BOOK OF ABSTRACTS

25th Annual International CyberPsychology, CyberTherapy & Social Networking Conference (CYPSY25)

13-15 September 2021 (VIRTUAL EDITION – Online)

Conference Chairs and Organizers: Giuseppe Riva (Università Cattolica del Sacro Cuore), Brenda K. Wiederhold (Interactive Media Institute, Virtual Reality Medical Institute).

Local Committee: Pietro Cipresso (Università Cattolica del Sacro Cuore), Claudia Repetto (Università Cattolica del Sacro Cuore), Daniela Villani (Università Cattolica del Sacro Cuore), Elisa Pedroli (Università E-Campus), Daniele Di Lernia (Università Cattolica del Sacro Cuore), Silvia Serino (Università Cattolica del Sacro Cuore), Alice Chirico (Università Cattolica del Sacro Cuore).

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(National Institute on Drug Abuse – NIDA), Christina Botella (Universitat Jaume), Willem-Paul Brinkman (Delft University of Technology), Andrew Campbell (The University of Sydney), Darlene Colson (Norfolk State University), Scott Debb (Norfolk State University), Chris Fullwood (University of Wolverhampton), Luciano Gamberini (University of Padova), Pedro Gamito (Universidade Lusófona de Humanidades e Tecnologias), Karen Holmes (Norfolk State University), Hitoshi Kaneko (Nagoya University), Robert Kayers (Redskins University), José Gutierrez Maldonado (University of Barcelona), Thomas Parsons (University of North Texas), Susan Persky (National Institutes of Health - NIH), Wendy Powell (Tilburg University), Brad Ridout (The University of Sydney), Dan Romer (University of Pennsylvania), Michael Roy (Uniformed Services University of the Health Sciences), Anna Spagnolli (University of Padova), Stefan Stieger (Karl Landsteiner University), Dennis Patrick Wood (Virtual Reality Medical Institute).

Site: https://www.interactivemediainstitute.com/cypsy25/

SEPTEMBER THE 13TH

14.00-14:30
OPENING CEREMONY

14.30-15.30
KEYNOTE SPEECH PROF. BLANKE *Self-Consciousness. From Neuroscience & Virtual Reality To Immersive Digiceuticals*

15.30-17.00 PARALLEL SESSIONS
"THEMATIC SESSION: TECHNOLOGIES IN NEURODEVELOPMENTAL DISORDERS"

- *Online Musical Videogame Language Learning for Autistic Children*
  Christopher Harz
- *A voice recognition application for the semantic and prosodic analysis of ASD caregivers*
  Irene Alice Chicchi Giglioli
- *A qualitative and quantitative virtual reality usability study for the early assessment of ASD children*
  Maria Eleonora Minissi

"THEMATIC SESSION: CLINICAL USE OF VR-1"

- *A Motion Controlled Virtual Reality Paradigm for Ostracism Research*
  Patrick Mulvaney
- *Designing a therapeutic game for maximized entertainment*
  Micaela Fonseca
- *Virtual Reality Exposure for Stress Inoculation in Police Officers from Traffic Division*
  Pedro Gamito
- *Cognitive stimulation using non-immersive virtual reality tasks in children with learning disabilities*
  Pedro Gamito
- *Exposure-based Rehabilitation in Immersive Contexts - a novel use of VR for PTSD*
  Nancy van Veelen

"THEMATIC SESSION: DEALING WITH COVID THROUGH TECHNOLOGIES"

- *The impact of grit in productivity: remote work-related barriers during COVID-19 lockdown*
  Ana Rita Farias
- *Technology as a daily resource for Italian college students during the lockdown period. A qualitative study*
  Claudia Carissoli
- *Exploring Virtual Teacher Acceptance Post-Pandemic with the Diffusion of Innovation Model*

17-18.30 PARALLEL SESSIONS
"THEMATIC SESSION: TECHNOLOGIES FOR EATING DISORDERS"

- *The way we look at our own body, really matters! Body-related attentional bias as a predictor of worse clinical outcomes after a virtual reality body exposure therapy*
  Marta Ferrer-Garcia

- *Going beyond body exposure therapy. Presenting an innovative Virtual Reality and Eye-Tracking body-related attentional bias task*
  Bruno Porras Garcia
- *Rescripting emotional eating with virtual reality: a single case study*
  Clelia Malighetti
- *The relationship between interoception and multisensory bodily illusions in Anorexia Nervosa*
  Daniele Di Lernia
- *A Virtual Reality tool using embodiment and body swapping techniques for the treatment of obesity: A usability study*
  Dimitra Anastasiadou

"THEMATIC SESSION: CLINICAL USE OF VR-2"

- *Where do we stand? An overview of systematic reviews regarding the status of virtual reality applications in alcohol use disorder*
  Alexandra Ghita
- *Adaptive Virtual Reality Exposure Therapy Based on Physiological Measures*
  Athar Mahmoudi-Nejad
- *Effectiveness of a stand-alone, smartphone-based virtual reality exposure app to reduce fear of heights in real-life: a randomized controlled trial*
  Dorothee Bentz
- *Training mentalization in virtual reality: an experimental treatment for children*
  Ilaria Maria Antonietta Benzi
- *360° immersive photos and videos, an ecological approach to memory assessment*
  Francesca Bruni

"THEMATIC SESSION: REPLICATING CLASSICAL METHODS IN VR"

- *RorschachVR: Leveraging Intentional Ambiguity and Live Motion Capture in a Turn-Key Teletherapy Tool Prototype*
  Ari Hollander
- *Exploratory Factor Analysis of the Virtual Reality Stroop Task*
  Justin Asbee
- *Conformity in times of COVID-19: Virtual Adaptation of Asch's Classic Psychology Experiment*
  Leonor Novo
- *Implicit Measures of Perceived Realness in Virtual Reality*
  Marius Rubo

18.30-20.00 PARALLEL SESSIONS
"SYMPOSIUM: 3MDR: INTERNATIONAL EFFORTS TO VALIDATE THE EFFICACY OF NOVEL "WALK AND TALK THERAPY" FOR PTSD IN AN IMMERSIVE VIRTUAL REALITY ENVIRONMENT"

- *Clinical Trial of 3MDR to Treat PTSD after Mild TBI, with and without Eye Movement*
  Michael Roy
- *Tackling trauma with technology: Treating chronic combat-related PTSD in Canadian Armed Forces personnel and veterans with 3MDR*
  Suzette Bremault-Phillips
- *Efficacy of Interactive Motion-Assisted Exposure Therapy for Veterans with Treatment-Resistant PTSD: A Randomized Controlled Trial*
  Nancy van Veelen

- *Synergistic Sleep and 3MDR Immersion Therapy Program for Treatment of Post Traumatic Stress*
  Pinata Sessoms

"THEMATIC SESSION: CLINICAL USE OF VR-3"

- *An investigation into the impact of virtual reality character presentation on participant's depression stigma*
  David Redmond
- *Cyberintervention on plant workforce's mental activity for safety*
  Elena Sajno
- *Systematic review of biofeedback interventions using immersive natural environment Virtual Reality*
  Elena Sajno
- *Control the heart, control the mind: biofeedback training in virtual reality improves memory and attention*
  Lukas Bögge
- *Effectiveness of a stand-alone, smartphone-based gamified augmented reality exposure app to reduce fear of spiders in real-life: a randomized controlled trial*
  Anja Zimmer

"THEMATIC SESSION: NEW PERSPECTIVES FOR DESIGNING VIRTUAL ENVIRONMENTS"

- *The immersive 3D objects' library for applying non-invasive brain stimulation in research on the motor control & the mirror neurons system: a call for collaboration*
  Andrey Vlasov
- *Normative Affordances: Utilising the constraint of context-specific expectation in simulated environments*
  John Francis Leader
- *Influence of Photorealism and Non-Photorealism on Connection in Social VR*
  Nienke Bierhuizen
- *Memory Performance in a Fully Immersive Virtual Reality Environment*
  Alexandra Voinescu

SEPTEMBER THE 14TH

11.30-13.00 PARALLEL SESSIONS

"SYMPOSIUM: TOWARDS A MULTISENSORY EXPERIENCE IN VR"

- *Interoceptive stimulation technology reduces chronic pain in musculoskeletal, primary, and neuropathic conditions: a parallel randomized clinical trial*
  Daniele Di Lernia
- *Visual size matters for touch. The embodiment of fake bodies with different sizes affects the perception of tactile distances*
  Giorgia Tosi
- *Defining the multisensory parameters, in a virtual reality application, that can decrease stress and improve performance in professional rugby players*
  Solène Neyret
- *Motor planning and execution of retargeted reaching actions in virtual reality*
  Antonella Maselli

- *The effect of embodiment as a victim of ipv on attitudes of victim blaming in the general public*
  Tania Johnston

"THEMATIC SESSION: HUMAN-TECHNOLOGY INTERACTION- 1"

- *Embodied Robot, Telecommunication, and Level of Controllability*
  Myeongul Jung
- *Smartphone Application for Wheelchair User's Transportation Mode Detection: A Preliminary Study*
  Sungjin Hwang
- *Between benevolent lies and harmful deception: Ethical analysis of deceptive practices in dementia care technology*
  Ans Tummers

"THEMATIC SESSION: HUMAN-TECHNOLOGY INTERACTION- 2"

- *Can a robot lie? A study on intentionality comprehension in 5- and 6-year-olds children*
  Giulia Peretti
- *Human-cobot interaction: an overview of the factors affecting workers' well-being based on the SHELLO model*
  Mattia Chiappini
- *Facial expression analysis for assessing emotional impact raised by online art experience: an empirical evidence*
  Maurizio Mauri
- *Design for Phygitally Enriched Interactions in Social Organizations. Towards an 'Ultradisciplinary Stance'*
  Carlo Galimberti

13.00-14.00
LUNCH BREAK

14.00-15.00 POSTER SESSION

- *Body based mental imagery and its relationship to body image disturbances and interoception from adolescence to late adulthood*
  Akansha Mahesh
- *Testing a music-based virtual reality intervention for upper limb motor rehabilitation in post-stroke hemiparetic patients*
  Alice Cancer
- *The effects of the COVID-19 pandemic on body image and eating habits in a non-clinical sample of adult women*
  Amelia Paquette
- *Transposing a paper-and-pencil neuropsychological test into an immersive virtual environment*
  Andrea Onali
- *Emotional Wandering in a VR real world: a preliminary study*
  Chiara Di Nuzzo

- *Understanding the Overall Utilization of a Chatbot for Depression*
  Cyrus Chang
- *Progetto Savor, a pilot study: effectiveness of e-savoring training on subjective well-being and the role of future time perspective in older and young adults*
  Elisa Pancini
- *Treatment expectations and acceptability results of brief psychological mindfulness-based intervention for the treatment of depression in primary care*
  Soledad Quero
- *"ConsapevolM€NT€": an application to empower management money competences*
  Davide Cavallo
- *Meta Cognition on the Internet: Expected Accuracy of Human and AI Virtual Assistants' First Impressions about Us Online*
  Elena Tsankova
- *Relationship between Body Satisfaction and Social Media Platforms*
  Grace Weatrowski
- *Digital Career Guidance Technologies: Using Augmented and Virtual Reality*
  Irina Petrova
- *Impact of Perceived Agency of a Virtual Human on Social Modulation of Pain*
  Isabel Neumann
- *Happiness through virtual lens: The influence of immersion, social and non-social contents on positive emotion induction*
  Katarina Pavic
- The benchmark and the study of feasibility of the 360-degree video-based virtual reality to induce a full body illusion
  Sara Ventura
- Become more human: positive changes on empathy and violent attitude after a study with male sample who embodied a female victim of sexual harassment
  Sara Ventura
- *Acceptance and Commitment Therapy Interventions for Internet-Based Addictions: A Systematic Review*
  Kristina Axenova
- *Diffusion and the popularization of smart home technology. Can the use of psychological theory aid in the acceptance of smart home devices and accelerate global uptake?*
  Neil Daruwala
- *Identifying prototypical trust signals in Open-Source Software depositories: A think aloud study*
  Rob Huw Peace
- *The effect of virtual touch in the enhancement of the user experience in virtual reality*
  Rocio Herrero
- *Exposure to beauty ideals via Social Networking Sites and body image: a systematic review of experimental studies*
  Sara Bocci Benucci
- *Virtual reality for relaxation in a pediatric hospital setting: an interventional study with a mixed-methods design*
  Sylvie Bernaerts
- *Preliminary study of a gait rehabilitation based on Brain Computer Interface treatment*
  Woosang Cho

