted by age groups, social groups and even environments such as schools and workplaces or even to single individuals or groups. In fact, bullying cuts across all boundaries and the consequences are varied with the worst involving loss of life. Bullying remains a difficult area of study due to the human and social systems involved as conducting experiments on this type directly on people are out of the question for moral and ethical reasons [3]. Se we turn to using Complex Systems Modeling (CSM) and in particular Agent Based Modeling (ABM) to provide a safe, non-human impacting virtual environment in which we control the various population and individual parameters,

to test our theories.

[1] Corresponding author, mudraks@msn.com

A computational model must adhere to the following aspects of an ABM as stated by Nigel Gilbert, Melanie Mitchell and Epstein and Axtell. Gilbert sets forward the requirement that ontological correspondence must exist in which a direct correspondence between the computer agents in the model and real-world agents exist. This includes the agents, their interactions, and the environment [3]. Epstein and Axtell emphasize that agents operate utilizing micro-level behaviors and the use of a heterogeneous model to provide the fit for the social modeling [4]. And Mitchell provides the definition in support of emergent behavior stating that a complex system is a system that exhibits nontrivial emergent and self-organizing behaviors [5].

In this paper, we use Agent Based Modeling to create a virtual world with people, corresponding to real-world actors possessing micro-level behaviors that exhibit the emergence of self-organizing behaviors, to explore the dynamics of gang / group bullying. These gangs will be used as both a means of attacking and a means of defending. We will make use of Hamming values and tolerances [6] at the individual level for determining their flock-mates or social group and again when the individual determines who around them will compose their attack-mates and defense-mates.

2. Model Details

Our model supported one primary actor: a person. The breadth of attributes and behaviors are a subset of what we defined in our single person bullying model [6]. Each person possessed a visual radius supporting a 360 degree field of view, a metabolism to decrease energy from a corresponding energy 'tank', a Hamming Distance value to provide distinctness and support differentiation among the population, strength and appetite values. Additionally, as we were interested in modeling gangs, each person had to ability to belong to a gang for attack purposes and a gang for defensive purposes. The attack and defensive gangs were not guaranteed to consist of the same group of people but where constructed using the Hamming values of the surrounding individuals given the person's Hamming tolerances for each gang type. Additionally, we supported the concept of an 'energy reserve'. This reserve served as an overflow tank when a bully 'took' energy in excess of what filled them up.

We utilized the core Hunger-Aggression model from our prior work to drive individual bullying behaviors. To provide a local group of similar individuals we introduced flocking behavior to our population and supported flocking based on Hamming value or initial energy tier, represented visually by distinct colors. For the gang aspect, we added two additional behaviors that at each cycle, the person would their flock for other people with Hamming values falling within the tolerance range for an attacking group and for a defensive group. The range was determined in similar fashion to determining the prey population with each person using their preferred Hamming value +/- the tolerance to yield a range of Hamming values that were compatible.

We treated the gangs as force multiplies applied when a person performed a bullying action and when a person performed a defensive action. The force multiple was a modeler determined scalar value times the group size and then added to the corresponding attack or defense value.

3. Model Implementation

As with our individual bullying model, we utilized hunger as the primary influencing value with aggression, attack strength and defensive strength secondary. Prey selection was a randomly chosen individual from the larger dissimilar population determined by the Hamming value and tolerance of the bully. We chose to utilize gangs as force multipliers for attack and defensive purposes once the prey had been selected or the person was selected as prey. For gang selection, we again turned to using the individual's (bully/bullied) Hamming value with a separate tolerance range for the attack gang and the defense gang. This decision allowed for greater variability in the composition between the two group. Each gang could be similar or dissimilar based on the tolerance values chosen. However, because the primary factor for group determination was the individual's Hamming value, one group would always be a subset of the other based on how tolerant the individual was for either the attack or defense group selection. For this model, we chose to leave the simulation tool's concept of time, a 'tick', as just that and not map to any real world concept of time [7]. Additionally, we utilized the full three dimensional space offered by the simulation tool to visually represent the energy levels of the individuals with higher energy individuals at the top and the lowest energy individuals at the bottom. Further we specifically chose to address over-bullying of any individual by setting zero energy as the floor and not allowing for negative or deficit energy.

4. Simulations

For our simulation runs, we kept the majority of the variables the same across the population. We varied the attack visual distance to see what impact that may have on the population distribution. We also varied the defensive tolerance used in determining the defensive group along with the defensive group weighting scalar and we adjusted the “poaching” scalar so that any success bully would share the energy taken with their gang and varied the overall flocking option.

All simulations demonstrated the greatest population movements during the first several seconds. We anticipated this behavior as the individuals are working towards their own personal steady state of energy use and bullying for energy recovery. We utilized two flocking approaches to determine to what extent they would impact the gang bullying and defense. Our first approach was having the individuals flock based on initial color defined at creation time. The color was based on their initial energy and not impacted by runtime energy which could vary. The color based flocking ensured that the people would group with a more superficial attribute while still supporting the possibility of no attack and defense grouping depending on the specified tolerance. That is, while an individual may be part of a flock, then may not be similar enough given their tolerance to form any groups. Similar to how cliques in the real world have sub-cliques within them based on a finer detailed attributes and preferences. Our second flocking approach was to have people flock based on their Hamming value and Hamming tolerance. This approach provided a greater opportunity for individuals to form gangs, again depending on their tolerances.

We observed that across the simulations, the general population tendencies were consistent. That is, the victim class was always the largest class given time and individuals never existed once entering this class. The top-tier class with the most

successful bullies always accrued more energy from their bullying activities than necessary and demonstrated an increasing 'banking' of this energy. The most notable differences between the the two flocking choices was observed within the end-capping tier classes: the bottom and top-tier classes. When flocking was set to make use of Hamming values, we observed larger groups of top-tier bullies while the bottom tier exhibited greater dispersion and less obvious grouping. In contrast, when flocking was set to Color, most top-tier bully groups were noticeably smaller and in many cases consisted of a single individual while the bottom tier (victims) exhibited significantly greater grouping.

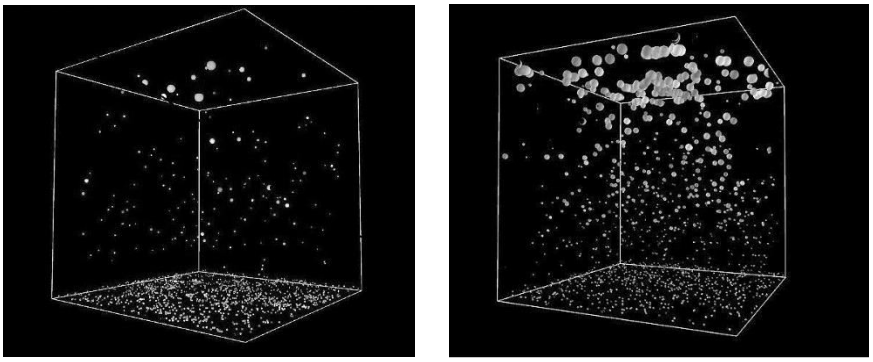


Figure 1 - Color based gang affinity vs. Hamming based gang affinity

5. Discussion of Emergent Behavior

Across the simulations, the macro behaviors remained consistent with the early stages demonstrating the greatest population moves and greater stability reached over time. All cases exhibited bullying, flocking and movement up and down the visual hierarchy based on each individuals' energy.

We feel that our choice of utilizing the full three dimensional modeling space provided additional insight into the actual bullying population distribution. We observed a hierarchy develop where the individuals at the top were fewer in number and possessed a larger share of energy with the population increasing as energy levels decreased. The bottom of the predator-prey hierarchy consisted of the largest portion of the population with the least amount of energy. While the visual confirmation of top tier bullies was re-assuring, we were surprised at the emergence of passivity among the largest but least energized population. We had expected that successful bullying would occur among this population and be visualized as individuals "jumping up and down" as their energy cycled. Instead what we observed was that individuals within this population were not able to bully their way up the food chain but rather, once people fell into this subpopulation, they were unable to escape: exhibiting an unexpected passivity or almost a learned helplessness at moving up.

Another fascinating emergence was the 'hoarding' of energy by the top tier bullies. These bullies consistently increased their total energy even as the population declined and eventually stabilized. Our speculation is that the alpha-bullies are driven to prey more often and take more energy from their victims than they need to satisfy themselves from the hunger perspective.

6. Conclusions

Having demonstrated in our prior work that the hunger driven model of bullying displays behaviors that meet the specific bullying definition provided by StopBullying.gov [2], we find that our next step of including group based bullying also meets the same requirements and hence we have a virtual environment with digital people that demonstrate these emergent bullying behaviors.

Inspecting and analyzing our simulations over their runtimes, we observe the emergence of behaviors that we did not specifically code for. This behavioral emergence is a core feature that can be found in agent based modeling. The observed behaviors included 'hoarding' by the top group of bullies in which they continued to prey upon the population and take energy even though there was no apparent need considering the amount of energy they already possessed. This also lead to what could be considered a privileged group as once people made their way into this group, there were effectively beyond being victims. We also saw that the majority of the population ended up at the bottom of the predator-prey hierarchy and individuals within that prey population were not able to bully their way out up the hierarchy. This effectively lead to a victim class of people.

We feel our model's results are very encouraging on using ABMs for group or gang based bullying / predation and provide a platform to extend and add upon for further development. Some enhancements for consideration include the energy split from a successful bullying effort among the attacking gang, placing limits on the amount of energy within the environment, provide a means for the prey population to receive energy without bullying being required, and possibly make the tolerance and visual radius a function of the person's energy.

References

[1] J. Wang, R. Iannotti, and T. Nansel, School Bullying Among Adolescents in the United States: Physical, Verbal, Relational, and Cyber. Journal of Adolescent Health, 2009.
[2] StopBullying.gov, http://www.stopbullying.gov/what-is-bullying/definition/, 2013.
[3] G. Nigel, Agent-Based Models, Series: Quantitative Applications in the Social Sciences. SAGE Publications, 2008.
[4] J. Epstein, and R. Axtell, Growing Artificial Societies - Social Science from the Bottom Up. Brookings Institution Press, 1996.
[5] M. Mitchell, Complexity A Guided Tour, Oxford University Press, 2009, 12-13
[6] G. Mudrak, and S. Semwal, Modeling Aggression and Bullying: A Complex Systems Approach. iACToR Cyber Psychology Conference, **20** (2015).
[7] G. Mudrak, and S. Semwal, AgentCity - An Agent-Based Modeling Approach to City Planning and Population Dynamics. International Conference on Collaboration Technologies and Systems (2012), 91-96.

SECTION VII

BRIEF COMMUNICATION

User Experience of BenEssere Mamma, a pregnancy app for women wellbeing

Claudia CARISSOLI [a,1] Daniela VILLANI[a], Stefano TRIBERTI[a], Giuseppe RIVA[a,b]
[a] *Department of Psychology., Università Cattolica del Sacro Cuore, Milano*
[b] *Applied Technology for Neuro-Psychology Laboratory, Istituto Auxologico Italiano, Milan, Italy*

Abstract. Pregnancy is a very special time in a woman's life, a time of physical and psychological change. Often anxiety and negative emotions prevent to fully enjoy this magical moment and hamper the well-being, negatively influence obstetric outcomes, development of the child and neonatal adaptation. BenEssere Mamma aims to improve pregnant wellbeing, helping women to be conscious of their affective state and to learn strategies to better cope with anxiety and stress. BenEssere Mamma consists of a brief self-help protocol containing inspired mindfulness meditation and guided imagery exercises for a total of four weeks. This study reports a brief user experience (Beta Version) among pregnant women, delivered by mobile devices. Twelve mothers-to-be experienced a 7-days study and filled two online ad hoc questionnaires. The application was perceived easy to use. Exercises were assessed as pleasant and quite effective. .