- *A brief online intervention to promote gratitude using ecological momentary assessment: a study protocol*
  Alberto González-Robles

15.00-15.30
BREAK

15.30-17.00 PARALLEL SESSIONS
"SYMPOSIUM: ASSISTIVE TECHNOLOGIES AND REAL-WORLD EVIDENCE: FINDINGS FROM THE ITALIAN IRCCS AGING NETWORK"

- *Technologies for frailty and geriatric syndromes: a systematic review of research designs*
  Alessia Gallucci
- *Robots for the elderly: facts or fantasy?*
  Antonio Greco
- *Assistive technologies to support fragile older adults: lesson learned from European experiences*
  Elvira Maranesi
- *Mapping technologies use and efficacy in frailty, multimorbidity and comorbidity: preliminary results from a systematic review*
  Silvia Cavedoni

"THEMATIC SESSION: MEDIA AND EDUCATION IN THE DIGITAL AGE"

- *Mind your time: The implications of prolonged Instagram use and drive for thinness in university students*
  Alexandra Ghita
- *Learners' attitudes towards immersive virtual reality in higher education*
  Anna Flavia Di Natale
- *Gaming Streetwork: The Need for Outreach Approaches in Media Education and Addiction Prevention*
  Fabian Wiedel
- *Primary schoolers' response to a multisensory serious game on Cartesian plane coordinates in VR*
  Sarah Cooney

"THEMATIC SESSION: INNOVATION IN GAMING RESEARCH"

- *Further Validation of Russian Video Games Addiction Scale (VGAS)*
  Nataliya Bogacheva
- *Creativity and Virtual reality: effects of an ecological non immersive setting on creativity during a game session in MineCraft*
  Andrea Gaggioli
- *The relationship between computer-game-type preference and personality traits, moral foundations and self-regulation among young adults*
  Liubov Glinkina

17.00-18.30 PARALLEL SESSIONS
"THEMATIC SESSION: ONLINE INTERVENTION"

- *Positive technology for emotion regulation: a virtual self-help intervention*
  Clelia Malighetti

- *Live chats in postvention: an analysis of interventions with people recently bereaved by suicide*
  Lorenza Entilli
- *Mental health practitioners' perceptions regarding online empathic interactions*
  Milou Feijt
- *The key moderating role of telepresence on the strength of working alliance in videoconference-based psychotherapy. Or why can it work despite the use of such an imperfect medium?*
  Stephane Bouchard
- *From a 'minimal quality interaction' to 'intersubjectivity'in telepsychotherapy*
  Lise Haddouk

"THEMATIC SESSION: ONLINE COMMUNICATION"

- *Managing online reviews: promoting online reputation through expressions of gratitude*
  Ana Rita Farias
- *Women Do It Too: Examining the Personality Characteristics of Female Digital Catcallers*
  Kathryn Seigfried-Spellar
- *Online Behaviors in Emerging Adults: A Study in Italy and the U.S.A.*
  Martina Benvenuti
- *Personality traits and dynamics of direct communication on SNS*
  Maria Melnikova

"SYMPOSIUM: TOWARDS A SCIENCE OF COMPLEX EXPERIENCES"

- *Inspiring awe in high school teachers: Design and preliminary test of a virtual training in AltspaceVR*
  Alice Chirico
- *Covid-19 Lockdown in Italy as a Potential Transformative Experience: A Pilot Study*
  Alice Chirico
- *Being pregnant during the Covid-19 pandemic: a complex experience*
  Giulia Corno

SEPTEMBER THE 15TH

11.30-13.00 PARALLEL SESSIONS
"THEMATIC SESSION: ONLINE RELATIONSHIPS"

- *An online intervention coupling psychological support and physical exercise for breast cancer survivors: A pilot study*
  Valeria Sebri
- *Sexting and Pornography in the context of adolescent romantic relationships*
  Gaia Cuccì
- *Idealization on dating apps: Seeing fewer photos of the potential partner leads to expectancy violation and lower attraction*
  Simona Sciara
- *Structural characteristics in online dating apps: The development of a new taxonomy*
  Gabriel Bonilla

"THEMATIC SESSION: SOCIAL MEDIA"

- *'Feed' or 'Unfeed'? The role of social networking use in the link between identity development and psychological functioning in emerging adulthood*
  Ágata Salvador
- *Predictors of problematic social media use in emerging adults: the role of basic needs frustration and fear of missing out*
  Daniela Villani
- *Active and passive selfie use: Implications for mental health*
  Vojana Obradović
- *Parent-child dysfunctional communication about sexting: The role of parental characteristics and parental mediation*
  Michal Dolev-Cohen
- *Two Dimensions of Problematic Smartphone use Mediate the Relationship Between Fear of Missing Out and Emotional Well-Being*
  Nino Gugushvili

"THEMATIC SESSION: VR EMOTION AND COGNITION-2"

- *ANTaging: A Research Protocol for Active Navigation Training with Virtual Reality in Mild Cognitive Impairment*
  Cosimo Tuena
- *Virtual Reality-Based Behavioral Activation: A Single Case Experimental Design*
  Desirée Colombo
- *Using a spatial-semantic task in virtual reality to study the specifics of switching between languages in bilinguals*
  Liudmila Shaigerova

13.00-14.00
LUNCH BREAK

14.00-15.30 PARALLEL SESSIONS
"THEMATIC SESSION: TECHNOLOGIES FOR WELLBEING"

- *SerenaMente Mamma: a Positive Psychology and Mindfulness App for enhancing expectant mothers' wellbeing*
  Claudia Carissoli
- *Venturing through storm and stress. A virtual reality app for the assessment of Emotional Sensitivity*
  Ilaria Maria Antonietta Benzi
- *Promoting well-being in tennis players through the Perform-Up Tennis App: a pilot study*
  Sara Bordo
- *A Virtual Reality experience to support the Loving Kindness Meditation*
  Maria Alejandra Quiros Ramirez

"THEMATIC SESSION: VR EMOTION AND COGNITION- 1"

- *Gesture based word (re)acquisition with a virtual agent in augmented reality: A preliminary study*
  Manuela Macedonia
- *PROFFILO: a new digital assessment tool to evaluate learning difficulties in secondary school*
  Martina Benvenuti
- *Using virtual reality to assess Mind Wandering and Episodic Memory*
  Philippe Blondé

"SYMPOSIUM: HIGH-END AND LOW-END VIRTUAL REALITY SYSTEMS FOR THE REHABILITATION OF FRAILTY IN THE ELDERLY"

- *High-end and Low-End Virtual Reality protocol for Reducing the Physical Decline in the Elderly*
  Marco Stramba-Badiale
- *High-end and Low-End Virtual Reality protocol for Reducing the Cognitive Decline in the Elderly*
  Elisa Pedroli
- *Brain M-App, a new application for cognitive rehabilitation at home: preliminary results of a usability study*
  Valentina Mancuso
- *Investigating Virtual Reality technology acceptance by patients: preliminary results from a TAM-based model*
  Sandra Morelli

15.30-17.00 PARALLEL SESSIONS
"SYMPOSIUM: VIRTUAL REALITY FOR THE TREATMENT OF COMBAT AND NON-COMBAT RELATED POST TRAUMATIC STRESS DISORDER/POST TRAUMATIC STRESS"

- *Virtual Reality to Achieve More Successful Therapy for Combat-Related PTSD: Reflections on the Conduct of Four Randomized Controlled Trials at Walter Reed*
  Michael Roy
- *Personality, posttraumatic stress symptoms, emotional regulation, and coping strategies: Virtual-reality task of Covid-19 infection*
  Ricardo Pinto
- *Predicting Post-Traumatic Stress Disorder Treatment Response Using Heart Rate Variability Response to Virtual Reality Environment and Modified Stroop Task: An Exploratory Study*
  Brenda Wiederhold
- *Using Virtual Reality to Enhance Exposure Therapy for PTSD: A Randomized Controlled Trial in an Active Duty Sample*
  Amie Newins

“THEMATIC SESSION: 360° VIDEOS FOR ASSESSMENT AND INTERVENTION”

- *Aphasia360°: A virtual reality intervention for anomia rehabilitation in post-stroke patients*
  Claudia Repetto
- *An innovative solution for an integrated evaluation of Executive Dysfunctions*
  Francesca Borgnis
- *Usability and Users Experience of EXecutive-function Innovative Tool (EXIT 360°)*
  Francesca Borgnis
- *The 360° Mental Screening (MS-360°): A Screening Test for an Ecological Assessment of Everyday Cognitive Functioning*
  Luca Pieri
- *Using 360-degree videos for virtual bodily illusions: a preliminary study*
  Silvia Serino

17.15-18.15
KEYNOTE SPEECH PROF. PARSONS *Cyberpsychology And The Brain: Practical And Ethical Implications Of Technologies Extending Cognition*

18.30-19-30
AWARDS AND CONCLUDING REMARKS

19.30 SOCIAL EVENT: VIRTUAL REALITY TREASURE HUNT (Altspace VR)

Conference Social Event: 15 September 2021 – 19.30 CET

Dear participant,

it is a pleasure to invite you to join a treasure hunt and an informal meeting to better know your colleagues on AltspaceVR, which will be held on **September 15, at 19.30 CET after the concluding remarks.**

To avoid access problems, it is important that you **confirm your presence** through the following form **within the day 13/9:**

https://docs.google.com/forms/d/e/1FAIpQLSfI9icyVq_XdLgWaz3HZpwuwapzzM0U08wgGe0N08m1qKy_DQ/viewform?usp=sf_link

(https://tiny.cc/nh0juz)

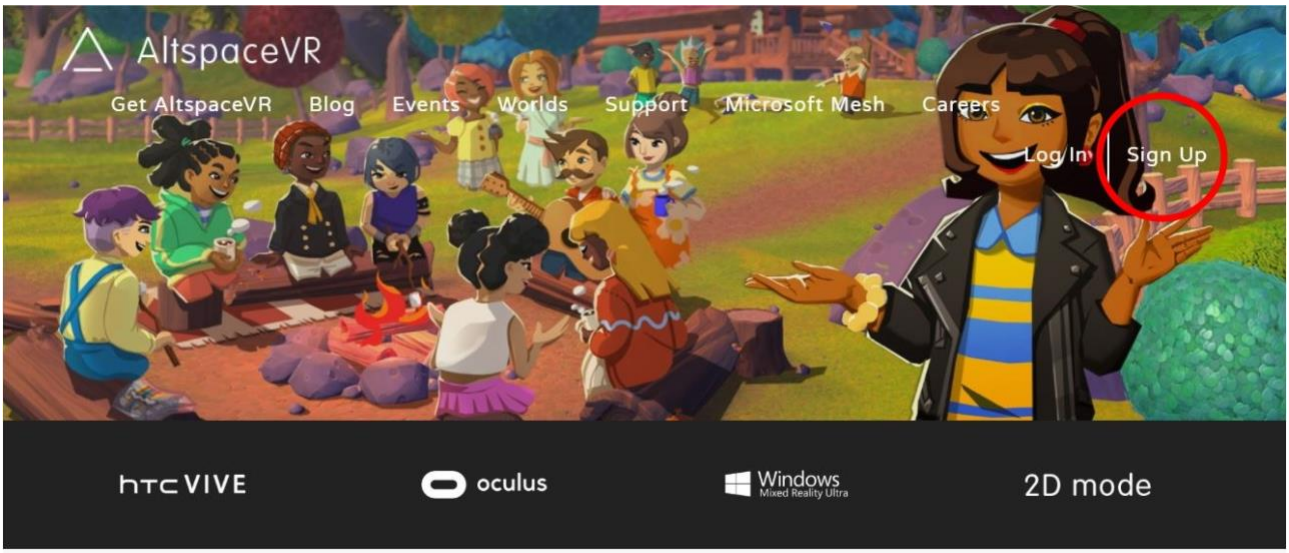
What will happen? We will meet in the XPL Virtual Meeting Room, for an hour of games and chat: you can participate in a **virtual treasure hunt** and try your hand at other leisure activities.

Do I need some VR stuff? You don't. It is enough to have a laptop, a good Internet connection, and headphones. Then, if you own a VR headset with controllers, it can be even better. You can use both Oculus and Vive headsets.

Do I need to register and/or download some software? Yes, you need create your own account, download AltspaceVR, and join the virtual lab.

Step 1: Go to www.altvr.com

Step 2: Click the “Sign Up” button and register



Step 3: Download the AltspaceVR client for your platform:

- **OCULUS Version**: https://www.oculus.com/experiences/rift/1072303152793390/
- **HTC Vive Version**: https://store.steampowered.com/app/407060/AltspaceVR/
- **PC Windows Version**: https://www.microsoft.com/en-us/p/altspacevr/9nvr7mn2fchq?activetab=pivot:overviewtab
- **MAC Version**: https://altvr.com/altspacevr-mac/

Step 4. Enter in our meeting room:

https://account.altvr.com/worlds/1643423683164767062/spaces/1643424503469965422

More questions? Please, feel free to contact our AltspaceVR expert, **Francesco Serafini** francesco.serafini01@icatt.it

FINAL PROGRAMME

13 September 2021

14:00-14:30	**OPENING CEREMONY**		
14.30-15.30	**KEYNOTE SPEECH: PROF. BLANKE**		
15.30-17:00	**THEMATIC SESSION: TECHNOLOGIES IN NEURODEV. DISORDERS**	**THEMATIC SESSION: CLINICAL USE OF VR-1**	**THEMATIC SESSION:DEALING WITH COVID THROUGH TECHNOLOGIES**
17:00-18.30	**THEMATIC SESSION: TECHNOLOGIES FOR EATING DISORDERS**	**THEMATIC SESSION: CLINICAL USE OF VR-2**	**THEMATIC SESSION: REPLICATING CLASSICAL METHODS IN VR**
18.30-20:00	**SYMPOSIUM: 3MDR: INTERNATIONAL EFFORTS TO VALIDATE THE EFFICACY OF NOVEL "WALK AND TALK THERAPY" FOR PTSD IN AN IMMERSIVE VIRTUAL REALITY ENVIRONMENT**	**THEMATIC SESSION: CLINICAL USE OF VR-3**	**THEMATIC SESSION: NEW PERSPECTIVES FOR DESIGNING VIRTUAL ENVIRONMENTS**

Keynotes

13 September 14.30-15.30

SELF-CONSCIOUSNESS. FROM NEUROSCIENCE & VIRTUAL REALITY TO IMMERSIVE DIGICEUTICALS

Professor Olaf Blanke

Bertarelli Chair in Cognitive Neuroprosthetics

Swiss Federal Institute of Technology (EPFL)

Geneva, Switzerland

Recent evidence has defined a minimal form of self-consciousness that is based on the integration of exteroceptive bodily signals and referred to as bodily self-consciousness (BSC). BSC is based on the integrated and multisensory perception of tactile, proprioceptive, visual signals and has been studied in cognitive psychology, neuroscience, and in neurological patients (exteroceptive BSC, e-BSC). A different or opposing account of self-consciousness, interoceptive BSC (i-BSC), has highlighted the relevance of interoceptive bodily signals (such as cardiac and respiratory signals). Based on latest neuroscience evidence using different VR technologies (VR, AR, ER) in human neuroscience, I will propose an integrated neural account reconciling these two largely separated views (x-BSC) (Park and Blanke, 2019). These data show that x-BSC is an integrated system based on torso-centered signals in a distributed cortical network and delineate how x-BSC accounts for fundamental aspects of self-conscious experience such as self-location and self-identification with an individual's body. Moreover, I will argue that the integration of VR technologies with those of human neuroscience is of fundamental importance to achieve further advances in BSC and in many other domains in human neuroscience. I will conclude by describing our current efforts in immersive digiceuticals and highlight the potential of translating these scientific insights and immersive VR technologies to several medical applications such as chronic pain and breathing discomfort.

15 September 17.15-18.15

CYBERPSYCHOLOGY AND THE BRAIN: PRACTICAL AND ETHICAL IMPLICATIONS OF TECHNOLOGIES EXTENDING COGNITION

Thomas D. Parsons

Director of Computational Neuropsychology and Simulation (CNS) Laboratory
University of North Texas

Our technologies are progressively developing into algorithmic devices that seamlessly interface with digital personhood. This talk discusses the ways in which technology is increasingly becoming a part of personhood and the resulting ethical issues. It includes a framework for a brain-based cyberpsychology. Using this framework, Dr. Parsons investigates the practical and ethical issues that emerge in algorithmically coupled people and technologies. The ethical implications of these ideas are important as we consider the enhancements that can be afforded by our technologies. If people are intimately linked to their technologies, then removing or damaging the technology could be tantamount to a personal attack. On the other hand, algorithmic devices may threaten autonomy and privacy.

13 September

15.30-17 PARALLEL SESSIONS

THEMATIC SESSION: TECHNOLOGIES IN NEURODEVELOPMENTAL DISORDERS

Online Musical Videogame Language Learning for Autistic Children

Christopher Harz (Harz Associates International)

This presentation covers the updated and latest results of a US Dept. of Education funded project on creating musical videogames to teach autistic spectrum disorder (ASD) children to speak. Music-based interventions have been shown effective for ASD, but have had limited access. This project was a novel approach using mobile digital devices and an online videogame format to engage, motivate, and educate ASD children. This Game Based Learning (GBL) demonstrated improved speech and language development as well as early-developing social communication skills. Training of subjects was conducted by either parents or teachers/trainers; effectiveness was compared. A novel Train-the-Trainer (T3) application proved useful for trainers and K6 teachers. Gamification features include entertaining cartoon characters, music and songs, game levels, challenges, and awards, together with formation of a user community for feedback and continuity. The strategy combines music, gameplay, universal digital access, interactive digital training, auto data reporting, and low cost, thus offering treatment options for families who cannot normally afford access or costs of extensive speech therapy. It could prove especially suitable for Telehealth Training in the Age of COVID-19. The presentation includes descriptions of methods and results as well as a short video.

A voice recognition application for the semantic and prosodic analysis of ASD caregivers

Irene Alice Chicchi Giglioli*, Luna Maddalon*, Lucia Gomez-Zaragozá*, Maria Eleonora Minissi*, Marian Sirera**, Luis Abad** and Mariano Alcañiz* (*Universitat Politecnica de Valencia, **Centro de Desarrollo Cognitivo Red Cenit)

The voice manifests and conveys numerous components of meaning in addition to words, such as prosody and semantic. Previous studies have found that parents of children with Autism Spectrum Disorder (ASD) seem to have a delayed response time compared to parents of children with typical development. Words and number repetitions, duration of pronunciation and meaning used by parents vary by child diagnosis as well. The aim of this project is to demonstrate that the parent's voice can be a powerful behavioral biomarker in the diagnosis of ASD. Parental quality of life may also be a strong predictor of the quality of life of children with ASD. Given this goal, we propose the creation of a voice analysis application that through Machine Learning (ML) algorithms, is able to detect elements of prosody and semantics for investigation purposes. The application is based on the Autism Diagnostic Interview-Revised (ADI-R) and contains some personality questionnaires. The pilot study foresees to include 300 caregivers belonging to 3 different groups based on their

child's diagnosis. Findings are expected to recognize that parents of children with ASD have distinct differences in prosodic and semantic levels compared with parents of control children. The uniqueness of this study lies in the creation of a tool focused on the voice, through combined ML and psychological techniques. This application has the potential to empower the ADI-R methodology by meeting the terms of validity and objectivity.

A qualitative and quantitative virtual reality usability study for the early assessment of ASD children

Maria Eleonora Minissi*, Irene Alice Chicchi Giglioli*, Fabrizia Mantovani**, Marian Sirera***, Luis Abad*** and Mariano Alcañiz* (*Universitat Politecnica de Valencia, **Universita' degli Studi di Milano-Bicocca, ***Centro de Desarrollo Cognitivo Red Cenit)

The diagnosis of autism spectrum disorder (ASD) is usually done using structured and semi-structured interviews directed to children and caregivers. These procedures are administered by certified clinicians, who have expertise in the assessment of ASD. However, on one side semi-structured procedures addressed to children are usually administered in settings requiring ecological validity, such as the laboratory; on the other side, structured interviews to caregivers rely on self-report, that might be affected by psychological response biases. There is the need to fulfil aforementioned needs improving ASD assessment procedures through the use of both ecological settings and objective measures. The present study wanted to investigate the usability of a novel procedure to assess ASD, based on virtual reality (VR) and quantitative measures. 20 children with ASD and 20 children with typical development (TD) performed four basic tasks in the VR system Cave Assisted Virtual Environment (CAVE™) while an examiner analysed the usability of the application, as well as children's user experience. Quantitative behavioural variables related to children performance across tasks were measured. Involved tasks required to interact in the virtual environment with childlike objects. Findings demonstrated that VR application was promising for the assessment of ASD, due to good usability in three tasks out of four, and positive user experience. Moreover, quantitative behavioural outcomes revealed differences between groups on time spent playing and accuracy across tasks. Quantitative and qualitative usability studies improve the effectiveness of new objective and technology-based ASD assessment procedures, in particular when children represent the population target.

THEMATIC SESSION: CLINICAL USE OF VR-1

A Motion Controlled Virtual Reality Paradigm for Ostracism Research

Patrick Mulvaney, Brendan Rooney and Lauren Christophers (University College Dublin)

Despite being a popular field of study, ostracism research paradigms have been criticised for their abstract nature and lack of mundane reality. The current paper sets out to address the problem of ecological validity through the introduction of a newly developed paradigm that makes use of virtual immersive environments, motion controls, and haptic feedback. Based

on the Cyberball-Game, this VR tool locates participants in a playground where they are asked to play a game of catch with two agents. When passed to, the player can pick up the ball and throw it to whoever they choose using motion controls. After a period, the other players will only pass between themselves, inducing the feeling of being ostracised for the participant. A pilot study (n=24) was run to assess the effectiveness of the tool in inducing feelings of ostracism using the Basic Needs Scale. The sample size was too small to report inferential statistics, but descriptive statistics demonstrate that the tool was successful in inducing an experience of being ostracised when the control (M = 72.46, SD = 10.64) and ostracism (M = 43.73, SD = 11.1) conditions are compared. All participants were successfully able to use the device with no errors. This tool presents significant advantages in comparison to conventional methodology, with greater ecological validity resulting from improved presence and embodiment. Greater experimental control and measurement is also offered when compared to in vivo methods.