Keywords. Pregnancy, Mobile App, Stress, Mindfulness, Positive Technology

1. Introduction

Pregnancy is a psychologically complex and vulnerable period in a women's life[1]. A wide consensus exists about the role of maternal psychological state in influencing child development and the course of pregnancy [2,3]. Furthermore anxiety and depression disorders during pregnancy should be monitored as they are related to post-partum depression [4,5]

To regulate maternal stress and provide expecting mothers with coping strategies to increase their quality of life a wide range of interventions have been tested (relaxation, mindfulness meditation, yoga therapy, breathing instructions, guided imagery, etc.), showing promising results [6-9]. In recent years, mobile apps demonstrated good potential to help people to manage stress and anxiety [10-14] and they appears particularly suitable to better reach mothers-to-be than traditional methods [15].

The mobile app BenEssere Mamma aims to help pregnant women better manage anxiety and stress, especially in the last trimester of pregnancy, but even before, and cope with childbirth. It consists in a four-week self-help protocol including practices of

[1] Corresponding author, claudia.carissoli@unicatt.it

mindfulness inspired meditation and guided imagery. The app can be easily integrated in the social and work habits of women and offers a way to find out time for take care of themselves. Here a brief user experience to evaluate the app in term of easiness of use, usability, pleasantness and general efficacy is presented.

2. User Experience

2.1Participants

Twelve participants were recruited from a water gym course for pregnant women. The recruitment criteria were: (a) being older than 18 years old, (b) being pregnant, (c) holding a smartphone or a tablet, (d) being Italian mother tongue, (e) having a normal pregnancy. Participants took part voluntarily in the intervention after signing the informed consent form. Participants' average age was 31 years, they were daily user of smartphone and they had high education level.

2.2Procedure

All participants were met in group and information about the app, installation procedure and the protocol were shared. BenEssere Mamma test version, developed for Android, included 7 exercises to practice one a day and all lasting about 10/15 minutes: meditation on breath, smile meditation, connection with child in womb, secure place visualization, walking meditation, silence meditation and music listening exercise. The app included also two other optional exercises to practice with the partner.

2.3Measure

User experience has been assessed in two moments: after each mobile experience women were asked to answer to a few online ad hoc questions about technical quality and easiness of use, pleasantness and perceived utility; at the end of the 7days of practice, a general online evaluation about the whole experience was investigated (app quality, pleasantness, effectiveness, interest in continuing training). All questions have been assessed on a 5 points likert scale.

2.4 Results

Women tried all proposed meditation experiences and they found as good the technical features (M= 3.9, SD=1.2). The easiest practice was assessed the connection with child in womb (M=4.2, SD=0.7), and the most pleasant and effective was the secure place visualization (M=4.5, SD=0.7). According to the whole experience evaluation the app was perceived easy to use and to install (M=4.3, SD=0.7) and of good quality (M=4.2, SD= 0.6). The brief trial was assessed quite effective (M=3.6, SD=1.0) and pleasant (M=4.2, SD=0.8) and most of the participants stated to be quite interested to continue the experience or a similar one (M=3.5, SD= 1.2). In general terms, all women declared the propensity of using the app according to their needs rather than daily.

3 Conclusion

According to the survey, BenEssere Mamma appears easy to use and the proposed exercises are assessed as pleasant and quite effective in inducing relaxation and reducing anxiety and stress. Participants reported high levels of engagement maybe thanks to the easiness and comfort in practicing. BenEssere Mamma represents a potential tool to integrate traditional pregnancy courses with a self-help training aimed to increase women awareness of their affective resources and experience techniques to cope with stress and anxiety.

Future pragmatic trials [16] are needed to evaluate efficacy in reducing stress and improving psychological wellbeing during pregnancy.

References

[1] K. Lindgren, Relationships among maternal–fetal attachment, prenatal depression, and health practices in pregnancy, *Research in Nursing & Health* **24** (2001), 203-217.
[2] J. Dayan, C. Creveuil, M. Herlicoviez, C. Herbel, E. Baranger, C. Savoye, and A. Thouin, Role of anxiety and depression in the onset of spontaneous preterm labor, *American Journal of Epidemiology* **155** (2002), 293-301.
[3] S. Hoffman and M.C. Hatch, Depressive symptomatology during pregnancy: evidence for an association with decreased fetal growth in pregnancies of lower social class women, *Health Psychology* **19** (2000), 535.
[4] M.-P. Austin, L. Tully, and G. Parker, Examining the relationship between antenatal anxiety and postnatal depression, *Journal of affective disorders* **101** (2007), 169-174.
[5] K.-A. Grant, C. McMahon, and M.-P. Austin, Maternal anxiety during the transition to parenthood: a prospective study, *Journal of affective disorders* **108** (2008), 101-111.
[6] A.E. Beddoe and K.A. Lee, Mind-Body Interventions During Pregnancy*, Journal of Obstetric, Gynecologic, & Neonatal Nursing* **37** (2008), 165-175.
[7] J. Teixeira, D. Martin, O. Prendiville, and V. Glover, The effects of acute relaxation on indices of anxiety during pregnancy, Journal of Psychosomatic Obstetrics & Gynecology 26 (2005), 271-276.
[8] C. Urech, N.S. Fink, I. Hoesli, F.H. Wilhelm, J. Bitzer, and J. Alder, Effects of relaxation on psychobiological wellbeing during pregnancy: a randomized controlled trial, *Psychoneuroendocrinology* **35** (2010), 1348-1355.
[9] C. Vieten and J. Astin, Effects of a mindfulness-based intervention during pregnancy on prenatal stress and mood: results of a pilot study*, Archives of women's mental health* **11** (2008), 67-74.
[10] L. Chittaro and A. Vianello, Evaluation of a mobile mindfulness app distributed through on-line stores: A 4-week study*, International Journal of Human-Computer Studies* **86** (2016), 63-80.
[11] C. Repetto, A. Gaggioli, F. Pallavicini, P. Cipresso, S. Raspelli, and G. Riva, Virtual reality and mobile phones in the treatment of generalized anxiety disorders: a phase-2 clinical trial, *Personal and Ubiquitous Computing* **17** (2013), 253-260.
[12] D. Villani, P. Cipresso, A. Gaggioli, and G. Riva, Positive Technology for Helping People Cope with Stress, Integrating Technology in Positive Psychology Practice (2016), 316.
[13] D. Villani, A. Grassi, C. Cognetta, D. Toniolo, P. Cipresso, and G. Riva, Self-help stress management training through mobile phones: An experience with oncology nurses*, Psychological Services* **10** (2013), 315.
[14] D. Villani and G. Riva, Does interactive media enhance the management of stress? Suggestions from a controlled study, *Cyberpsychology, Behavior, and Social Networking* **15** (2012), 24-30.
[15] C. Carissoli, D. Villani, and G. Riva, An Emerging Model of Pregnancy Care: The Introduction of New Technologies, Integrating Technology in Positive Psychology Practice (2016), 162.

[16] C. Carissoli, D. Villani, and G. Riva, Does a meditation protocol supported by a mobile application help people reduce stress? Suggestions from a controlled pragmatic trial, *Cyberpsychology, Behavior, and Social Networking* **18** (2015), 46-53.

Classifying Different Types of Augmented Reality Technology

Amanda EDWARDS-STEWART [a,1] Tim HOYT [a], and Greg M. REGER [b]
[a] *National Center for Telehealth & Technology, U.S. Defense Health Agency*
[b] *Veterans Health Administration, Puget Sound Health Care System*

Abstract. Augmented reality (AR) is defined as "…a live direct or an indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input…" [1]. AR is often considered a type of virtual reality (VR), but could also be considered two distinct technologies and be classified separately. Furthermore, applications referred to as AR can be distinct from one another and it is useful to define different categories and types. This paper identifies Triggered AR technologies, which include four types: Marker-based, Location-based, Dynamic Augmentation, and Complex Augmentation. View-based AR is also discussed, which includes Indirect Augmentation and Non-specific Digital Augmentation. Examples and characteristics of each type are identified. Lastly, this paper summarizes research using different types of AR in behavioral healthcare and discusses future applications.

Keywords. Augmented reality, virtual reality, innovative technology, behavioral health

1. Introduction

AR technology input can be audio or visual. AR enhances perception of the user's world. Though AR is often considered a type of virtual reality, it is a technology with unique characteristics and a different purpose. Virtual Reality typically replaces the real world with a simulated one, immersing users in a reproduced or alternative reality. Augmented reality enhances the current environment, creating a mixed reality instead of replacing that reality. Previous typologies of AR have tended to focus on technical aspects of the approaches [2]. However, applications of AR to behavioral health may also be assisted by classifications based on functional characteristics of various applications. Such classifications can help researchers consider appropriate problem areas that may fit with certain AR types.

AR has six different types that fall under two overarching categories. These include triggered versus view-based augmentation. Triggers are stimuli or characteristics that initiate or "trigger" the augmentation. Triggers can be paper or object markers, GPS location, dynamic augmentations of objects, as well as a combination of dynamic object recognition with GPS location that is classified as a Complex Augmentation. Other forms of AR are view-based, which includes either digitized augmentations without reference to what is in view or augmentation of a stored/static view. See Table 1 for a concise summary of the AR types.

[1] Corresponding author, amanda.e.stewart7.civ@mail.mil

2. Triggered augmented reality technologies

Among triggered AR technologies, four types exist. First, Marker-based AR requires a marker to activate an augmentation. Such markers can be paper-based or physical objects that exist in the real world. Augmentations related to the marker enhance the image or object, though some are only a means to access digital content. For example, the app Aurasma's augments the appearance of a real-world $20 bill, which morphs into an entertaining, patriotic animation. This example takes an object-marker and providers a meaningful augmentation of the trigger stimulus.Location is another form of trigger. Location-based AR uses the device's GPS location as a trigger to pair dynamic location with points of interest in order to provide relevant data or information (e.g., restaurants in Yelp's monocle view). A third type of triggered AR is Dynamic Augmentation, which is responsive to the view of the object as it changes. Dynamic Augmentation with motion tracking can also scale the augmentation to fit the identified object. For example, Swivel is a shopping application that allows users to try on clothing and accessories digitally. Finally, Complex Augmentation pair a real, dynamic view of the world with digital information typically accessed via the Internet. It is a combination of Marker/Location-based AR and Dynamic Augmentation. This can be seen in the original concept for Google Glass, wherein users see information about local sites based on their GPS location. Objects in the user's field of vision are presented with helpful information about their surroundings from an internet backend.

3. Indirect and non-specific digital augmentation

The second category of AR includes Indirect Augmentation and Non-Specific Digital Augmentation. Indirect Augmentation intelligently augments a static view of the world. This often involves augmenting images. An example of this category includes applications that allow users to take a picture of a room and then change the wall color of that room. The application identifies the wall from other objects and augments only the wall. Non-Specific Digital Augmentation digitizes a dynamic view of the world without reference to what is being viewed. This is common in mobile games. The user interacts with the augmentation, such as tapping the augmentation when it comes into view but without reference to the user's environment.

4. Applications of augmented reality in behavioral health

The ability to digitally augment real world settings may have a range of applications to support the psychological health of individuals. Available literature on the use of AR to support psychological health is limited but concepts appear promising. Marker-based AR has been used with small animal phobias [3,4], as well as in improving emotion facial recognition with autism spectrum disorders [5]. Location-based AR has been paired with pleasant event scheduling [6] and Dynamic Augmentation was found helpful with visually impaired older drivers [7]. Future AR applications include

advances in Location-based AR with geo-fencing and Dynamic Augmentation (e.g., HoloLens). Current pilot work using Location-based AR with blue tooth sensor to help patients navigate large military hospitals is underway. Dynamic Augmentations to support exposure therapy are also being explored. AR is a popular technology with continual development. For example, a new tool to assist blood draw, AccuVein, is considered AR. AccuVein provides a light that contrasts veins from surrounding tissue to improve the accuracy of blood draws. This form of AR does not clearly fit into the types identified above. As a result, the current typology may need to be augmented to accommodate developing technologies.

Table 1. Summary of augmented reality categories and types.

Category	Type	Examples	Characteristics
Triggered	1a. Marker-based: Paper	String (string.co) Blippar (blippar.com)	Paper marker activates stimuli.
	1b. Marker-based: Object	Aurasma (aurasma.com)	Most objects can be made into markers.
	2. Location-based	Yelp (yelp.com) PAJ (t2health.dcoe.mil/positiveactivityjackpot) Instagram (instagram.com)	Overlay of digital information on a map or live camera view. GPS may activate stimuli.
	3. Dynamic Augmentation	Video Painter (itunes.apple.com/us/app/video-painter/id581539953?mt=8) Swivel (Motion; facecake.com)	Meaningful, interactive augmentation with possible object recognition and/or motion tracking.
	4. Complex Augmentation	Google Glass (google.com/glass)	Augment dynamic view and pull internet information based on location, markers, or object recognition.
View-Based	5. Indirect Augmentation	Wall Painter (itunes.apple.com/us/app/wall-painter/id396799182?my=8)	Image of the real world augmented intelligently.
	6. Non-specific Digital Augmentation	Swat the Fly (inengy.com/swatthefly) Bubbles (virtualpopgames.com)	Augmentation of any camera view regardless of location.

References

[1] What is Augmented Reality (AR)? In *IGI-Global's online dictionary*. Retrieved from http://www.igi-global.com/dictionary/augmented-reality-ar/1859, n.d.

[2] J. Normand, M. Serviéres, & G. Moreau. A new typology of augmented reality applications. *AH'12 Proceedings of the 3rd Augmented Human International Conference* **18** (2012).

[3] C. Botella, M.C. Juan, R.M. Baños, M. Alcañiz, V. Guillen, & B. Rey. Mixing realities? An application of augmented reality for the treatment of cockroach phobia. *Cyberpsychology & Behavior* **8** (2005), 162-171.

[4] M.C. Juan, & D. Joele. A comparative study of the sense of presence and anxiety in an invisible marker versus a marker augmented reality system for the treatment of phobia towards small animals. *International Journal of Human-Computer Studies* **69** (2011), 440-453.

[5] C. Chen, I. Lee, & L. Lin. Augmented reality-based self-facial modeling to promote the emotional expression and social skills of adolescents with autism spectrum disorders. *Research in Developmental Disabilities* **36** (2015), 396-403.

[6] Edwards-Stewart. Using technology to enhance empirically supported psychological treatments: Positive activity jackpot. *Archives of Medical Psychology* **3** (2012), 60-66.

[7] M.L. Rusch, M.C. Schall, J.D. Lee, J.D. Dawson, & M. Rizzo. Augmented reality cues to assist older drivers with gap estimation for left-turns. *Accident Analysis and Prevention* **71** (2014), 210-221.

Patients' expectations and satisfaction towards an Internet-based treatment for flying phobia: preliminary data

Daniel CAMPOS [a,] , Soledad QUERO[a,b1] , Juana BRETÓN-LÓPEZ[a,b], Carla SOLER[a], Sonia MOR[a] & Cristina BOTELLA[a,b]

[a]Universitat Jaume I (Castellón, Spain).
[b]CIBER de Fisiopatología de la Obesidad y Nutrición (CIBEROBN)

Abstract. The treatment of choice for specific phobias is *in vivo exposure*. Despite the proven efficacy of this technique, it is linked to a number of limitations in its acceptation. Information and Communication Technologies (i.e., computer-assisted exposure programs and Internet) could help to overcome these issues. However, to our knowledge, no other studies investigate the acceptability of an Internet-based treatment for Flying Phobia. The aim of this work is to offer data about the patients' expectations and satisfaction towards *NO-FEAR Airlines* in a pilot study. The sample was composed by four participants residents in Spain (N=3) and Colombia (N=1). Participants completed the Treatment Expectation-Satisfaction Questionnaire, reporting high expectations (M=8.7; SD=.85) and satisfaction (M=9.4; SD=.44) about the treatment. In conclusion, *NO-FEAR Airlines* was a well accepted Internet-based Treatment for FP.

Keywords. Specific phobia, Flying Phobia, Acceptability, Computer-Assisted Exposure, Internet based therapy

1. Introduction

Flying Phobia (FP) is a common and disabling disorder, resulting in a profound impact on professional, social and family life [1]. The treatment of choice for specific phobias is *in vivo exposure* showing its efficacy in several studies [2]. Despite the proven efficacy of this technique, it is not used extensively among therapists. Some authors have raised ethical concerns about the safety, tolerability, and indeed humaneness of exposure therapy [3]. Moreover, approximately 20-25% of patients reject in vivo exposure because they consider it too aversive [4]. Thus, *in vivo exposure* is linked to a number of limitations in its acceptation among therapists and patients.

Information and Communication Technologies (ICTs) could help to overcome these issues. Specifically, the use of computer-assisted exposure programs is an effective and highly recommended alternative for FP [5]. Furthermore, the Internet is a useful tool for providing these effective psychological treatments in a wide range of psychological disorders and psychiatric conditions [6].

[1] Corresponding author, squero@psb.uji.es
[1] Corresponding author, squero@psb.uji.es

However, to our knowledge, no other studies investigate the acceptability of an Internet-based treatment for FP. The aim of this work is to offer data about the patients' expectations and satisfaction towards an Internet-based treatment for Flying Phobia called *NO-FEAR Airlines* in a pilot study.

2.Method

2.1. Participants

The sample was composed by four participants (3 women and 1 man) with a mean age of 34.5 (SD=11.1) residents in Spain (N=3) and Colombia (N=1). All participants fulfilled the Diagnostic and Statistical manual for Mental Health Disorders-Version 5 (DSM-5) criteria for specific phobia (FP).

2.2.*Measures*

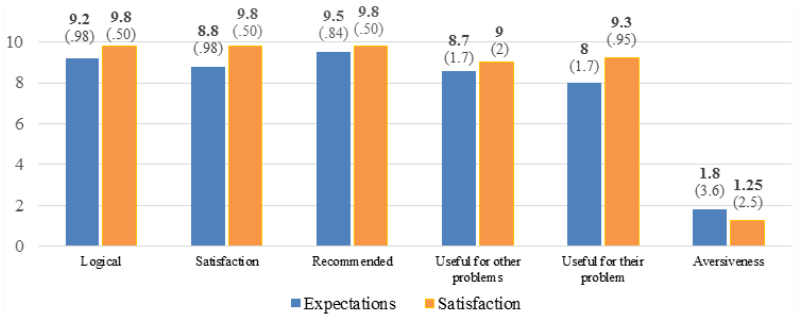
Treatment Expectation-Satisfaction Questionnaire [7] measures the participants' expectations about the treatment they will receive and their satisfaction at the end. It includes a 6-item scale ranging from 0 ("*not at all*") to 10 ("*very much*") about: 1) how logical the treatment seemed, 2) to what extent it could satisfy the patient, 3) whether the patient would recommend the treatment to others, 4) whether it would be useful in treating other problems, 5) the treatment usefulness for the patient's problem and, 6) to what extent it could be aversive. The participants answered these questions before the treatment and after receiving a brief explanation about the treatment rationale and the exposure component. After the treatment, they filled in the same questions.

2.3. NO-FEAR Airlines

NO-FEAR Airlines is a self-applied program via the Internet that allows people with FP to be exposed to images and sounds related to their phobic fears [8].

The treatment protocol comprises 3 therapeutic components: 1) *Psychoeducation* related to FP; 2) *Exposure* to 6 scenarios composed by real sounds and images (travel preparations, airport, boarding and taking off, central part of the flight, landing, plane crashes news) and; 3) *Overlearning*, the same exposure scenarios with greater difficulty (i.e., turbulences effect).

2.4. Procedure



All participants completed the screening and pre-treatment assessment via telephone. Then, all of them completed the *NO-FEAR Airlines* self-applied treatment via the Internet. The duration of the treatment varied according to the rate of each participant with a maximum of six weeks. Post-treatment assessment was applied through the Internet and telephone, including the satisfaction measure.

Results

All participants reported high expectations (M=8.7; SD=.85) and satisfaction (M=9.4; SD=.44) about the treatment (Figure 1). Regarding *aversiveness*, results showed low mean scores.

.

Figure 1. Means and standard deviations of participants' expectations and satisfaction towards *NO-FEAR Airlines*

3. Discussion

NO-FEAR Airlines was a well-accepted Internet-based Treatment for FP. The data obtained suggests that *NO-FEAR Airlines* can be a less aversive and more accepted exposure treatment alternative that could help us to reduce the limitations of the traditional *in vivo* exposure therapy, such as the low acceptance on the part of the patients. More studies are needed to confirm these preliminary and promising results in order to promote the dissemination of evidence-based treatments.

References

[1] M. Oakes, and R. Bor, The psychology of fear of flying (part I): A critical evaluation of current perspectives on the nature, prevalence and etiology of fear of flying. *Travel Medicine and Infectious Disease*, **8** (2010), 327-338.

[2] P.E. Nathan, and J.M. Gorman, editors, *A guide to treatments that work*. Oxford University Press, New York, 2015.

[3] J.M. Olatunji, B.J. Deacon, and J.S. Abramowitz, The Cruelest Cure? Ethical Issues in the Implementation of Exposure-Based Treatments. *Cognitive and Behavioral Practice*, **16** (2009), 172-180.

[4] A. García-Palacios, C. Botella, H. Hoffman, and S. Fabregat. Comparing acceptance and refusal rates of virtual reality exposure vs. In vivo exposure by patients with specific phobias. *Cyberpsychology & Behavior*, **10** (2007), 722-724.

[5] M. Tortella-Feliu, C. Botella, J. Llabrés, J.M. Bretón-López, A. Riera del Amo, R.M. Baños, and J.M. Gelabert, Virtual Reality Versus Computer-Aided Exposure Treatments for Fear of Flying, *Behavior Modification*, **35** (1) (2011), 3-30.

[6] G. Andrews, J. M. Newby, and A.D. Williams, Internet-delivered cognitive behavior therapy for anxiety disorders is here to stay. *Current psychiatry reports*, **17**(1) (2015), 1-5.

[7] I.M. Marks, and A.M. Mathews, Case histories and shorter communication. *Behaviour Research and Therapy*, **17** (1979), 263–267.

[8] S. Quero, D. Campos, A. Riera del Amo, J.M. Bretón-López, M. Tortella-Feliu, R. Baños, and C. Botella, NO-FEAR Airlines: a computer-aided self-help treatment for flying phobia. *Studies in Health Technology and Informatics*, **219** (2015), 197-201.

Enhancing Well-being During the Pregnancy: Protocol of an Innovative Positive Psychology Intervention Addressed to Brazilian Pregnant Women

Giulia CORNO [a,1] , Geissy L. L. ARAÚJO[b], Priscila PALOMO[a], Gabriela V. SIMABUCURU[b], Elizabel S. R. VIANA[b], Maria Bernardete C. SOUSA[b], Marcelo M. P. DEMARZO[c] & Rosa M. BAÑOS[A]

[a] *University of Valencia- Spain*
[b] *Federal University of Rio Grande do Norte- Brazil*
Federal University of São Paulo- Brazil

Abstract. Pregnancy is no longer considered an unproblematic time for all expectant mothers, thus it is important to foster the well-being of these women during pregnancy. The aim of this paper is to present the protocol of a study that will compare the difference, in terms of increased mental well-being, between the use of an innovative online positive psychology training and more traditional interventions addressed to pregnant women. This study will substantially contribute to open the way to future research on positive psychology and positive interventions among pregnant women.