Designing a therapeutic game for maximized entertainment

Micaela Fonseca*, Pedro Neves*, Miguel Fernández*, Cláudia Quaresma**, Jorge Oliveira*, Pedro Gamito* and Filipe Luz* (*Lusófona University, **Laboratory of Instrumentation, Biomedical Engineering and Radiation Physics)

The Village Druid project explores a novel approach to games for physical and cognitive upper-limb rehabilitation therapy for motor dysfunction patients. The approach is consistently enforcing maximization of patient entertainment in game design and development to a greater degree than what is done for health games. This is done by pushing narrative fantasy and adaptive difficulty together with biofeedback (specifically electrodermal activity). Through its novel approach to health game design, the Village Druid project has already yielded an analog paper-based prototyping method for VR games, which is a research outcome in its own right. The game is currently under development, and has finished its proof of concept stage with 20 individuals with no associated pathology. Further stages in iterative game development, improving integration with VR and biofeedback technology, and testing with rehabilitation patients is ongoing, with deployment and validation in partner institutions to follow.

Virtual Reality Exposure for Stress Inoculation in Police Officers from Traffic Division

Pedro Gamito*, Jorge Oliveira*, Ricardo Dias*, Joana Rosa*, Jorge Silva** and Maria Mendes** (*Lusófona University, **Policia de Seguranca Publica)

This study aims at validating a VR-based stress inoculation environment on police officers. We have randomly selected two samples of police officers from a traffic division in Lisbon (Portugal). This sample was exposed to a VR environment where they had to face two victims, a fellow officer and a baby, of a motor vehicle accident for 10 minutes. Results from anxiety and depression scales collected before VR exposure did not reveal difference between these groups. The analysis on psychophysiological data from skin conductance levels, peripheral

temperature, heart rate and respiration rate, revealed main effects of VR exposure in these parameters, but subjective activation was higher in less experienced police officers. These results suggest that VR cues are effective in eliciting emotional response in police officers, while having implications for developing further stress inoculation programs directed at police officers and other professionals that are likely to be exposed to stressful events.

Cognitive stimulation using non-immersive virtual reality tasks in children with learning disabilities

Pedro Gamito, Lucileide Santos and Jorge Oliveira (Lusófona University)

Executive functions comprise a set of higher-order mental processes that are crucial for cognition, emotion and behavior regulation. This study aimed to explore the benefits of a cognitive stimulation program using virtual reality (VR) for improving executive functioning in children identified with learning disabilities. The design of this study consisted of a pilot randomized controlled trial. This study was approved by an ethics committee. Nineteen children were randomly distributed by the experimental group consisting in non-immersive VR cognitive stimulation with tasks and the control group without intervention. A battery to assess executive functions in children was used for assessing the outcomes. The results suggest improvements in most domains of executive functions from pre- to post-intervention. A positive effect was also observed in the response to a questionnaire for parents about behavioral aspects of their children. These improvements were found only in the experimental group, which suggest a positive role of intervention in this population. Despite being a pilot study, these results highlight the positive role on executive functions of cognitive interventions using non-immersive VR.

Exposure-based Rehabilitation in Immersive Contexts - a novel use of VR for PTSD

Eric Vermetten*, Nancy van Veelen*, Ewout van Dort** and Bastiaan Bruinsma** (*LUMC, **Ministry of Defense)

Introduction: Virtual Reality (VR) with a head-mounted display (HMD) is a technique that can be used to actualize/realize the objective of interaction and engagement in a scenario that has taken place in the past. This enables the military and veteran population to simulate battlefield experiences at various location in the world and personalize the experiences that the serviceman was exposed to.
Method: We present on development of a novel project that leverages technology to facilitate personalisation and immersion in VR with techniques, such as eye tracking, voice-to-text, and biofeedback in a protocol based on exposure that has a strong capacity for treatment of reconsolidation of fear conditioned experiences and dysfunctional cognitive schemes.
Result: Fragmented relaxation exercises are built into VR so that servicemen or patients can create a phased exposure. Narrative elements in the VR environment provide new meaning to experiences and store them in a personal document. We present user cases in this presentation.

Conclusion: Future directions include: implementing text to speech to capture connotations for images, including triggers to reduce fear, controller-free interaction, event logging, external sense stimulation with heat, wind and smell, and more. During development, the product will be tested by various health care partners and will be validated for treatment for PTSD.

THEMATIC SESSION: DEALING WITH COVID THROUGH TECHNOLOGIES

The impact of grit in productivity: remote work-related barriers during COVID-19 lockdown

Ana Rita Farias*, Beatriz Rebordão** and Cláudia Simão** (*Lusofona University, **Universidade Católica Portuguesa)

The outbreak of Covid-19 pandemic has changed the nature of work and millions of people worldwide are currently working from their homes. In this study, we explored the remote work barriers and how a certain personality trait – grit: passion and perseverance in achieving long-term goals – could influence how workers are coping with this new reality. A total of 247 participants (71% females) with a mean age of 42.73 (SD = 12.93) years completed the online survey, during the first COVID-19 lockdown in Portugal, investigating grit, perceived stress/anxiety, perception of remote work as an obstacle, and self-reported productivity during this period. The findings suggest that grit decreases the perception of remote work as an obstacle and consequently increases worker productivity. Productivity seems to be related to the number of obstacles perceived, and this relation is mediated by grit.

ìkdown period. A qualitative study

Claudia Carissoli, Claudia Redaelli, Giuseppina Bernardelli, Luca Negri and Antonella Delle Fave (Università degli Studi di Milano)

The restrictions imposed during the Covid-19 pandemic have challenged human daily activities and habits worldwide. In this novel scenario, technology proved to be a resource for individuals and communities. A qualitative study explored the typologies of services primarily used by Italian university students in 2020, during the first lockdown period. Technology emerged as a major resource, facilitating daily tasks such as learning activities, relationships, and leisure.

Exploring Virtual Teacher Acceptance Post-Pandemic with the Diffusion of Innovation Model

Marjorie Zielke, Sean Lenox and Djakhangir Zakhidov (Center for Simulation and Synthetic Humans)

The COVID-19 pandemic has reshaped the landscape of education, and in turn, attitudes toward adoption of educational innovations. We explore this paradigm shift with a focus on virtual teachers, and how their future development and adoption could be affected by an altered educational environment. Virtual teachers could address a new set of challenges which the nation's rapid adoption of distance learning technologies has revealed. Motivations and challenges for virtual teacher adoption are examined from a stakeholder perspective through a diffusion of innovation framework. This framework includes communication, time, and social components, as well as the nature of these components in light of the COVID-19 pandemic. Stakeholder perspectives are examined for teachers, parents, and educational administrators, along with their roles in determining the acceptance of virtual teachers. Students with disabilities are presented as notable stakeholders in this new educational environment. Discussions of post-pandemic virtual teacher potential, possible entry points, and possible deterrences are also offered. We conclude with a discussion of possible emerging influences on virtual teacher diffusion, including their new role in post-pandemic education, the implications of their adoption, opportunities for further research, and pivotal turning points that may shape the future of virtual teacher diffusion and education as a whole.

17-18.30 PARALLEL SESSIONS

THEMATIC SESSION: TECHNOLOGIES FOR EATING DISORDERS

The way we look at our own body, really matters! Body-related attentional bias as a predictor of worse clinical outcomes after a virtual reality body exposure therapy

Marta Ferrer-Garcia*, Bruno Porras-Garcia*, Helena Miquel*, Eduardo Serrano-Troncoso**, Marta Carulla-Roig** and José Gutiérrez-Maldonado* (*Universitat de Barcelona, **Hospital Sant Joan de Déu)

Body-related attentional bias (AB) experienced by anorexia nervosa (AN) patients has been associated with body image disturbances and other eating disorders (ED)-related symptoms. The aim of this study was to assess whether the body-related AB reported by AN patients before a virtual reality (VR)-based body exposure therapy predicted worse clinical outcomes after treatment. Thirteen AN outpatients participated in the study. AB was recorded using an eye-tracker incorporated in a VR-Head Mounted Display. Results showed that AN patients attended to their weight-related body parts for longer and more frequently than to their non-weight-related body parts. Statistically significant ($p<.05$) negative and positive correlations between pre-intervention body-related AB measures and the difference between pre- and post-assessment fear of gaining weight, body dissatisfaction and body appreciation measures

were also found. Showing higher body related AB before the intervention marginally predicted a lower reduction of fear of gaining weight (p =.08 and p=.07) and body dissatisfaction (p = .05 and p=.06) at post-treatment, and significantly predicted a lower increase of body appreciation scores after the intervention (p<.001). Results suggest that body-related AB may reduce the efficacy of VR-based body exposure therapy in patients with AN.

Going beyond body exposure therapy. Presenting an innovative Virtual Reality and Eye-Tracking body-related attentional bias task

Bruno Porras Garcia, Alana Singh, Marta Ferrer-Garcia, Helena Miquel, Gemma Taña-Velasco, Natalia Briseño-Oloriz, Jesus Fleta, Emma Iglesias and José Gutiérrez-Maldonado (Universitat de Barcelona)

The present study provides preliminary findings of an innovative body-related AB modification task (ABMT), using Virtual Reality (VR) and Eye-tracking (ET) technologies. Analyses were carried out on a sample composed of college women (n = 35) who were divided into women with high body dissatisfaction (n = 16) and low body dissatisfaction (n = 19). All participants were exposed to an immersive virtual environment in which they were embodied in a virtual body which resembled the measurements of their real body. Subjects performed the body-related attentional bias modification task for 20-minutes. Body-related disturbances and body-related attentional bias (AB) were measured before and after a single session of the VR-ABMT. Results showed a significant (p<.05) reduction of fear of gaining weight after the intervention, only among women with high body dissatisfaction. Our results indicated promising evidence in favor of using this ABMT particularly among women with high body dissatisfaction. In addition, the current research provides a new application of VR and ET technologies that might open a wide range of possibilities for designing and developing new body-related interventions among patients with EDs and women with body image disturbances.

Rescripting emotional eating with virtual reality: a single case study

Clelia Malighetti*, Ciara Schnitzer**, Georgia Potter**, Katherine Nameth***, Theresa Brown**, Emily Vogel**, Giuseppe Riva*, Cristin Runfola*** and Debra Safer*** (*Università Cattolica del Sacro Cuore, **Stanford PsyD Consortium, ***Stanford University)

Emotional eating (EE), or eating in response to distress, is a manifestation of difficulties with emotion regulation (ER) for individuals with eating disorders. Although existing ER-focused interventions for eating disorders show promise in reducing symptoms, a significant subset of patients (~50%) experience suboptimal outcomes, with residual symptoms including EE. Innovative approaches targeting ER, and its manifestation as EE, are needed. We developed a novel ER-focused virtual reality (VR) immersive intervention, aimed at reducing EE among individuals with a history of a diagnosed binge-type eating disorder, designed to be delivered

over seven weekly sessions. Here, we present a case study of one patient with binge-eating disorder who received this intervention in a "real-world" clinical setting. The immersive experiences were delivered by a doctoral-level psychology student using a stand-alone head-mounted display (HMD). They included rescripting techniques aimed to increase awareness and identification of emotional states, resilience, and self-control over eating. Pre- and post-treatment assessments were administered to evaluate EE (Dutch Eating Behavior Questionnaire, DEBQ), eating disorder symptoms (Binge Eating Scale, BES) and emotion dysregulation (Difficulties in Emotion Regulation Scale, DERS). Results show a decreasing trend in emotional eating, emotion dysregulation, and binge episodes at the end of the treatment compared to baseline. This single-case suggests value in further evaluating this novel emotion regulation approach.

The relationship between interoception and multisensory bodily illusions in Anorexia Nervosa

Daniele Di Lernia, Silvia Serino and Giuseppe Riva (Università Cattolica del Sacro Cuore)

Interoception has shown promising evidence to describe and explain how we perceive our body from within and how this perception can shape our bodily feelings and bodily representations. Interestingly, patients with anorexia nervosa (AN) showed alteration and deficits in the interoceptive domains suggesting that interoception plays a fundamental role in the etiology of this pathological condition, and in the perceptive alterations that connotate the symptomatology. In this regard, multisensory bodily illusions (also rendered via virtual reality environments and with virtual avatars) are exploited to investigate the plasticity of bodily experience in both healthy and clinical populations. There has been an increasing amount of works using these techniques to modulate body representations and, recently, it has been possible to find some interesting attempts using these techniques to investigate the characteristics of distorted bodily experience also in patients suffering from AN. In the present study, we used a well-validated VR multisensory bodily illusion, along with interoceptive perception tasks to explore how interoception is related to bodily representations and multisensory integration in individuals (N=16) suffering from AN. Results indicate that interoceptive perception plays an important role in modulating the ownership and the agency of individuals suffering from AN over a virtual body.

A Virtual Reality tool using embodiment and body swapping techniques for the treatment of obesity: A usability study

Dimitra Anastasiadou*, Bernhard Spanlang**, Mel Slater**, Julia Vazquez-De Sebastian*, Josep Antoni Ramos-Quiroga*, Gemma Parramon Puig*, Andreea Ciudin*, Marta Comas* and Pilar Lusilla-Palacios* (*Vall d´Hebron Research Institute, **Virtual Bodyworks S.L.)

The objective of the present study, which is framed within European Union's H2020 project titled SOCRATES, is to examine the usability of a Virtual Reality (VR) embodiment tool for treating obesity. Six healthy adult participants with a desire to make lifestyle changes in terms

of eating healthier and doing more physical activity were recruited and were randomly assigned to the experimental group (EG) or the control group (CG). Participants from the EG engaged in a self-conversation aiming at enhancing their self-awareness and, through embodied perspective taking (body swapping), they were embodied alternately in their own virtual representation and in a counsellor's virtual body. Participants from the CG, embodied in their own virtual bodies, participated in a "scripted dialogue" with a counsellor of their choice who asked them about their perceived barriers for engagement with a healthier lifestyle and gave them practical recommendations about how to make lifestyle changes. A mixed-methods design was used, involving a semi-structured interview examining the level of users´ satisfaction with the 2 virtual experiences and their uncovered needs, as well as self-report questionnaires, including readiness to change habits, body ownership during the VR experiences and system usability. The usability study was conducted in July 2021. Then, from September 2021 onwards, once modifications to the prototype will be carried out based on the usability testing and the final VR tool is ready for use in a clinical setting, a Randomised Controlled Trial will be conducted with 97 participants with obesity to assess its preliminary efficacy compared to usual care.

THEMATIC SESSION: CLINICAL USE OF VR-2

Where do we stand? An overview of systematic reviews regarding the status of virtual reality applications in alcohol use disorder

Alexandra Ghita (University of Twente)

Introduction: The current overview of reviews aims to evaluate the progress of VR use in AUD emphasizing its present status in terms of assessment and treatment applications. Methods. The literature search was conducted using terms like "virtual reality" and "alcohol", "substance", "addiction", or "addictive" on databases such as Web of Science, Embase, PubMed, including the Cochrane Library.
Results: Seven narrative and systematic reviews published between 2014 and 2021 were identified as targeting the use of VR in addictive behaviors, including AUD. In total, 33 studies targeted the use of the VR technology in AUD, although 18 studies were duplicated in the reviews. Overall, the two main applications of VR in AUD were: 1) assessment (mainly using VR-based cue-exposure paradigm targeting craving elicitation during exposure to alcohol-related cues and contexts), and 2) treatment [generally VR-cue exposure therapy (VR-CET) to reduce responses (e.g. craving) to alcohol-related cues and contexts]. In all studies, VR was successfully implemented as an assessment or treatment approach (and outweighed control conditions).
Discussion: The reviews emphasize that VR is an ecologically valid instrument in AUD and is a better alternative to traditional cue-exposure techniques due to its technical features. Limitations and future research directions regarding the use of VR in AUD are discussed.

Adaptive Virtual Reality Exposure Therapy Based on Physiological Measures

Athar Mahmoudi-Nejad, Pierre Boulanger and Matthew Guzdial (University of Alberta)

Background: A new wave of psychological research is pioneering virtual reality (VR) to diagnose and treat mental and psychological disorders, from anxiety disorders to pain management. Many revolutionary treatments are still in laboratory testing, but some are already being used in hospitals and therapists' offices. There are numerous mental disorders with different symptoms that could benefit from using virtual reality (VR) for a patient's treatment. These disorders are characterized by a disruption in an individual's cognition, emotion regulation, behaviour, or relationship with others. To date, the most successful use of VR-based therapies has been focusing on the concept of exposure therapy, a treatment for anxiety disorders in which patients are exposed to a sequence of anxiety-inducing stimuli in a safe, controlled environment. The main idea of exposure therapies is that by repeating exposure to a virtual threat, the brain can reprogram itself into a familiar stimulus-response. For example, if someone is afraid of heights, VR-based therapy will allow you to be exposed to progressively higher buildings under a therapist's guidance. Studies by Côté et al. and Rizzo et al. are excellent examples of VR exposure therapy for Arachnophobia and post-traumatic stress disorder (PTSD) treatments, respectively. VR technologies allow therapists to create simulated and safe environments where therapists can control the intensity of patients' exposure to psychological triggers. Using VR therapy, patients can also do things they could not normally do in the real world, such as jumping off a cliff or helping a wounded soldier. Objective: Unfortunately, many VR environments are generic, with fixed VR parameters regardless of the users' characteristics and conditions. Adaptive VR environments exist, but they require the therapist's modification, which relies on intuition and experience instead of objective measurement of a patient's stress responses. There are also rule-based adaptive VR systems, which map user performance to predefined difficulty levels, and some studies have employed machine learning algorithms to predict user's performance. However, these rule-based approaches need prior knowledge and cannot generalize to an individual unless the developer designed the system with that type of individual in mind. This paper present a novel VR exposure therapy strategy where the stimulus sequence generated by the VR display is optimized by real-time measurement of the stress level during a session via reinforcement learning, a type of machine learning. Our goal is to demonstrate that: • Real-time physiological stress response measurements/classification can be performed during a VR therapy session to measure the treatment efficiency and the effect of a particular stimulus exposure objectively. • Exposure therapy treatments can be improved by real-time stress measurements/classification followed by the optimization of the treatment exposure sequences using a reinforced learning approach. To reach our research objectives, the following system is under development: 1. Develop a Unity 3D VR environment that can synchronize vital sign measurements with the virtual world's activities. The sensory inputs include eye-tracking, ECG, pulse, blood pressure, temperature, activity level, breathing rate, and volume. 2. Develop a machine learning algorithm that can objectively classify stress levels based on the sensory inputs as trained by various stimulus levels generated by the VR environment (visual and sound). 3. Based on the real-time recognition of stress levels, automatically optimize the effect of the exposure therapy using a reinforced learning approach

to determine the best sequence of stimulus. 4. Test the concept with patients suffering from various levels of arachnophobia. Conclusion: So far, we have developed various machine learning algorithms capable of recognizing stress levels using public domain databases. The physiological measurements were skin resistance, pulse, respiration, and temperature of 15 patients exposed to various levels of stressful stimulus followed by clam periods. Our current results show that despite the small sample size, one can recognize a patient's stress levels at a 76% error rate using a random forest algorithm. We have also developed a reinforcement learning optimization simulator to determine the best exposure sequence to minimize stress for an arachnophobia treatment application. The success of these early results shows that our new approach is viable and may work in real-clinical applications. Many more experiments need to be done to demonstrate that such an approach can improve clinical outcomes. The presentation will discuss this system's various theoretical and technical aspects, followed by the most recent experimental results.

Effectiveness of a stand-alone, smartphone-based virtual reality exposure app to reduce fear of heights in real-life: a randomized controlled trial

Dorothee Bentz, Nan Wang, Merle K. Ibach, Nathalie S. Schicktanz, Anja Zimmer, Andreas Papassotiropoulos and Dominique de Quervain (University of Basel)

Smartphone-based virtual reality (VR) applications (apps) might help to counter low utilization rates of available treatments for fear of heights. Demonstration of effectiveness in real-life situations of such apps is crucial, but lacking so far. Objective of this study was to develop a stand-alone, smartphone-based VR exposure app and to test its effectiveness in a real-life situation. We performed a single-blind, parallel-group, randomized controlled trial. We recruited 70 participants with subclinical and clinical (DSM-V) fear of heights, aged 18-60 years. Primary outcome was performance in a real-life Behavioral Avoidance Test (BAT) on a lookout tower after a single 1-h app use (phase 1) and after additional repeated (6x30min) app use at home (phase 2). Secondary outcomes focused on self-reported fear of heights. We demonstrated that repeated use of our smartphone-based VR exposure app resulted in a profound reduction in avoidance behavior and subjective fear in the BAT. The effect size of our seven exposure sessions between 30min and 1h is comparable to the current gold standard in vivo exposure treatment.1 Our study is the first using a stand-alone VR treatment assessing avoidance behavior and subjective fear in a real-life situation. Our approach is solely based on exposure without cognitive elements. Our study includes both subclinical and clinical individuals. We conclude from this that stand-alone, smartphone-based VR exposure apps represent a low-threshold, low-cost treatment option for sufferers from subclinical and clinical specific fears that can be used as a self-help tool or as an adjunct to clinician-guided standard exposure therapy.

Training mentalization in virtual reality: an experimental treatment for children

Ilaria Maria Antonietta Benzi**, Francesca Locati*, Pietro Cipresso*** and Laura Parolin* (*Universita' degli Studi di Milano-Bicocca, **Istituto Auxologico Italiano – Milano, ***Università degli Studi di Torino)

Mentalization is the ability to understand behaviors as underlying mental states such as thoughts, emotions, and motivations. Mentalization development is considered complete between 8 to 12 years old. The possibility to work on this competence may have a substantial role in preventing or intervening in child psychopathology. Mentalization Skills (MS) are activated in a relational context. This contribution's main objective is to suggest developing a Virtual Reality (VR) tool to assess socio-emotional abilities in children and train mentalization skills (MS) in an immersive environment. Participants will be assessed with the Roberts-2 test using a VR app to assess MS using a head-tracked Head Mounted Display (HMD). Looking at images depicting relational scenarios, the subject must tell a coherent story trying to evaluate characters' thoughts, emotions, and motivations. The HMD device will assess the participants' ability to make inferential thoughts about others' states of mind, and a validated device will record Heart Rate Variability as a measure of emotion regulation. The comparison between the information assessed by the Roberts-2 and the physiological activation of the child will allow selecting five significant cards to be used for a follow-up training of the child's MS. This new protocol thoroughly evaluates MS in an ecological environment via an agile technology-based approach, offering clinicians valuable insights into the children's skills/deficiencies, useful for prevention and clinical intervention.

360° immersive photos and videos, an ecological approach to memory assessment

Francesca Bruni (IRCCS Istituto Auxologico Italiano)

An innovative trend in Virtual reality (VR) technology are the 360° spherical photos and videos; they emerged as promising instruments to provide life-like experiences in a controlled and safe way that might enhance the link to test score and real-life functioning compared to standard paper-and-pencil tests, keeping high levels of graphical realism and immersivity. Examining the evidence of a previous pilot study, we implemented a tool focusing on free recall and recognition as indexes of memory function. The protocol will be presented to confront and correlate the performances obtained by the participants in a standard paper and pencil condition and in the 360° test.