Keywords. Pregnancy, Positive Psychology, Well-being

1. Introduction

Pregnancy is a time of changes: it represents the start of a new role for women of all ages. Thus, as Yali and Lobel reported [1], it could be a stressful period during which women are more exposed to the risk to develop some psychological disorders [2, 3].Thus, as pregnancy is no longer considered an unproblematic time for all expectant mothers, it is important to foster and maintain positive well-being during pregnancy.

Positive psychology is an approach to human functioning centered on the enhancement of existing positive facets of well-being and personal strengths, rather than focused on the attempt to treat existing negative symptomatology. Recent meta-analyses confirm that Positive Psychology Interventions lead to reliable and sustainable boosts of wellbeing [4].

As our knowledge, the scientific literature about positive psychology and pregnancy reports the results of only one PPI addressed to pregnant women [5]. Thus, starting from these evidences, we have developed an Internet-based positive psychology training ("Positive Pregnancy") aimed to the promotion of the well-being

[1] Corresponding author, giulia.me.corno@gmail.com

of the future mothers. "Positive Pregnancy" is a 5-weeks self-applied program. The aim of this paper is to present the protocol of a study that will analyze the effect of this innovative training (plus a traditional intervention: a prenatal course) in terms of increased mental well-being. We hypothesize that after five weeks, women assigned to the condition "Positive Pregnancy" + prenatal course will report higher levels of mental well-being, positive affect, optimism, self-compassion and psychological well-being, and lower levels of depression, anxiety, and negative affect than the women that would be assigned to the condition that include only the prenatal course. Furthermore, we will explore if these changes will be maintained at 1 and 6- months follow-ups.

2. Method

2.1 Study Design

This study is characterized by two experimental conditions, and will include Brazilian pregnant women, who are up to the 12th week of pregnancy, have access to the Internet, have decided to be the mother of the baby, and signed the consent form. Participants will be randomly assigned to one between two conditions: (1) attending to a prenatal course and participate to the Positive Pregnancy training, and (2) attending to a prenatal course.

2.2 Study Procedure

After completing the pre-assessment on the SurveyMonkey platform, participants will be assigned to one of the conditions described above. At the end of the study, participants will receive by e-mail a link to complete the post-assessment. After one and six months from the post-assessment, participant will receive another link to complete the follow-up evaluations.

2.3 Outcome Measures and Instruments

Table 1 shows the main dimensions, questionnaires and timing of administration of the scales.

Table 1. Dimension, questionnaires and assessment times

Questionnaire	**Measurement**	**Assessment time**			
		Pre-ass.	**Post-ass.**	**1 month follow-up**	**6 months follow-up**
WEMWBS [6]	Mental Well-Being	X	X	X	X
PHQ-9 [7]	Depression	X	X	X	X
SPANE [8]	Positive and Negative Affect	X	X	X	X
PAS [9]	Pregnancy anxiety	X	X	X	X
SPT [10]	Optimism and future expectancies	X	X	X	X
SWL [11]	Satisfaction with life	X	X	X	X
MSPSS [12]	Social support	X	X	X	X
PWBS [13]	Psychological well-being	X	X	X	X
SCS-SF [14]	Self-compassion	X	X	X	X

3. Conclusion and future expectancies

This paper is aimed to describe the protocol of a study that will compare the difference, in terms of increased mental well-being, between the use of this innovative training + traditional intervention (i.e. prenatal course) and the use of just a more traditional intervention (i.e. prenatal course) addressed to pregnant women. The study described in this paper will substantially contribute to the lacking previous bibliography on this thematic, and it will open the way to future research on positive psychology among pregnant women.

References

[1] A.M. Yali, M. Lobel, Coping and distress in pregnancy: an investigation of medically high risk women, *Journal of Psychosomatic Obstetrics and Gynaecology* **20**(1) (1999), 39-52

[2] B. Zuckerman, H. Bauchner, S. Parker, H. Cabral, Maternal depressive symptoms during pregnancy, and newborn irritability, *Journal of Developmental & Behavioral Pediatrics* **11**(4) (1990), 190-194.

[3] A. Buist, N. Gotman, K.A. Yonkers, Generalized anxiety disorder: course and risk factors in pregnancy, *Journal of Affective Disorders* **131**(1) (2011), 277-283.

[4] L. Bolier, M. Haverman, G.J. Westerhof et al., Positive psychology interventions: a meta-analysis of randomized controlled studies, *BMC Public Health* **13**(1) (2013), 119.

[5] K. O'Leary, The effect of positive psychological interventions on psychological and physical well-being during pregnancy, DClinPsych Thesis, University College Cork, 2015.

[6] R. Tennant, R. Fishwick, S. Platt et al., Monitoring positive mental health in Scotland: validating the Affectometer 2 scale and developing the Warwick-Edinburgh Mental Well-being Scale for the UK, NHS Health Scotland, Edinburgh, 2006.

[7] K. Kroenke, R.L. Spitzer, The PHQ-9: a new depression diagnostic and severity measure, *Psychiatric Annals* **32**(9) (2002), 1-7.

[8] E. Diener, D. Wirtz, W. Tov et al., New well-being measures: Short scales to assess flourishing and positive and negative feelings, *Social Indicators Research* **97**(2) (2010), 143-156.

[9] I. Burstein, R.A. Kinch, L. Stern, Anxiety, pregnancy, labor, and the neonate, *American Journal of Obstetrics and Gynecology* **118**(2) (1974), 195-199.

[10] A. K. MacLeod, A. Byrne, J.D. Valentine, Affect, emotional disorder, and future-directed thinking, *Cognition and Emotion* **10**(1) (1996), 69-86.

[11] E.D. Diener, R.A. Emmons, R.J. Larsen, S. Griffin, The satisfaction with life scale, *Journal of Personality Assessment* **49**(1) (1985), 71-75.

[12] G.D. Zimet, N.W. Dahlem, S.G. Zimet, G.K. Farley, The multidimensional scale of perceived social support, *Journal of Personality Assessment* **52**(1) (1988), 30-41.

[13] C.D. Ryff, Happiness is everything, or is it? Explorations on the meaning of psychological well-being, *Journal of Personality and Social Psychology* **57**(6) (1989), 1069.

[14] K. Neff, Development and validation of a scale to measure self-compassion, *Self and Identity* **2** (2003), 223–250.

Virtual Reality vs Television vs Web Exposure: The impact on Brand Experience. A preliminary study

Sofia SCATENA [a,b,1] , Gian Nicolò RUSSO[b,] and Giuseppe RIVA[b,c]
[a] *Centro Studi e Ricerche di Psicologia della Comunicazione, Dipartimento di Psicologia, Università Cattolica del Sacro Cuore di Milano, Italy*
[b] *Dipartimento di Psicologia, Università Cattolica del Sacro Cuore di Milano, Italy*
[c] *Applied Technology for Neuro-Psychology Laboratory, Istituto Auxologico Italiano, Milan, Italy*

Abstract. This research explored the effects of different types of advertising media (television – TV, web - WEB, and virtual reality - VR) on brand experience, involving a sample of 72 Italian male subjects aged between 18 and 50. All subjects experienced three different advertising contents counterbalanced for brand (Volvo, Pan di Stelle and Nike), media (TV, WEB and VR) and duration (for television we used more ads to reach the same level of media exposure). In general, all the ads were able to positively influence the sensory dimension of the brand experience, regardless of media used. However, we also found differential effects of media exposure. Firstly, TV reduced the intellectual dimension of the brand experience resulting in a less effective proposition for both holistic consumers and utilitarian consumers. Secondly, VR improved the affective dimension of the brand experience, suggesting its potential added value for both holistic users and inner-directed ones. In conclusion, these data, albeit preliminary, underline the differential effects of ads when experienced through different media and suggest the potential advantage of VR in improving the brand experience, expecially for holistic and inner-directed users.

Keywords. brand experience, marketing, advertising, virtual reality, web, tv

1. Introduction

Brand experience is construed as those sensations, feelings, cognitions, and behavioral responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments [1]. Consumers today are no longer interested in products *per se* but seek for a more thorough and gratifying experience when they relate to the decisional process. For this reason, it's been conceptualized that brand experience has a role in defining consumer satisfaction and loyalty through brand personality associations. More, experiential types moderate the relationships between brand attitude and purchase intention around five types of consumers [2]: *hedonistic, action-oriented, holistic, inner-directed, and utilitarian consumers*. As much as 90 percent of the marketing communication investments is in brand contacts, i.e., the points at which the consumer and the brand come in contact with each other [3].

[1] Corresponding author, sofiafrancesca.scatena@unicatt.it

In particular, in US alone, advertising spend in 2015 reached nearly $187 billion [4]: TV ads accounted for $79 billion (42% of the market) while digital ads accounted for just under 30% of that — 28%, or $52.8 billion. For this reason, understanding which media is most effective in rewarding brands for their ads is a key open question.

2.The Study

This research aims to explore on an empirical basis the effects of different types of advertising media (television – TV, web - WEB, and virtual reality - VR) on brand experience. In particular, the study has one key research question:

- RQ1: Describe and explain if and how the exposure to different media types of advertising affects the four dimensions of the brand experience (sensory, affective, behavioral and intellectual):
    - H1: Brand experience levels increase at the end of the exposure in comparison to the baseline.

2.1 Methodology

The study involves a sample of 72 Italian male subjects aged between 18 and 50. All the subjects experienced three different advertising contents (see Table 1), counterbalanced for brand (Volvo, Pan di Stelle and Nike), media (TV, WEB and VR) and duration (for television we used more ads to reach the same level of media exposure).

Table 1. The different **Ads** used in the study

	Brand 1 (Volvo)	**Brand 2 (Pan di Stelle)**	**Brand 3 (Nike)**
Television	https://www.youtube.com/watch?v=WSjLVG8ovjk	https://www.youtube.com/watch?v=XUzwTTxdObU	https://www.youtube.com/watch?v=eSah-U9Voi0
Web	http://www.volvocars.com/it/modelli/volvo/nuova-xc90	http://www.pandistelle.it/prodotti/biscotto	http://news.nike.com/news/hypervenom-ii-deceptive-by-nature
Virtual Reality (Video 360)	https://itunes.apple.com/us/app/volvo-reality/id940642303?ls=1&mt=8	https://www.youtube.com/watch?v=wFCZkAJNCiI	https://www.youtube.com/watch?v=bBZhuqPRx9c

Before and after the exposure to a given medium the subjects were submitted to the Brand Experience Scale developed by Brakus and colleagues [1]. This scale is composed by 12 items (7-steps likert) assessing four dimensions (sensory - SEN, affective - AFF, behavioral - BEH and intellectual - INT): of the brand experience. The scale is internally consistent and consistent across samples and studies. The scale successfully passed various reliability and validity tests, including test–retest reliability and criterion validity.

4. Results

We used Repeated Measures ANOVA to analyze pre-post changes in the brand experience scores. The results are reported in Table 2.

Table 2. **Results** of ANOVA Repeated Measures

	Television				Web				VR (Video 360)			
Before	SEN	AFF	BEH	INT	SEN	AFF	BEH	INT	SEN	AFF	BEH	INT
	12,5±1,7	12,5±2,2	12,5±3,1	10,2±2,2	12±1,9	12,18±2,25	12,5±3,24	9,85±2	12,8±1,9	12,3±2	12,7±2,8	10,1±2,4
After	SEN	AFF	BEH	INT	SEN	AFF	BEH	INT	SEN	AFF	BEH	INT
	13,2±1,9	12,9±2	12,6±2,8	9,64±2,2	12,3±1,9	12±2,1	12,6±3,27	9,86±2,1	13,5±2,2	12,7±1,8	13±2,15	10,2±2,1
F	10,3	2,27	0,203	6,12	3,13	0,12	0,12	0,00	6,8	3,53	0,7	0,15
p	**,002**	,136	0,654	**0,01**	**0,08**	0,73	0,73	0,95	**,011**	**,06**	0,396	0,7

Regarding TV, advertisements result in a significant increase of the SEN dimension in brand experience and a signficant decrease of the INT dimension. Regarding WEB, we found an almost significative increase of the SEN factor; finally exposure to VR ads showed a significant increase of both SEN and AFF dimensions.

3. Discussion and Conclusions

Results of the study are still preliminary (due to the relatively small size of the sample and its gender) but allow a few interesting considerations. In general, all the ads are able to positively influence the SEN dimension of the brand experience; for this reason ads, regardless of media used, seem to be effective in targeting innner-directed consumers [2]: who focus on internal processes such as sensations, emotions, and thoughts. However, we also found differential effects of media exposure. First, TV reduces the INT dimension of the brand experience resulting in a less effective proposition for both holistic consumers - who are interested in all sorts of experiences (that is, sensory, affective, intellectual, and behavioural) - and utilitarian consumers, who follow a low experiential and utilitarian approach. Secondly, VR improves the AFF dimension of the brand experience, suggesting its potential added value for both holistic users and inner-directed ones who are attracted by brands which have sensory appeal, generate emotion, and stimulate their thinking. In conclusion, these data, albeit preliminary, underline the differential effects of ads when experienced through different media and suggest the potential advantage of VR in improving the brand experience, expecially for holistic and inner-directed users.

References

[1] J.J, Brakus, B.H. Schmitt, and L. Zarantonello, Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty? *Journal of Marketing*,. **73**(2009),52-68.
[2] L. Zarantonello and B.H. Schmitt, Using the brand experience scale to profile consumers and predict consumer behaviour. Journal Brand Management **17** (2010), 532-540.
[3] Chattopadhay and J.-L. Laborie, Managing Brand Experience: The Market Contact Audit™. Journal of Advertising Research, **45**(2005),. 9-16.
[4] M. Goodman, Advertising Market Forecast North America 2015. 2014, Boston: Strategy Analytics. 29.

Mixed Reality Therapy: Presentation & Experience In Applied Psychology

John Francis LEADER [a,b,1]
[a] *Cognitive Science Programme, University College Dublin, Ireland*
[b] *Mixed Reality Experiential Learning Centre, Dublin, Ireland*

Abstract. The therapeutic use of mixed reality is defined, and it is advocated that psychological therapy be viewed as an extended process, inclusive of all modes of interaction that are therapeutically beneficial and that may lie outside of traditional therapy. The interplay of the physical, the virtual and the imaginary is highlighted and it is argued that all therapy can be viewed as implicitly mixed reality in nature, with the title of Mixed Reality Therapy (MRT) applying formally to methods that actively seek to manipulate these reality conditions for therapeutic benefit. The terms Presentation and Experience are offered to better differentiate between operator and participant perspectives, and the implications of various reality condition Presentation/Experience interactions are explored.

Keywords. Extended Therapy, Experiential Learning, Mixed Reality Therapy

1. Extended Therapy

The term *therapy* derives from the modern Latin therapīa and Greek therapeia meaning to cure or heal. The more specific term *psychotherapy* is used to refer to a variety of interventions which aim to provide support and promote psychological wellbeing by assisting the participant in making better subjective sense of world, self and others [1]. Beyond psychotherapy the word therapy is a much broader term applicable also to fields such as psychopharmacology and physiotherapy. That physiotherapy and psychotherapy should appear to be such obviously different things may seem to be a given, however it can be argued that this basic assumption, though often practical linguistically and prescriptively, can be problematic in fully appreciating the potential of therapy. Much as physiotherapy emphasises action, and as occupational therapy emphasises real-world context, a similar opportunity exists for traditional psychological therapies to embrace the interconnectedness of action and perception [2, 3, 4]. Consequently, the therapy room becomes as big as the world itself. In this mode therapy can only be contrasted with non-therapy much as an object in a museum can be distinguished from a regular object; by how it is intentionally framed. A significant challenge that comes about from this extended approach to therapy arises from the aim, on one hand, to incorporate a breadth of experience into the process but the necessity, on the other hand, of retaining order and discipline so that it may achieve its aim.

[1] Corresponding author, john@jfl.com

2. Mixed Reality

The term *Mixed Reality* (MR) has emerged from the fields of display technology and virtualisation as a way of referring to the fact that there are separate if closely interconnected reality conditions. In 1994 Milgram and Kishino [5] popularised MR as a physical to virtual continuum, encompassing augmented reality and augmented virtuality. The 2002 work of Stapleton, Hughes, Moshell, Micikevicius and Altman [6] further extended this model by adding the role of the participant's imagination, leaving three poles: the *physical*, *virtual* and *imaginary* (PVI). A *constructivist* view of cognition affirms the inclusion of the participant in mixed reality, as it recognises that the process of generating meaning is active and historically extended, and that we do not experience the world in a conceptually impoverished way [7]. Our previous history conveniently fills in the blanks but leaves us vulnerable to interpretive errors.

On this basis it is helpful to draw a distinction between *Presentation* and *Experience*; capitalised to indicate intentionality on the part of the operator providing the content and the participant experiencing it. Whilst MR Presentation content may primarily target certain PVI reality conditions, potentially all three factors may be engaged on the part of the participant's *Experience*. This means that varying individual responses are inevitable given the same content. Though posing some challenges in ensuring that narratives do not become too unwieldy, this expansive capacity of imagination is of great benefit as it serves to fill in gaps in the Presentation allowing it to be lightweight.

When experiencing a presented item in a given reality condition *x*, a participant may view the presented item correctly as being of that reality condition *x,* which we will call *identification*, or they may incorrectly interpret it as being of another reality condition *y*; *misidentification*. While the top three rows of the contents of Figure 1 show the various identification/misidentification outcomes of different Presentation/Experience pairs, the bottom three rows illustrate *representation* where, tying in with Lev Vygotsky's (1896-1934) description of signs [8], a given item *x* can appropriately stand in the place of *y*, and this can take place both within and between reality conditions. It is not possible to be in error in representing something: problems generally arise when, instead of *x* pointing to *y*, *x* becomes mistaken for *y*. The term *misrepresentation* therefore involves incorrectly moving from a representation mode into a (mis)identification mode where problems necessarily arise to the extent that there is any functional difference between the two. The notation of Presentation/Experience equivalence '=' is used where *x*=*x* is identification and *x*=*y* is misidentification. For representation '→' is used where *x*→*x* and *x*→*y* are both valid representations.

MR Presentation & Experience Matrix		*Presentation*		
		Physical (P)	*Virtual (V)*	*Imaginary (I)*
Experience	**Identification**			
	is Physical (=P)	P=P Identification	V=P Misidentification	I=P Misidentification
	is Virtual (=V)	P=V Misidentification	V=V Identification	I=V Misidentification
	is Imaginary (=I)	P=I Misidentification	V=I Misidentification	I=I Identification
	Representation			
	rep. Physical (→P)	P→P Representation	V→P Representation	I→P Representation
	rep. Virtual (→V)	P→V Representation	V→V Representation	I→V Representation
	rep. Imaginary (→I)	P→I Representation	V→I Representation	I→I Representation

Figure 1. Mixed Reality Presentation & Experience Matrix. See jfl.com/mrt for illustrated examples.

3. Mixed Reality Therapy

The term *Mixed Reality Therapy* (MRT) can be used to refer to the deliberate use of mixed reality in an extended therapeutic context. Therapists are already using mixed reality technology, in both its sophisticated and simplest forms, to create learning environments that are conducive to therapeutic progress; therein helping to address the resource problems that extended therapy faces [9, 10]. Such therapeutic asset support may be as immersive as full virtual reality, involve therapeutically relevant objects through augmentation, or provide contextually relevant backdrops to sessions. Our capacity to take the virtual as physical when suitably engaged (V=P misidentification) offers a means of simulating the physical and providing developmental scaffolding.

Additionally it can be noted that all therapy, and for that matter all personal experience, is inherently mixed reality in nature and that in normal interaction we identify or misidentify, represent or misrepresent. As anyone who has ever worried will know, rarely will the causes of stress be those things that are immediately physically present but all too often those things that are imagined (I=P misidentification). Jean Piaget (1896-1980) used the term *equilibration* to refer to the ideal balance between taking our existing sense of the world and projecting it upon the world, and taking the world in as raw and non-conceptual a form as possible (11). Mindful engagement with mixed reality provides a promising experiential learning platform to progress towards this aim, using parallel process, enabling the therapy to model the participant's daily life [9].

Such an approach to therapy will encourage therapists to involve a variety of media in their care of patients/clients. Creative and technical professionals will be encouraged to see the potential importance of their work in enhancing health and wellbeing. This, at very least, will be a type of cognitive ergonomics which will make engagement with day-to-day experience non-harmful and, at best, will involve the incorporation of therapeutic aims into the design of a variety of content for formal and informal use.

References

[1] W. Dryden, Dryden's handbook of individual therapy, Sage, 2007
[2] J. Dewey, The reflex arc concept in psychology. *Psychological review*, **34** (1896), 357.
[3] F. Röhricht, S. Gallagher, U. Geuter, and D. D. Hutto, The construction of new therapeutic environments. Sensoria: **A Journal of Mind, Brain & Culture**, 10 (2014), 11-20.
[4] A. Noë, Action in perception, MIT Press, 2004
[5] P. Milgram, and F. Kishino, A taxonomy of mixed reality visual displays. IEICE Transactions on Information and Systems, 77.12 (1994), 1321-1329.
[6] C. Stapleton, C. Hughes, M. Moshell, P. Micikevicius, and M. Altman, Applying mixed reality to entertainment. **Computer**, 35(2002), 122-124.
[7] D. C. Phillips, The good, the bad, and the ugly: The many faces of constructivism. Educational researcher, 24.7 (1995), 5-12.
[8] L. S. Vygotsky, Mind in society: The development of higher psychological processes. Harvard university press, 1980
[9] N. Morina, H. Ijntema, K. Meyerbröker, and P. M. Emmelkamp, Can virtual reality exposure therapy gains be generalized to real-life? A meta-analysis of studies applying behavioral assessments. *Behaviour research and therapy*, **74** (2015), 18-24.
[10] D. Opriş, S. Pintea, A. García-Palacios, C. Botella, Ş. Szamosközi, and D. David, Virtual reality exposure therapy in anxiety disorders: a quantitative meta-analysis. *Depression and anxiety*, **29** (2012), 85-93.
[11] J. Piaget, The development of thought: Equilibration of cognitive structures, (Trans A. Rosin), Viking, 1977

Risks and Benefits of Internet Use by People with Neurodevelopmental Disorders

Claude L. NORMAND [a,1] and François SALLAFRANQUE ST-LOUIS [b]
[a] *Université du Québec en Outaouais, Gatineau, Qc, Canada*
[b] *CISSS de l'Outaouais, Gatineau, Qc, Canada*

Abstract. Very little is known about how people with neurodevelopmental disorders, namely intellectual disability and autism, use information and communication technology (ICT) for purposes other than assisted communication. Our study asked young adults with neurodevelopmental disorders about their use of ICT and Internet. We found that Internet was used primarily for social networking. Although it has the benefit of communicating with friends, it also presents with risks of abuse.