THEMATIC SESSION: REPLICATING CLASSICAL METHODS IN VR

RorschachVR: Leveraging Intentional Ambiguity and Live Motion Capture in a Turn-Key Teletherapy Tool Prototype

Ari Hollander (SAIC)

For more than 20 years, virtual reality has been used as a tool for treating phobias and post-traumatic stress. Although this approach has clear advantages, even with modern VR development tools it remains costly and challenging to create compelling, realistic simulations that are evocative of traumatic events relevant to individual patients. This is especially true of scenarios that depend heavily on human interactions, as humans are notoriously difficult to simulate. Fortunately, realism is not necessarily required nor even optimal for Cybertherapy. This prototype tool uses perceptual ambiguity to create the space for the patients to fill from their own memories. The therapist sketches out a rough environment using simplified Minecraft-like worldbuilding tools. In this context they then realistically animate a suggestive human figure in arbitrary live role-play scenarios by simply moving their body in front of a relatively inexpensive depth camera. As no therapy can be successful without the participation of the patient, this system is also designed to be deployed in zero-contact mode over the Internet with the patient using inexpensive VR hardware in one location and the therapist with a non-VR workstation in another. In this talk, the author describes the characteristics of the system in detail, performs a live demonstration, and invites collaboration on future development and research.

Exploratory Factor Analysis of the Virtual Reality Stroop Task

Justin Asbee and Thomas Parsons (University of North Texas)

Introduction: Executive functioning (EF) involves various controlled processing abilities, such as cognitive workload, attention, planning, goal orientation, and inhibition1. The Virtual Reality Stroop Task (VRST) is a test of EF that uses a virtual reality driving simulation to present Stroop stimuli onto the windshield as the participant travels through low and high stress environments. The dual process theory has been used to explain results from the VRST2. According to dual process theory automatic processing (e.g., word reading) is understood to be related to overlearned behaviors that require little effort or direct control from the participant, while controlled processing (e.g., color-word interference) involves inhibition of prepotent (overlearned) responses. Additionally, the VRST may tap into affective responses4. The aim of the current study is to examine the underlying neuropsychological constructs being measured by the VRST.
Methods: In the current study 85 participants from a university in the southern United States (58% female; M age = 19.82, SD = 2.10) completed the Virtual Reality Stroop Task (VRST). To examine the underlying constructs of the VRST an exploratory factor analysis was performed. Both principal components analysis (PCA) and principal axis factoring (PAF) were conducted. Further, both oblique, direct oblimin with delta set to zero, and orthogonal, varimax, rotation methods were implemented.

Results: Both the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO; 0.78) and Bartlett's test of sphericity, $\chi 2(120) = 1003.32$, $p < .001$, indicate that underlying factors likely exist for the VRST. There were 4 factors with eigenvalues greater than one for the VRST, which accounted for 78.46% of the total variance, however based on scree plots, parallel analysis, and the minimum average partial test 3 factors were retained. The VRST retained constructs found in traditional Stroop tests: automatic processing factor (color naming and word reading) and cognitive processing factor (simple interference and complex interference). Moreover, the results suggest that the VRST also discriminates between participants' response accuracy (to Stroop stimuli) relative to low and high stress environmental stimuli.
Conclusion: The VRST likely measures multiple cognitive and affective constructs. In addition to measuring automatic and controlled cognitive constructs found in traditional Stroop tasks, the VRST may be an accurate measure of the affective impact of environmental stressors on a participant's automatic and controlled processing. Additional research in a larger sample may enhance the stability of factor structures. In sum, the current study examined the constructs underlying the VRST and sheds light on the neurocognitive affective processes involved.

Conformity in times of COVID-19: Virtual Adaptation of Asch's Classic Psychology Experiment

Leonor Novo, Ágata Salvador, Pedro Gamito, Micaela Fonseca and Jorge Oliveira (Lusófona University)

Using a replication of the classical Asch's line-judgment conformity experiment to a virtual environment, this study aims to investigate if the social context of Covid-19 pandemic increases individuals conformity behavior, and if it is influenced by the fear of Covid-19. Ninety Portuguese undergraduate students were randomly assigned to one of three experimental conditions: no-threat, Covid-19 threat, and control. Conformity was measured recording the participant's responses to the experiment, and fear of Covid-19 was measured using the Fear of Covid-19 Scale. Results show that for the participants that most fear Covid-19, the threat posed by the coronavirus intensified their conformity behavior, compared to the other conditions. Overall, this virtual implementation of Asch's experiment showed to be an effective method to study individuals' behavior, contributing to the replication of classical experiments.
1. Introduction: Individuals often follow the majority, motivated by the desire to obtain social approval, to be accurate or to keep a positive self-concept. A stronger tendency to conform is verified in situations of uncertainty, like when mortality or a threatening infectious disease is salient. Accordingly, during the Covid-19 pandemic, the consumption behavior is more conformist, since individuals buy products that most consider protective, even in the absence of evidence. Using an adaptation of the classical Asch's line-judgment conformity experiment to a virtual environment, this study aims to test the effect of Covid-19 threat on conformity behavior, exploring the moderating role of the fear of Covid-19.
2. Method: Participants were 90 Portuguese undergraduate students (79 women), aged between 18 and 51 years ($M = 21.23$, $SD = 5.80$). Individuals participated in the virtual

experiment during the Covid-19 lockdown and informed consent was obtained. An adaptation of the classical Asch's experiment was configured to a virtual environment. Participants were randomly assigned to one of three experimental conditions: no-threat (Asch's classical condition; n=36), Covid-19 threat (n=30), and control (n=24). In the no-threat condition, participants were in a virtual room with six alleged participants (avatars) that give incorrect answers to a line-judgment task. In the Covid-19 threat condition, the scenario and task were the same, but the fear of contagion to Covid-19 was manipulated (avatars were using masks and study was presented as perception of social distance between people during the pandemic). In the control condition, participants were alone in the virtual room. Conformity is measured recording the participant's responses (number of errors) in the critical trials (wrong answers from the avatars). Fear of Covid-19 was measured using the Portuguese version of Fear of Covid-19 Scale.
3. Results: Prior analysis show that fear of covid-19 was not statistically different across conditions ($F(2,87)=0.319$, $p=.727$), and correlational analysis indicate that conformity behavior and fear of Covid-19 was only correlated for those in the condition of Covid-19 threat condition ($r=.59$, $p=.001$). There were no differences in the conformity behavior between the experimental conditions replicating the classical experiment (no-threat vs. control). However, in line with our hypothesis, results from moderation analyses showed that participants in the Covid-19 threat condition, in relation to the other two conditions, presented greater conformity behavior, but only for those who presented a greater fear of Covid-19 ($B=0.490$, $SE=0.142$, $t=3.459$, $p=.001$).
4. Conclusion: This study corroborates conformity research, suggesting that for individuals who fear Covid-19, the disease threat intensifies their conformity behavior. Moreover, although the original Asch's findings were not replicated, this adaptation showed to be a reliable methodology to capture individuals' behavior. As such, we expect to contribute to the discussion about the potentiality of using virtual settings to replicate psychological experiments.

Implicit Measures of Perceived Realness in Virtual Reality

Marius Rubo (Fribourg University)

Virtual Reality (VR) provides an interesting form of stimulus presentation due to its capability to elicit lifelike experiences. People often feel present (i.e. as if they were there) in a virtual scenario, but they can additionally obtain a sense of owning a virtual body and experience virtual conspecifics as socially present. These experiences can be assessed explicitly using questionnaires, but several studies have also employed behavioral and physiological measures to trace when people experience a virtual situation as real. This article gives a brief introduction to how implicit measures were used to explore these distinct but related facets of perceived realness in VR and how they may be exploited to better understand mental health conditions.

18.30-20 PARALLEL SESSIONS

"SYMPOSIUM: 3MDR: INTERNATIONAL EFFORTS TO VALIDATE THE EFFICACY OF NOVEL "WALK AND TALK THERAPY" FOR PTSD IN AN IMMERSIVE VIRTUAL REALITY ENVIRONMENT"

Clinical Trial of 3MDR to Treat PTSD after Mild TBI, with and without Eye Movement

Michael Roy*, Paula Bellini*, Hannah O'Malley*, Sarah Kruger**, Kerri Dunbar* and O'Min Kwon** (*Uniformed Services University, **Walter Reed National Military Medical Center)

PTSD is estimated to occur in 10-20% of US military service members (SMs) who deployed to Iraq or Afghanistan in the past 2 decades. Combat-related PTSD is challenging to treat, with even the most proven therapies achieving at best modest reductions in symptoms. Mild TBI is equally common and frequently comorbid in this population, and has no proven treatment. This presentation will describe the results of a pilot randomized controlled trial of 20 (50% female) SMs with PTSD and mTBI treated at Walter Reed National Military Medical Center, using a novel approach, Motion-assisted, Multi-modular Memory Desensitization and Reconsolidation (3MDR). Participants choose music and pictures that are integrated into a sophisticated immersive virtual reality "cave", the Computer Assisted Rehabilitation Environment (CAREN). The pictures are chosen to facilitate discussion of the traumatic experience, with the participant literally confronting their traumatic memories by walking on a treadmill toward the pictures that have been integrated into the virtual environment, as a therapist standing next to the treadmill asks them about the pictures. The PTSD Checklist for DSM5 (PCL5) is used to confirm eligibility (PCL5 > 34) and is the primary outcome measure. The target of 20 participants have been recruited; 12 have completed participation as of early April, 2020, and all should be complete by the time of the meeting. For the first 12 completers, a clinically and statistically significant improvement in symptom severity has been observed, with a decline in mean PCL5 score from 52.6 at baseline to 33.0 post-intervention ($p<0.01$).
Introduction: Posttraumatic stress disorder (PTSD) and mild traumatic brain injury (mTBI) are persistent, frequently comorbid complications of recent wars. There is no proven treatment for mTBI, while current PTSD therapies are frequently unpalatable and often achieve only transient, modest impact. Motion-assisted, Multi-modular Memory Desensitization and Reconsolidation (3MDR) is a novel PTSD therapy that combines multiple modalities, including ambulation on a treadmill while engaging in cognitive therapy ("walk and talk" therapy), and immersive virtual reality in the Computer Assisted Rehabilitation Environment (CAREN). Another element, eye movement (EM), is a controversial component of EMDR.
Objective: This pilot study seeks to: 1) obtain an initial estimate of the efficacy of 3MDR in male and female service members with comorbid PTSD and mTBI, and 2) determine the impact of EM on treatment response. The study hypothesis is that 3MDR will significantly improve symptom severity, as measured by the PTSD Checklist for DSM5 (PCL5), both with

(EM+) and without EM (EM-).
Methods: Participants (n=20; 10 men, 10 women, deliberately recruiting equal numbers) at Walter Reed National Military Medical Center, Bethesda, MD, must have an initial PCL5 score of > 34, and a lifetime history of mTBI documented by the Ohio State University TBI identification method. All participants receive 10 sessions (3 preparatory, 6 3MDR treatment, and 1 conclusion), with randomization to EM+ or EM-. During preparatory sessions, the therapist helps the participant to select songs that will start and end each treatment session, the first one chosen in order to mentally take them back to the time of the trauma and played in full at the start of each session, while the second is a song the participant is currently fond of, played at the end of each session to help bring them back to present day. Participants also choose 14 pictures that are representative of their trauma and rate them from least to most impactful. Throughout each 60-90 minute treatment session, participants walk at a comfortable pace of their own choosing on the CAREN's embedded treadmill, initially listening to their first song, then going through 2 virtual hallways and approaching a picture at the end of the second hallway until the picture looms before them, filling their field of vision. The therapist stands next to the treadmill, asking questions about the picture (e.g., "why did you choose this picture?", "what is going on here?", how is it making you feel to look at this now?"…) while the engineer superimposes key responses which the participant ultimately reads aloud after 5-15 minutes of Q&A. Then, for ~60 seconds, EM+ participants see a red ball "bounce" back and forth across the picture, and recite 2-digit numbers that appear in white on the ball as it touches the screen's edge. Procedures are repeated for 5-7 pictures each session. The primary outcome measure is the change in the PCL5 score from pre- to post-intervention, with additional follow up assessments conducted at 3 and 6 months.
Results: The target number of 10 men and 10 women (mean age 45; 13 White, 5 Black, 2 Latinx; 13 Army, 4 Navy, 2 Air Force, 1 Marine Corps, 1 Army National Guard) have been enrolled and randomized. We report interim results after the first 12 have completed the intervention. Most had multiple traumas, with combat and sexual traumas most common; anger, regret, frustration and fear have been among the most common themes addressed. The mean PCL5 score dropped from 52.6 at baseline to 33.0 post-intervention ($p<0.01$), with this improvement sustained at 3 and 6-month follow-ups. Nine of twelve have had clinically significant improvement (PCL5 score declined by more than 10 points), including six who had resolution of their PTSD. Both EM+ and EM- groups have shown similar, statistically significant improvement ($p<0.05$).
Conclusions: The 3MDR approach has great promise for improving the treatment of PTSD, including in those with comorbid mTBI. The study should be fully complete by the time of the meeting and full results will be presented.
Novelty/Discussion: The 3MDR approach has multiple unique aspects which may contribute to its success. First, it combines multiple components, including physical exercise which may have benefits of both increasing blood flow to the brain as well as distraction from anxiety-provoking memories. Second, it has high technology elements, most notably virtual reality, which may be especially attractive to younger military service members. Finally, it asks participants to choose music and pictures that are integrated into virtual reality, which gives participants greater investment in their treatment, and likely enhances compliance.

Tackling trauma with technology: Treating chronic combat-related PTSD in Canadian Armed Forces personnel and veterans with 3MDR

Suzette Bremault-Phillips, Chelsea Jones, Antonio Miguel-Cruz, Liana Lentz and Lorraine Smith-MacDonald (University of Alberta)

Posttraumatic stress disorder (PTSD) and moral injury (MI) have been receiving significant attention for their roles in ongoing psychological distress within military members (MM) and veterans. PTSD is characterized by exposure to a traumatic event(s) and symptoms including negative cognitive intrusions, avoidance, hypervigilance, and alterations in mood, arousal, and reactivity. MI is characterized as the violation of deeply held moral values or beliefs resulting in significant emotional and interpersonal distress. Multi-modular Motion-assisted Memory Desensitization and Reconsolidation (3MDR) therapy is an emerging intervention for treatment-resistant combat-related PTSD (crPTSD)and MI. Delivered in a virtual reality (VR) Computer-Assisted Rehabilitation Environment (CAREN), 3MDR provides an immersive environment where exposure therapy, eye movement desensitization therapy, VR imagery, and treadmill walking are combined under the guidance of a trained therapist. Assessing the acceptability and usability of this technologically-based treatment amongst MM and veterans is important in determining the potential for future clinical utilization in these populations.

Objective: This study aims to investigate: (1) the impact of 3MDR on PTSD and MI symptoms in Canadian Armed Forces MMs and veterans with treatment-resistant crPTSD; (2) technology acceptance and usability of the 3MDR technology amongst MMs, veterans, 3MDR therapists, and CAREN operators; and (3) the longitudinal effect of 3MDR on participants' mental health and psychosocial function at 1, 3, 6, and 12 months postintervention.

Methods: This mixed-methods randomized control-waitlist trial employs a cross-over design. An experimental group (N=20) of MMs and veterans with chronic crPTSD will receive 6 sessions of 3MDR; a waitlist control group (N=20) will receive usual treatment,followed by 6 sessions of 3MDR. Quantitative data, including technology acceptance and usability questionnaires, based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model, and health-based and psychological outcome measures will be collected pre/post-intervention, and at 1, 3, 6 and 12 month follow up. Data will be analyzed using repeated measures and linear regression modelling. Additionally, blood and saliva will be collected to measure biomarkers related to PTSD and resilience. Qualitative data of participants' experiences of 3MDR will be collected through semistructured interviews and thematically analyzed. Amongst the 3MDR therapists (n=9) and operators (n=4), the UTAUT model will guide pre/post-intervention questionnaires and semi-structured interviews to measure perceived acceptance and usability of 3MDR with the CAREN.

Results: Preliminary results (n=11) utilizing the Clinically Administered PTSD Scale(CAPS5) demonstrated clinically and statistically significant reductions in both the severity of PTSD symptoms (Z=-2.67, p=0.01) and number of PTSD symptoms (Z=-2.32, p=0.02) post-3MDR intervention where 27% of participants no longer met the criteria for a

diagnosis of PTSD; findings were maintained at 3 month follow-up. Significant improvements in emotional regulation (Z= -2.20, p=0.03) and MI symptomatology (Z=-2.10, p=0.04) were also observed. Qualitative data indicated notable improvement in perceived health, wellbeing, social interactions, and overall functioning post-3MDR. Technology acceptance and usability was rated as "excellent" by the MMs, veterans, therapists (n=5), and operators (n=2). Based on a partial least square path model, performance and effort expectancy were the most prevalent indicators of participants' intention to use 3MDR, where social influence was the least prevalent indicator.
Conclusion: Preliminary results are promising and highlight the potential for 3MDR to be an effective intervention for treatment-resistant crPTSD and MI in MMs and veterans.Variation in biomarkers associated with PTSD, and long-term outcomes, will be assessed in 2021. If proven to be effective and worthy of widespread use, research into the portability, utilization and accessibility of the technology would be beneficial.

Efficacy of Interactive Motion-Assisted Exposure Therapy for Veterans with Treatment-Resistant PTSD: A Randomized Controlled Trial

Eric Vermetten*, Mirjam Mink** and Nancy van Veelen* (*LUMC, **ARQ)

Objective: Veterans with posttraumatic stress disorder (PTSD) tend to benefit less from evidence-based treatments than other PTSD populations. Low engagement and high avoidance during treatment might hinder positive treatment outcomes. A novel virtual reality and motion-assisted exposure based intervention, called 3MDR, aims to overcome these issues by providing therapy in an immersive, personalized and activating context. We will report on the results of the first randomized controlled trial of 3MDR for veterans with treatment-resistant PTSD.
Methods: In this trial, 43 veterans with treatment-resistant PTSD were randomized to receive either 6 sessions of 3MDR followed by 10 weeks treatment as usual, or 16 weeks non-trauma-focused treatment. The primary outcome was PTSD symptom severity (CAPS-5) from baseline to 10 weeks post-treatment. Secondary outcomes included quality of life and daily life avoidance. Differences between groups were tested with an intent-to-treat analysis of covariance, including baseline scores as covariate. Clinically relevant improvement or deterioration was assessed with the reliable change index.
Results: The mean change in PTSD symptoms severity score from baseline to 10 weeks post-treatment differed significantly between groups, with a large effect size ($F = 6.43$, d.f.= 37, $p = .016$, Cohen's $d = 0.83$). On average, participants in the 3MDR group scored 6.60 points lower on the CAPS-5 as compared to the control group. Clinically relevant improvement was found in 45% of the veterans receiving 3MDR (n=9). None of the secondary outcomes differed significantly between groups from baseline to 10 weeks post-treatment. Drop-out was low (7%) and no adverse events were reported, indicating that acceptability of the treatment and engagement in treatment were high.
Conclusions: The integrated approach in 3MDR, of motion, immersion and exposure therapy with an EMDR-based dual-attention task, has demonstrated to be able to effectively decrease PTSD symptoms in a sample of veterans that failed to respond to, on average, 4 prior

treatments. Almost half of the veterans showed clinically relevant improvements in PTSD symptom severity and drop-out was low. As such, this approach to psychotherapy has the potential to substantially improve treatment for veterans with PTSD. The improvements in PTSD symptoms did not directly translate into improved quality of life or daily life avoidance. Low sensitivity of the applied instruments for this population may have contributed to this and warrants more refined study into the effects of 3MDR. In addition to these data we will discuss novel developments and updates to the hardware for delivering the therapy.

Synergistic Sleep and 3MDR Immersion Therapy Program for Treatment of Post Traumatic Stress

Pinata Sessoms, Erin Miggantz, Paula Poh, Amanda Markham and Rachel Markwald (Naval Health Research Center)

Approximately 11–20% of U.S. military service members (SMs) who supported Operations Iraqi Freedom and Enduring Freedom suffer from symptoms of posttraumatic stress disorder (PTSD). As a result, the U.S. Department of Defense has encouraged the delivery of evidence-based therapies (EBTs) throughout the military healthcare system that specifically target PTSD. However, over 66% of SMs who complete these treatments continue to experience symptoms that significantly impact their daily functioning and quality of life. Consequently, more innovative and effective treatments are needed. Among the 11-20% of SMs experiencing PTSD symptoms, 70% also report having substantial sleep disturbances. Research examining co-morbid PTSD and insomnia has shown that augmenting PTSD treatment with evidence-based sleep interventions decreases PTSD symptom severity via sleep improvements. These findings suggest that PTSD treatment may be more effective when delivered concurrently with insomnia treatment. Considering that new PTSD treatments are needed, and that augmenting them with insomnia interventions improves outcomes, the current study is examining not only a novel PTSD therapy, but also its effects when delivered in tandem with insomnia treatment. This novel PTSD therapy is called Motion-Assisted Multi-Modal Memory Desensitization and Reconsolidation (3MDR), and the Computer Assisted Rehabilitation Environment (CAREN; a large, immersive virtual reality environment), is utilized to deliver the treatment. 3MDR enhances visual and auditory immersion by incorporating patient-chosen pictures and music into the therapy. Additionally, 3MDR helps patients to access emotional/cognitive trauma networks with the use of physical activity via walking on a treadmill. This full sensory immersion is intended to decrease cognitive avoidance, which often impedes progress during treatment with other EBTs for PTSD. This study (which is currently underway), is examining the feasibility and effectiveness of conducting 3MDR alone, CBT-I alone, and 3MDR delivered in tandem with CBT-I among active duty SMs, veterans, and dependents with PTSD and self-reported sleep disturbances. A total of 25 patients from Naval Medical Center San Diego are intended to participate. Participants will be assigned to one of three conditions based on their treatment history and current symptoms: 3MDR only, CBT-I only, or 3MDR+CBT-I in tandem. It is projected that the combined 3MDR+CBT-I condition will be associated with more significant decreases in PTSD and insomnia symptoms when compared to the 3MDR only and CBT-I

only conditions. Additionally, participants receiving 3MDR only and 3MDR+CBT-I are expected to show clinically significant decreases in PTSD symptoms as measured by the Clinician-Administered PTSD Scale for DSM-5. Results of this study will lend support for the feasibility and efficacy of providing CBT-I and 3MDR in tandem, as well as evidence of the efficacy of 3MDR alone in improving PTSD symptoms.