Keywords. Internet, intellectual disability, autism, social networking

1. Introduction

People with neurodevelopmental disorders, namely intellectual disability (ID) or autism spectrum disorder (ASD), are often stigmatized and excluded from mainstream society [1]. They tend to have fewer friends [2] and suffer from this lack of protective factor. Indeed, they are overrepresented as victims of abuse (emotional, physical, sexual, financial) [3] and bullying [4, 5]. Information and communication technologies (ICT) have the potential for increasing self-determination and community participation of all citizens [6, 7]. Internet access could therefore revolutionize the social lives of people living with an ID or ASD. It reduces physical barriers to meeting face to face, and offers countless opportunities to meet new people, or to stay in contact with friends and relatives. Considering that a larger social support network is correlated with better mental and physical health [8], it would seem appropriate to encourage people with neurodevelopmental disabilities to use ICTs in general, and social networking sites in particular. On the other hand, news media and anecdotal evidence suggest that families, educators and support workers may have good reasons to voice concerns about online safety [9]. There is a dearth of research on Internet use by people with ID or ASD. Our study attempts to fill a small portion of that knowledge gap by asking the question "how do people with a neurodevelopmental disorder use Internet?" and producing an overview of experiences from young adults diagnosed with ID or ASD.

[1] Corresponding author, claude.normand@uqo.ca

2. Methods

Recruitment was done through a rehabilitation center dedicated to ID and ASD. Social workers and educators were asked to contact clients they thought were Internet users and apt to answer a brief survey questionnaire and take part in an interview. They collected the participants' informed consent and questionnaire. As requested by the rehabilitation center, they were also present during the interview conducted by the researchers.

2.1. Sample

The sample consisted of 8 adults: five with an ID (3 M, 2 F), and three with ASD (2 M, 1 F). Mean age was 25 years. Subjects lived with their parents (n = 4), with their lover (n = 2), or in a group home (n = 2). Four of them worked part-time, two were looking for work, and two were students.

2.2. Measures

The first part of the questionnaire pertained to participants' sociodemographic characteristics. The second part focused on ICT use specifically. The semi-structured interview asked participants to describe their family and friends, intimate relationships, Internet use, perceived benefits as well as experiences of cybervictimization.

3. Results

Results are divided according to perceived benefits and risks of Internet use. The subjects with ASD did not show signs of an associated intellectual disability and where their results differ, they are given special consideration.

3.1. Benefits of Internet use

Table 1 shows the many ways subjects living with neurodevelopmental disorders use the Internet for their benefit. It illustrates how Internet is used mainly for social purposes, by all participants.

Table 1. Benefits of Internet use.

Internet use	Number of participants
Social networking (e.g. Facebook)	8
Read/ send e-mail	7
Make new friends	7
Search for information	6
Browse/ Shop online	5
Visit dating sites	5
Watch videos (e.g. music or film on Youtube)	4
Play games	3
Pornography	3 (all males)

3.2. Risks associated with Internet use

Six participants reported having been insulted, made fun of, or threatened online. Six also had met offline, a stranger they had first met online. The three females and three of the male subjects reported experiences of online sexual solicitation. They were asked to talk about sex when they did not want to, give sexual information, send a sexual photograph, or perform sexual acts in front of a webcam. Other risky Internet use was overspending or having one's laptop confiscated because of masturbating in front of the webcam.

3.3. The special case of subjects with ASD

While a large portion of the population with ASD also has an associated diagnosis of ID, our three participants did not. Consequently or coincidentally, they used Internet in additional and more proactive fashion. For example, one male had created two websites, one for each of his small businesses. Another reported using Internet to chat, to post his opinions, to do homework, to prepare for school the next day or to consult his work schedule. Our female participant was the only one to use Internet for distance education. She was also unique in owning a cell phone, using Snapchat, Twitter, and Instagram.

4. Discussion

People with neurodevelopmental disorders such as ID or ASD have joined the ranks of Internet users. The popularity of social networking and dating sites among our sample suggests they are used with the hope of increasing relationships and social support. The cybervictimization experienced seems to reflect the risks they encounter offline as well.

References

[1] C. Bigby, Known well by no-one: Trends in the informal social networks of middle-aged and older people with intellectual disability five years after moving to the community, *Journal of Intellectual and Developmental Disability* **33** (2008), 148-157.

[2] T. Lippold, J. Burns, Social support and intellectual disabilities: a comparison between social networks of adults with intellectual disability and those with physical disability, *Journal of Intellectual Disability Research* **53** (2009), 463-473.

[3] M.H. Fisher, J.V. Baird, A.D. Currey, R.M. Hodapp, Victimisation and social vulnerability of adults with intellectual disability: a review of research extending beyond Wilson and Brewer, *Australian Psychologist* **51** (2016), 114-127.

[4] C. Maïano, A. Aimé, M.-C. Salvas, A.J.S. Morin, C.L. Normand, Prevalence and correlates of bullying perpetration and victimization among school-aged youth with intellectual disabilities: A systematic review. *Research in Developmental Disabilities* **49-50** (2015), 181-195.

[5] C. Maïano, C.L. Normand, M.-C. Salvas, G. Moullec, A. Aimé, Prevalence of school bullying among youth with autism spectrum disorders: A systematic review and meta-analysis. *Autism Research* (2015), online DOI: 10.1002/aur.1568

[6] A. Watkins, *Model policy for inclusive ITCs in education for persons with disabilities,* UNESCO, Paris, France, 2014.

[7] D. Chadwick, C. Wesson, C. Fullwood, Internet access and people with intellectual disabilities. *Future Internet* **5** (2013), 376-397.

[8] A. Milner, L. Krnjacki, P. Butterworth, A.D. LaMontagne, A.D., The role of social support in protecting mental health when employed and unemployed: A longitudinal fixed-effects analysis using 12 annual waves of the HILDA cohort, *Social Science and Medicine* **153** (2016), 20-26.
[9] P.C.M. Buijs, E. Boot, A. Shugar, W.L.A. Fung, A.S. Bassett, Internet safety issues for adolescents and adults with intellectual disabilities, *Journal of Applied Research in Intellectual Disabilities* (2016), online DOI: 10.1111/jar.12250

Persona: A Digital Identity Amongst Many Selves

Oskar MILIK [a,1]
[a] *University College Dublin*

Abstract. Research into the players of digital games has focused heavily upon two forms of identity, primarily because of their relative permanence and because of access. First, there is the out-of-world identity, the player, that engages the virtual world but remains independent of it. Secondly, focus has been placed upon the character, or avatar, within the digital world. This research project finds that there is need for a third level of analysis, the persona, which is able to incorporate the complexities of creating and maintaining identity and reputation in an online and partially anonymous sphere.

Keywords. Interaction, Online methodology, MMO Games, Dramaturgy

1. Introduction

Online digital worlds have been a growing area of research for studies of many different types. These research projects have often been focused specifically on two different types of visible social actors. One type of research is on the player, the real-world person who engages the virtual world but remains independent of it. Quantiative studies on the incorporation of personality traits and out-of-game structural influences upon in-game behavior are examples. The other focus is on the character, or avatar, which is the representation of self in the virtual world. The character is responsible for interactions in-game, social, structural, and cultural.

After performing dramaturgical analysis of interactions and social controls in these digital games, this project argues that there is need for a third level of analysis, the persona. This concept is able to incorporate aspects of the player's real world identity along with the characteristics of their in-world character. The persona, then, offers a way for an individual to navigate the complexities of creating and maintaining identity and reputation in an online and partially anonymous sphere. This project shows that research on player interactions should focus upon this dramaturgical persona in order to have the most valuable findings of how individuals use and experience virtual worlds.

[1] Corresponding author, omilik@gmail.com

2. Methods

This paper is based upon an ongoing dissertation research project on players of *World of Warcraft* [1] and *EVE Online* [3]. Data collection was done through a series ethnographies [2] performed over a three-year period from 2012-2015. Participant observation was performed on a series of self-determined "hardcore" organizations focused on achievement and progress within their game. Analysis of field notes and in-game chat logs was performed using a modified version of grounded theory [4] based on a dramaturgical framework [5].

3. Persona

Engagement with a digital game, particularly MMORPGs such as *World of Warcraft* involves a large commitment of time and effort. This type of engagement is different from that designed for players of other types of games, particularly those where immersion is an important aspect of play. Players of MMO games will often take on the roles and categorizations of their online avatar. This is an intended aspect designed by the developers of these games. The connection that a player has with their character, however, does not mean that a player adopts the identity of their character. As one *EVE Online* player states "In this game I get to be the pirate. It doesn't mean I am an asshole in RL [Real Life], I just know how to play the game." The separation that players have from their actions online suggests that the sense of immersion does not indicate that player and character cause shared identities. The relationship that players have with their characters in MMO games is more complicated than the one-character-per-player dynamic that is common in many types of digital games. Instead, a player may have a complex set of different characters they can use. In *EVE Online*, for instance, spies entering organizations for nefarious purposes are a major part of the end-game. In order to succeed at this, however, a player needs to be able to maintain numerous identities simultaneously. They will have a "main" that works on behalf an organization, but also an "alt" spy that needs to pass as a member of the infiltrated organization. If the character was the only source of identity, there would be no detectible connection, and if the player was the only focus of interaction then being a spy would be impossible. Instead, what occurs is that there is a complex navigation of identities and social actions. This relationship can be studied through the concept of the persona, a concept of self that incorporates the malleability of the character and puts it together with the permanence of the player.MMO players can also be seen to be performing other tasks while they are participating within their game world. They may be watching a television show, tending a child, or even playing a different game at the same time as being active within the game world. Goffman refers to this as "out-of-frame activity." He states that in an interaction, the "performer in his capacity as opponent or protagonist is obliged to be mindful of the state of the game and to manage, with more or less physical aplomb, to get his piece to the intended square at the right time; but outside of that, he as a person will be allowed a wide range of side and subordinate activities"[6].

This ability to participate in a virtual world while at the same time participating in real world activities shows that strictly separating these aspects of self will cause inaccuracies in research.

When looking at the actions of players within the MMO gaming sphere, it is clear that there are certain out-of-game considerations that influence the *in situ* moment of play. Most players in "harcore" *World of Warcraft* guilds are well aware of there being certain metrics that matter for their ability to participate with their group. These are often based off of player-made "meters" that analyze the damage or healing that a character had performed on a particular fight. What this means that if a player wants to protect their active character from persecution, or potentially removal from the group, they will want to "pad the meters." Padding means performing better on metrics, but by ignoring important mechanics that can cause problems for the group as a whole, by for instance letting certain monsters free when they should have been contained. The appeal of these sort of actions is so strong that it makes sense that players and organizations needed to change the process of analyzing "combat logs" (recordings of metrics in-game) away from being single encounter and character specific, and towards a more reputation-based system. The persona is the result of this search.

4. The Meta-Stage of Identity

The persona is a collection of traits and identity features that combines the immediacy of character-based interaction with the permanence of player-based identity features. In order to create such a form of identity in the constructed and deeply anonymous virtual world, it is necessary for identity to take on a form away from the immediate in-game context and also away from the player sitting at their keyboard. This is where the dramaturgical concept of "meta-stage" comes into play. In the example of the damage meters above, the solution that players of the game established is a metric logging system that collects in-game data but analyzes it outside of the game and makes it readily available for public consumption. While these types of sites have gone through several iterations, one such logging side is Warcraftlogs [7].

By being able to access the history of a player, and see all the fights in which they had participated, a knowledgeable researcher would be able to put together a good image of the player behind the screen, as well as the character-specific competencies that they show *in situ*. What this means is that reputation systems are capable of being developed in the virtual world, and that these will be based upon a combination of particularly visible identities that end up creating a singular sense of self. This particular sense of self is the persona, and offers itself to creation of heuristics and quick interactions, but also to stereotypes and prejudices.

In order to get a good grasp at what is happening when many players interact together in a virtual world, entirely relying on observations of the character or on answers given by a player leads to analyzing identity through a very limited lens. The concept of persona, by allowing greater complexity and ability to understand actions in-context, gives the researcher the ability to better understand the online world.

References

[1] *World of Warcraft*, Blizzard Entertainment, Irvine, USA, 2004.
[2] T. Boellstorff, B. Nardi, C. Pearce, and T.L. Taylor, *Ethnography and Virtual Worlds: A Handbook on Methods*. Princeton University Press, Princeton, NJ, 2012.
[3] *EVE Online*, CCP Games, Reykjavik, Iceland, 2003.
[4] K. Charmaz, *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis,* SAGE Publications, London, England, 2006.
[5] E. Goffman, *The Presentation of Self in Everyday Life*, Anchor Books, New York, NY, 1959.
[6] E. Goffman, *Frame Analysis: An Essay on the Organization of Experience*, Northeastern University Press, Boston, MA, 1986.
[7] Warcraftlogs, https://www.warcraftlogs.com/, accessed 20/4/2015

Virtual memory palaces to improve quality of life in Alzheimer's disease

Kasper BORMANS [a,1] Keith. ROE [a], Dirk. De WACHTER [b]
[a] *Faculty of Social Sciences, KULeuven, Leuven School for Mass Communication Research, KULeuven*
[b] *University Psychiatric Centre, KULeuven, Kortenberg, Department of Neurophysiology, KULeuven*

Abstract. Dementia is the problem of the future in health care. Dementia is hard for the person living with it, but even more burdensome for his/her environment. The conversational dialogue between them seems to decline. The loss of recognition and contact is the most difficult to bare. For the elderly adults, retrieval of proper names is a source of unease and distress. This naming deficit is an early symptom of patients coping with neurodegenerative disorders such as Alzheimer's disease (AD). Individuals with Mild Cognitive Impairment (MCI) are at great risk of being in a prodromal phase of developing Alzheimer's disease. Memory enhancement training is an upcoming intervention in the field of Neurology and Geriatrics. These interventions have already proven to increase cognition in individuals with Mild Cognitive Impairment. Yet no studies have attempted to combine two powerful communication strategies (i.e. Method of Loci and Face-Name mnemonic) with virtual reality to improve the memory of significant others. This study has the ambition to optimize these communication strategies by externalizing and customizing memory palaces for subjects in the early phase of AD. We have developed a mobile application which allows caregivers to construct virtual scale models of the residential settings these individuals presently are living in. These models function as *memory palaces* in which photos of significant others are connected to the architectural, spatial environment. The application can function as an audio-guide through a well-known environment and subjects in the early phase of AD can make the walk together with a caregiver or a family member. Thus (augmented) reality supports and facilitates participants during their familiar walk along the loci route. We hypothesize this to be a convenient instrument to reaffirm the diminishing dialogue between subjects with dementia and their surroundings by positive storytelling. The first testing results are promising. At follow up we expect an increase in quality of life for subjects in the early phase of AD and their significant others.

Keywords. Alzheimer's disease, augmented reality, cognitive rehabilitation, communication strategies, method of loci, quality of life, virtual environments

[1] Corresponding author, kasper.bormans@soc.kuleuven.be

1. Introduction

Alzheimer's disease (AD) is the most common primary neurodegenerative dementia and a growing public health problem [1] with costly consequences for patients, their families and society [2,3]. Selective memory impairment and dementia are the primary clinical manifestations of AD [4]. In the last decade, behavioral interventions for improving the functioning in AD have increasingly been explored [5,6].

Mild cognitive impairment (MCI) is an intermediate state between cognitive changes of normal aging and early dementia, AD in particular [7]. 20–50% of individuals with MCI will develop dementia over a period of 2–3 years [8]. Therefore MCI may be a key period for providing interventions to stimulate brain plasticity and decrease cognitive symptoms [9,10].

Persons in *the early phase of Alzheimer's disease* have a particular sensitivity for losing their ability to recognize faces [11]. This has a negative impact on their own quality of life and of their significant others. Recent studies however, clearly demonstrate the feasibility of virtual reality technology to improve memory and functionality of daily activities in the early stages of AD [12-14]. The common feature of these innovative approaches is to endeavor to relate to aspects of the persons' everyday life (using interactive digital photographs of the patient and his/her surroundings) and to tasks designed to be relevant to activities of daily living [15].

1.1 Participants

All participants are Flemish individuals in residential settings, diagnosed as subjects in the early phase of AD according to clinical criteria.

1.2 Experimental design

The pilot study consists of a study population of 10 individuals diagnosed as subjects in the early phase of AD according to clinical criteria. 5 control subjects and 5 subjects who comply with the intervention. The control subjects use a placebo-application. The full study is an analogue study with a larger sample size. In order to achieve a well powered study we construct innovative software packages based on *memory palaces* (patient friendly and accessible to a broad and increasing segment of the population).

2. Materials: communication strategies

The Method of Loci (MoL) and the Face-name mnemonic (FNM) have proven to be two successful communication strategies to improve episodic memory for MCI subjects. The effectiveness of these mnemonics is largely due to their appeal to brain structures that are rather well-preserved in the course of the disease. Our study will examine the efficacy of the MoL and the FNM for subjects in the early phase of AD in combination with photographs of loved ones in familiar virtual environments. We have

developed a mobile application to reconnect individuals in the early phase of AD with their environment through positive storytelling.

2.1 Method of Loci (MoL)

Current findings indicate that the MoL is an effective and well-studied strategy to improve memory for the elderly [16-17], even when coping with MCI [18]. Further, this mnemonic technique has proven to be a valuable and therapeutic instrument to treat depression [19]. Application of the MoL involves three components [20]: selecting and memorizing a series of distinct loci along a familiar pathway, creating an image for each item to be remembered and placing images of the items in the selected loci. During the recall phase, the loci pathway is mentally retraced so that the images to be transformed into corresponding verbal items are found.

2.2 Face-name mnemonic (FNM)

Recent studies confirm the efficacy of the cognitive training program for MCI subjects regarding face-name associations [21-23]. Application of the Face-Name mnemonic consists of three phases [24] identifying a prominent feature of the individual, recoding the individual's name as a high-imagery keyword/name clue and connecting the keyword and prominent feature in an interactive image. Proper names are both arbitrary and meaningless and therefore more difficult to recall. The success behind the FNM is to add meaning. This communication strategy builds a retrieval path leading from a pictorial stimulus to a verbal response.

2.3 Virtual memory palaces: the mobile application

Our intervention combines the effectiveness of both the MoL and the FNM by anchoring familiar faces to specific reference points in the known environment. The mobile application allows caregivers to construct personalized and externalized memory palaces, in close collaboration with the subjects in the early phase of AD. Together, they upload photos of significant others, link them to real-life objects and they formulate a loci route across the residential setting. At regular intervals, participants are invited to complete the walk in real-life together with the caregiver or with a family member. The application has a guiding function and also invites participants to tell positive stories about significant others.

Studies indicate that subjects in the early phase of AD mainly have difficulty with mnemonic strategies that involve 'abstract thinking' [25]. Therefore the technology, which uses augmented reality to externalize and personalize the memory palaces, functions as a facilitating support rather than an additional difficulty.

3. Results

Our intervention is non-pharmacological, rather inexpensive, patient-friendly, unconventional and easy to combine with regular treatment of Alzheimer's disease. The first testing results reveal a decrease of disorientation in the participants and an increase in connectedness between caregivers and their family members.

We propose these memory palaces to be relevant instruments to strengthen the quality of care in residential settings. We hypothesize that the postponement of the naming deficit in the early phase of AD will have a positive impact on the activities of daily living, resulting in more independence and reduced costs for society. We expect this shared activity of positive storytelling to reaffirm a dialogue that seemed to diminish between subjects in the early phase of AD and their significant others.

4. Conclusions

The primary objective of this study is to examine whether the addition of (augmented) reality to communication strategies (MoL, FNM) can reconnect subjects in the early phase of AD with their caregivers and family members.

The secondary objective of this project includes a follow-up on recall and recognition of familiar faces. As well as a follow up on quality of life of subjects in the early phase of AD and their significant others.

5. Discussion

To date, no study has combined the MoL and the FNM with augmented reality to restore the communicative dialogue between subjects in the early phase of AD and their significant others. The mobile application generates a shared activity through positive storytelling. It is also an innovative and an unusual insight to transform the actual residential setting of subjects in the early phase of AD into multisensory memory palaces.

This research suggests the therapeutic value and rehabilitative possibilities of augmented reality in medical technology. Externalizing mnemonic techniques into the real world can be a future step in connecting healthcare with technology.

References

[1] S. Banerjee, Good news on dementia prevalence – we can make a difference. *The Lancet*, **382** (2013), 1384-1386.

[2] A. Wimo, The worldwide societal costs of dementia: Estimates for 2009. *Alzheimer's & Dementia*, **6** (2009), 98–103.

[3] R. Dodel, Determinants of societal costs in Alzheimer's disease: GERAS study baseline results. *Alzheimer's & Dementia*, **11** (2015), 933-945.

[4] A. Nervi, Comparison of clinical manifestations in Alzheimer disease and dementia with Lewy bodies. *Archives of Neurology*, **65** (2008), 1634-1639.

[5] L.P. De Vreese, Memory rehabilitation in Alzheimer's disease: A review of progress. International *Journal of Geriatric Psychiatry*, **16** (2001), 794–809.

[6] K.A. Bayles, Improving the functioning of individuals with Alzheimer's disease: emergence of behavioral interventions. *Journal of Communication Disorders*, **36** (2003), 327-343.

[7] M. Grundman, Mild cognitive impairment can be distinguished from Alzheimer Disease and normal aging for clinical trials. *Archives of Neurology,* **61** (2004), 59-66.

[8] R.C. Petersen, Current concepts in mild cognitive impairment. *Archives of Neurology*, **58** (2001), 1985–1992.

[9] S. Belleville, Improvement of episodic memory in persons with mild cognitive impairment and healthy older adults: evidence from a cognitive intervention program. *Archives of Dementia and Geriatric Cognitive Disorders,* **22** (2006), 486–99.
[10] M.D. Grilli, Self-Imagining enhances recognition memory in memory-impaired individuals with neurological damage. *Neuropsychology,* **24** (2010), 698-710.
[11] M. Calabria, The missing link between faces and names: Evidence from Alzheimer's disease patients. *Brain and Cognition,* **80** (2012), 250-256.
[12] G. Weniger, Egocentric and allocentric memory as assessed by virtual reality in individuals with amnestic mild cognitive impairment. *Neuropsychologia,* **49** (2011), 518-527.
[13] C. Herrera, Positive effects of computer-based cognitive training in adults with mild cognitive impairment. *Neuropsychologia,* 50 (2012), 1871-1881.
[14] G. Plancher, Using virtual reality to characterize episodic memory profiles in amnestic mild cognitive impairment and Alzheimer's disease: Influence of active and passive encoding. *Neuropsychologia,* **50** (2012), 592-602.
[15] M. Hofmann, Interactive computer-training as a therapeutic tool in Alzheimer's disease. *Comprehensive Psychiatry,* 44 (2003), 213-219.
[16] A. Engvig, Effects of memory training on cortical thickness in the elderly. *NeuroImage,* 52 (2010), 1667-1676.
[17] K. Yumiko, Changes in brain activation associated with use of a memory strategy: a functional MRI study. *NeuroImage,* **24** (2005), 1154-1163.
[18] S. Belleville, Training-related brain plasticity in subjects at risk of developing Alzheimer's disease. *Brain*, **134** (2011), 1623-1634.
[19] T. Dalgeish, Disruptions in autobiographical memory processing in depression and the emergence of memory therapeutics. *Trends in Cognitive Sciences,* **18** (2014), 596-604.
[20] A. Moè, Stressing the efficacy of the Loci Method: Oral Presentation and the Subject-generation of the Loci Pathway with expository Passages. *Applied Cognitive Psychology*, **19** (2005), 95-106.
[21] L. Jean, Efficacy of a cognitive training program for mild cognitive impairment: results of a randomized controlled study. *Neuropsychological Rehabilitation*, **20** (2010), 377-405
[22] T. Hopper, The effects of modified spaced-retrieval training on learning and retention of face-name associations by individuals with dementia. *Neuropsychological Rehabilitation*, **20** (2011), 81-102.
[23] N. Bier, Face-name associations learning in early Alzheimer's disease: a comparison of learning methods and their underlying mechanisms. *Neuropsychological Rehabilitation*, **18** (2008), 343-71.
[24] R.N. Carney, The face-name mnemonic strategy from a different perspective. *Contemporary Educational Psychology,* **22** (1997), 399-412.
[25] E. Hussey, Using mental imagery to improve memory in patients with Alzheimer's disease: Trouble generating or remembering the mind's eye*? Alzheimer Disease and Associated Disorders*, **26** (2012), 124-134.

Serious Games in Group Help to Evaluate the Risk of Suicide

Xanthie VLACHOPOULOU [a,1] and Lise HADDOUK [b]
[a] Paris Descartes University
[b] Rouen University

Abstract. Serious games can be used in many contexts and also in the field of psychotherapeutic mediations. The game Clashback by Prof. Pommereau has been developed in order to re-create situations of crisis between teenagers and their family. The main character of this game is Chloe, a 16-year-old girl who is trying to convince her father to allow her getting a tattoo. The player chooses the replies that he/she considers best in order to achieve this goal. We used this game with teenagers between 14 and 19 years old who have suicidal tendencies (group 1) or have attempted to commit suicide (group 2), during their full hospitalization in a psychiatric center for an average duration of one month. We proposed the game to groups of teenagers, but only one member of the group played during a single session. Every game was recorded and it provided a quantitative profile about the player, on aspects such as sociability, impulsiveness and adaptability. We compared these results to genogram, medical diagnosis and to qualitative data collected during scheduled clinical interviews during hospitalization. We compared the 3 mentioned aspects between the group 1 and group 2, which were composed of 20 participants in total (10 girls and 10 boys). Results show that the sociability and adaptability are higher for teenagers of group 1, whereas impulsivity seems higher for teenagers of group 2. These results indicate the possibility to use this kind of technological support as a complement in the psychological evaluation of measuring the risk of suicide.

Keywords: serious games, impulsiveness, suicide, adolescence

1. Introduction

Serious games are defined as a kind of theoretical application whose initial intention is to combine with consistency both serious aspects with the fun side of video games [1]. Some serious games are, for instance, designed to help joint attention for example, while other require special tools (glasses, gloves, etc.). These games are usually widely diffused, especially through mobile devices.

The term “serious games” sounds as a paradox: playing is rather associated with fun and as a pause from reality’s "serious" social requirements. Despite this

[1] Corresponding author, xanthievlachopoulou@yahoo.fr

apparent contradiction, playing is serious because it allows the child to grow and build its personality.

The use of serious games is directly facilitated from the appetite that especially of children and adolescents have for virtual reality; thus the less pleasant, even sometimes dreaded work of learning and care is more easily accomplished. This software is most commonly found in applications of somatic care, for example in the context of functional rehabilitation or in prevention campaigns. However, the psychological care also benefits from the contributions of serious games in various approaches and different situations.

Depressive disorders are among the issues that are targeted by serious games. For example, the game Sparx[46] (2012) has been developed in order to help young people with mild or moderate depression (addressed to New Zealand residents only). The player incarnates a hero in a script written by psychologists. In the research field using the virtual reality exposure, recent studies [2] have explored the effects of immersion on the treatment of depression.

For a teenager one of the major risks of depression is the passage to the suicidal act. This represents a public health problem for this age group.

We had the possibility to use the Clashback game with a population of adolescents with suicidal ideation and with adolescents who have attempted suicide. This allowed us to observe the differences in their way to play this game. Therefore, it seemed to us appropriate to consider this game as another tool to help in the psychological assessment of measuring the risk of suicide.

2. Problem

Can serious games be used as a complement in the psychological evaluation of measuring the risk of suicide for teenagers?
We wanted to explore a new direction in the use of serious games: beyond the educational and / or therapeutic use, is it also possible to benefit from this type of media to enrich the variety of our diagnostic assessment tools?

3. Method/Tools

Clashback[47] is a serious game created by Prof. X. Pommereau. It was developed to recreate a situation of crisis, a "clash" between adolescents and their families. The main character of this game, Chloe, is a 16-year-old girl who is trying to convince her father to allow her to get a tattoo. The player chooses the answers he / she considers best to achieve this goal. Chloe is presented at an introductory video: her parents are separated and she moved recently with her father, her stepmother and her half-brother. She is described as impulsive, suffering from bulimia with vomiting and has just separated from her boyfriend. The relationship with her father is quite confrontational and he has problems at his work.
We used the game as a tool of therapeutic mediation to facilitate dialogue with adolescents facing conflict situations.

[46] https://www.sparx.org.nz/
[47] http://www.clash-back.com/

Population: We used this game with adolescents between 14 and 19 years during their full hospitalization in a psychiatric center for an average term of one month. The psychiatric center is specialized in depression issues and particularly on the issue of suicidal ideation and suicide attempts. We wanted to explore the differences there might be in the way of playing this game for adolescents who attempted suicide and for those who have suicidal ideation without attempting suicide.

Our exploratory sample consisted of 20 patients with a diagnosis of major depressive disorder, 14 to 19 year-old, with a distribution into 2 groups composed of 10 patients: group 1 - persons with suicidal ideation without having committed a suicide attempt, and group 2 - persons with suicidal ideation having committed at least one suicide attempt. Each group of 10 consisted of 5 girls and 5 boys.

The game was proposed to groups of teenagers (between 5 and 7 participants). One member of the group (the first arrived at the center) played in a single session of 45 minutes. The session lasted on average between 20 and 30 minutes. In the game, it takes at least 20 minutes to get the tattoo. After the game session we proposed a group discussion. We have evaluated three aspects in particular, as follows:

High impulsivity, if the game session takes less than 10 minutes; High adaptability, if the player manages to get the tattoo; High sociability if the player asks for advise and take into account their opinion in moments of hesitation in the choice of the answer. The group was led by two psychologists and a training psychologist took notes of the interactions during the play sessions. We used these notes to evaluate the issue of sociability in the interaction between the player and the group.

Our hypothesis based on literature of psychodynamic psychopathology was that young people having attempted suicide have significant difficulty in managing their drive activity, and this has as result a high level of impulsivity. Moreover, difficulties to invest in relations with others can reflect the intensity of the death drive, which can facilitate a transition to a suicidal act. Instead, adolescents overwhelmed by suicidal thoughts without acting out, manage their drive activity in a functional way and invest in relations with others, and this prevents them from a suicidal act.

As Clashback allows simulation of conflict, it is proposed for testing the capabilities of the subject to manage its drive activity but also its level of sociability and adaptability.

4. Results

For group 1: 8/10 obtain the tattoo, 9/10 interact with the group, 7/10 consider the advice of the group and the average of the time of the session is 24,8 minutes.

For group 2: 2/10 obtain the tattoo, 4/10 interact with the group, 2/10 consider the advice of the group and the average of the time of the session is 12,5 minutes.

Results show that the sociability and adaptability are higher for teenagers of group 1, whereas impulsivity seems higher for teenagers of group 2. These results indicate the possibility to use this kind of technological support as a complement in the psychological evaluation of measuring the risk of suicide.

We propose three case studies that show the way of playing of different profiles.

Benjamin, 18 years old, is a teenager who has made several suicide attempts and is currently hospitalized with significant suicidal ideation. The diagnosis is major depressive disorder at the Diagnostic and Statistical Manual of Mental Disorders (DSM 5). When we proposed to him to embody the character of Chloe he immediately decided to invest in the goal of getting the tattoo. Soon Benjamin is verbally aggressed through the father's replies in the game. Thus, he opts for a strategy of extreme politeness and friendliness; however, the father in the game shows to him that his behavior is "weird" and "suspicious". Benjamin changes strategy, but, failing to find the middle ground, he ends up being again verbally abused by the father. Very distressed, he does not manage to rely on the group, even failing to follow the advice of another boy who got the tattoo in the previous session and who is trying to show him the way to follow. He comes very quickly (in 8 minutes) to a clash and does not get the tattoo, a result that causes him a lot of frustration.

Amandine is 16 years old, she was hospitalized for suicidal ideation without suicide attempts and for anorexia and bulimia. The diagnosis is major depressive disorder associated with eating disorders (DSM 5). Already while watching the introductory part of the game, Amandine looks very uncomfortable and reluctant to play. She opts for obtaining the tattoo but soon she adopts a provocative attitude towards the father in the game, who questions the character of Chloe on her eating behavior. The other members of the group provide advice; she seems attentive to their comments but does not take into account their suggestions. Finally, the clash is fast (in 12 minutes) and Amandine does not get the tattoo.

Eric is 16 and is hospitalized with significant suicidal ideation but no records of passage to the suicidal act. The diagnosis is major depressive disorder (DSM 5). He immediately shows not much motivation to participate at this game and even less motivation to be the one playing. He chooses the goal of getting the tattoo but finally chooses answers that are annoying to the father in the game. Approaching the clash, he addresses the group of teenagers to ask for help and considers their suggestions. The session lasts long (28 minutes) and Eric, while continuing to make choices that lead him near the clash, continues to progress and end up getting the tattoo.

These examples show that the use of the game was significantly different for adolescents with suicidal ideation and for those who have attempted suicide. The results show also a difference relative to their psychopathological problems, especially with the eating disorders comorbidity.

5. Conclusion

Our study shows that there are specific characteristics in the way Clashback is being played by teenagers with suicidal tendencies and by teenagers who have

attempted suicide. This validates our assumption that the use of this serious game exceeds its original purpose of therapeutic mediation and becomes a tool that can contribute to the diagnostic evaluation of suicide risk.

Our research nevertheless has limitations and it is merely a first reflection on the issue. Indeed, our sample was limited and the fact that the game was played in a group may have biased the results.

Another bias is the fact that the avatar of Clashback is a teenager with eating disorders: this aspect may have a direct impact on our results for the two teenagers concerned by such problems, who ended up not getting the tattoo, while the rest of their group did. The overly direct identification with this avatar and with its pathology has been difficult for these adolescents. Prof. X. Pommereau plans the development of a second game, where the protagonist will be a boy who uses cannabis; this game will allow to reassessment of the results for adolescents with eating disorders.

It will also be interesting to experiment in the context of such game tools with the use of glasses in order to achieve greater immersion in a higher virtual reality environment. Thus, the identification with the avatar might be stronger and there may result a deeper emotional involvement of the teenager in the game.

References

[1] J. Alvarez, *Du jeu vidéo au serious game : approches culturelle, pragmatique et formelle.* Computing PhD, Toulouse 2 University, Toulouse, 2007.

[2] C.J. Falconer, A. Rovira, J.A. King, P. Gilbert, A. Antley, P. Fearon, N. Ralph, M. Slater and C.R. Brewin, Embodying self-compassion within virtual reality and its effects on patients with depression. *British Journal of Psychiatry* (Open Feb), **2** (2016), 74-80.

Subject Index

Author Index