THEMATIC SESSION: CLINICAL USE OF VR-3

An investigation into the impact of virtual reality character presentation on participant's depression stigma

David Redmond*, Brendan Rooney*, Eilis Hennessy*, Clíodhna O'Connor*, Katalin Bálint** and Thomas Parsons*** (*University College Dublin, **Vrije Universiteit Amsterdam, ***University of North Texas)

There is a large body of research aimed at establishing who stigmatises mental illnesses, why they do so and the factors which mediate these thoughts and behaviours. Depression stigma in particular has been widely studied using written vignettes to depict a character with depression. However, despite vignettes providing an easily manipulatable experimental tool with which to measure people's reactions to a diagnosed character, their inability to depict a character's expressions and actions have led to concerns about their ecological validity. This study attempted to increase the ecological validity of traditional vignette studies by presenting a visual representation of the character through VR and then measuring the participant's stigma towards depression. Participants were presented with a written vignette (control and depression) and then interacted with a virtual reality (VR) character whose interactivity (eye contact behaviours) was manipulated. No significant effect of vignette type or eye contact behaviour (no eye contact versus eye contact offered) on participant's personal nor perceived stigma was found in this study. In conclusion, this study sought to improve methods used in the area of depression stigma, future research should focus on analysing whether different types of character interaction affect stigma and take a more character centred approach towards measuring stigma to capture the effect of the interaction with the character on a participant's stigma towards them directly.

Cyberintervention on plant workforce's mental activity for safety

Elena Sajno*, Michele Maisetti**, Roberto Luongo** and Pietro Cipresso*** (*Istituto Auxologico Italiano, **Mensior srl, ***Università degli Studi di Torino)

This work presents the development of an innovative intervention against stress using an AI approach for the detection of unhealthy stress status and a VR heart rate variability biofeedback to treat it. To train the AI we collected ECG data of plant workers during a standard work day, labeling the different moments in clusters of homogeneous behaviours.

Systematic review of biofeedback interventions using immersive natural environment Virtual Reality

Elena Sajno*, Federico Dagostin** and Pietro Cipresso*** (*Istituto Auxologico Italiano, **Università degli Studi di Pavia, ***Università degli Studi di Torino)

This work presents a systematic review of psychological interventions in which biofeedback is enhanced by immersive Virtual Reality scenarios. Our focus is to describe the studies in which the design of the virtual environment has embedded the physiological feedback to the user and natural environments are used.

Control the heart, control the mind: biofeedback training in virtual reality improves memory and attention

Lukas Bögge, Itsaso Colás and Pascale Piolino (Memory, Brain & Cognition Laboratory)

Biofeedback training, an intervention focusing on the voluntary self-regulation of physiological parameters, has recently been emphasized to improve cognitive functions. However, cognitive effects underlying biofeedback based on the control of one's heart rate variability (HRV) are still largely unclear. In particular, its influence on long-term memory has never been studied in adults. Moreover, virtual reality (VR) techniques have been rarely exploited to enhance training efficacy. The objective of this study was to determine whether HRV biofeedback training in a VR environment can persistently improve cognitive functions including episodic memory and the self-referential encoding effect. In addition, the link between training success –indexed by increased HRV during training– and cognitive improvements was investigated. We developed a novel cognitive training program coupling immersive VR with HRV and respiratory feedback. Twenty-two young, healthy adults were randomly divided into a biofeedback and a control group each attending six sessions of training. Cognitive evaluations were performed one week before and after the training. Compared to the control group, the biofeedback intervention had a significant beneficial effect on various measures of HRV, attentional capabilities as well as episodic and short-term memory. Further, episodic memory outcomes indicated that biofeedback training reinforced self-reference encoding processing of positive stimuli. Remarkably, cognitive processes affected by biofeedback training correlated moderately with spectral changes in HRV. Neuroscientific and behavioral implications are discussed, as they could have a meaningful impact on our daily functioning and wellbeing.

Effectiveness of a stand-alone, smartphone-based virtual reality exposure app to reduce fear of spiders in real-life: a randomized controlled trial

Zimmer Anja and Dominique de Quervain (University of Basel)

Smartphone-based gamified augmented reality (AR) applications (apps) might provide a practical tool for treatments or self-help for fear of spiders. Demonstration of effectiveness in real-life situations of such apps is lacking so far. We performed a single-blind, parallel-group,

randomized controlled trial to investigate real-life effectiveness of a stand-alone, smartphone-based gamified AR exposure app – Phobys – to treat fear of spiders in a hometraining, comparing it with a control condition. We recruited 66 participants with subclinical and clinical (DSMV) fear of spiders, aged 18-40 years. Primary outcome was a Subjective Units of Distress Scale (SUDS) of fear in a Behavioral Approach Test (BAT) in real-life (in vivo) at 6 weeks follow-up. The intention to treat (ITT) analysis showed that the repeated administration of Phobys lead to significantly lower subjective fear in the BAT compared to the control condition (Phobys, baseline: 7.12 [SD 2.03] followup: 5.03 [SD 2.19] vs. control condition, baseline: 7.06 [SD 2.34], follow-up 6.24 [SD 2.21]; adjusted group difference -1.24, 95% CI -2.17 to -0.31; Cohen's d= 0.6, p= 0.0101). Further, the approached distance in the real-life BAT was significantly longer in the Phobys condition (Phobys, baseline: 5.27 [SD 2.32] follow-up: 6.76 [SD 2.4] vs. control condition, baseline: 4.97 [SD 2.52], follow-up: 5.42 [SD 2.69]; adjusted group difference 1.05, 95% CI 0.46 to 1.64; Cohen's d = 0.4, p= 0.0007). We conclude that the use of Phobys reduces subjective fear and avoidance behaviour in a real-life spider situation, providing a low-threshold treatment for clinical and subclinical fear of spiders.

THEMATIC SESSION: NEW PERSPECTIVES FOR DESIGNING VIRTUAL ENVIRONMENTS

The immersive 3D objects' library for appliyng non-invasive brain stimulation in research on the motor control & the mirror neurons system: a call for collaboration

Andrey Vlasov*, Fanir Kilmukhametov** and Matteo Feurra* (*HSE University, **DeMontroyal, Ltd.)

We have developed and tested a library of 3D objects for the study of motor control in immersive reality (https://p3d.in/u/andreyhse/73mZx). The use of this stimulus (e.g., as on the Figure 4a) material opens up new opportunities for evaluating physiological parameters when using the method of neurotherapy in virtual reality. In combination with the Non-Invasive Brain Stimulation (NIBS) methods such as Transcranial Magnetic Stimulation (TMS), we propose to explore the effects of functional activity of the mirror neuron system on a large scale for further approbation of advanced & promising neurorehabilitation protocols.

Normative Affordances: Utilising the constraint of context-specific expectation in simulated environments

John Francis Leader (University College Dublin)

Affordances are the interactional opportunities that exist between us and our environment. The design processes of simulations (using technologies such as virtual reality and mixed reality) can benefit from considering three distinct forms of affordances. Possible affordances,

are interactional opportunities that exist but are not perceived. Perceived affordances appear to offer interaction possibilities but in fact do not. Normative affordances are those actions that are consistent with the socially-constrained behavioural expectations of a given setting. By considering these three types of affordances and, in particular, utilising normative affordances in the creation of affordance arrays, it is argued that more compelling.

Influence of Photorealism and Non-Photorealism on Connection in Social VR

Nienke Bierhuizen*, Wendy Powell**, Tina Mioch***, Omar Niamut*** and Hans Stokking*** (*University of Twente, **Tilburg University, ***Netherlands Organisation for Applied Scientific Research)

Traveling for business meetings is not only costly but also has a negative influence on the environment. Many video conferencing platforms have tried to reduce the need to travel, but people still find it relevant to meet face-to-face. Remote meetings via virtual reality (VR) allow users to still have the feeling of being together in the same space. In VR, avatars are used as digital user representations. This study investigated whether photorealistic avatars influence the connection users feel with each other during a VR remote meeting, and whether congruence between environment and avatar realism influences this connection. A 2x2 within-subject experiment was conducted whereby twelve participants had remote meetings in VR with photorealistic and non-photorealistic avatars and environments. Results indicate that when both participants are represented by live video footage of themselves (photorealistic), they feel more connected with each other than when they are represented by a non-photorealistic avatar. Congruence between the avatar and environment did not seem to influence connection. These results may help to improve the value of future remote business meetings.

Memory Performance in a Fully Immersive Virtual Reality Environment.

Voinescu Alexandra*, David Daneil** (*Department of Psychology, University of Bath, Bath, United Kingdom, **Department of Clinical Psychology and Psychotherapy, Babeș-Bolyai University, Cluj-Napoca, Romania)

Background: Previous studies that focused on the dual-memory processes in cognitive aging showed a strong decline of recollection (explicit, conscious and intentional recollection) and, to a lesser extent, of automaticity (implicit memory, unconscious and unintentional memory process) in case of older participants Besides ageing, several variables such as presence, cognitive absorbtion and simulator sickness might impact performance obtained in virtual reality (VR). Objective: The current study investigated in a highly immersive virtual reality (VR) environment the dual memory processes among older and younger healthy adults. We expected reduced recollection for older adults compared to younger adults and similar performance between the two groups on automaticity. Second, we investigated if presence, simulator sickness and cognitive absorption correlate with recollection and automaticity.

Methods: Estimates of recollection and automaticity were computed using an adapted version of Process Dissociation Procedure. The basic virtual environment (VE) consisted of a virtual apartment which ran on a CAVE environment (EON Icube). The virtual apartment consisted of a bedroom, a bathroom and an open space living room with a kitchen. Forty objects were included (e.g. bed, chair, table, glasses, bookshelf, vase, and flower). The procedure had two phases: one in which participants navigated in the VE and had to learn as many objects as possible and one in which participants had to recollect the objects learned in VR using a stem competition task. Participants completed measures of presence, simulator sickness and cognitive absorption at the end of the VR task.

Results: Twelve older adults aged between 60 and 77 years (M = 66.00) and 26 young adults aged between 19 and 34 years (M = 24.15) participated. Our predictions were partially supported by the results. A Mann-Whitney U Test revealed significant differences on recollection estimates between healthy adults (Md = 0.17) and older adults (Md = 0.0), U = 63.00, z = -2.97, p = .003. For automaticity, results showed no significant differences between groups, Md = 0.23 vs. Md = 0.32, U = 105.500, z = -1.58, p = .11. Contrary to our predictions, there were no significant correlations between memory performance and presence, simulator sickness and cognitive absorption (all $p > .05$).

Conclusions: Results fit with previous studies and showed that in an immersive environment, older participants had poorer recollection compared to younger adults, probably because controlled memory process are affected by ageing. For automaticity, our results are in accordance with those reported in previous studies as they showed no differences in performance between healthy adults and older adults. Presence, simulator sickness and cognitive absorption were not associated with automaticity or recollection performance.

14 September 2021

11.30-13:00	SYMPOSIUM: TOWARDS A MULTISENSORY EXPERIENCE IN VR	THEMATIC SESSION: HUMAN-TECHNOLOGY INTERACTION- 2	THEMATIC SESSION: HUMAN-TECHNOLOGY INTERACTION- 1
13:00-14:00	LUNCH BREAK		
14:00-15:00	POSTER SESSION 1	POSTER SESSION 2	POSTER SESSION 3
15:00-15.30	BREAK		
15.30-17:00	SYMPOSIUM: ASSISTIVE TECHNOLOGIES AND REAL-WORLD EVIDENCE: FINDINGS FROM THE ITALIAN IRCCS AGING NETWORK	THEMATIC SESSION: MEDIA AND EDUCATION IN THE DIGITAL AGE	THEMATIC SESSION: INNOVATION IN GAMING RESEARCH
17:00-18.30	THEMATIC SESSION: ONLINE COMMUNICATION	SYMPOSIUM: TOWARDS A SCIENCE OF COMPLEX EXPERIENCES	THEMATIC SESSION: ONLINE INTERVENTIONS

14 September

11.30-13.00 PARALLEL SESSIONS

"SYMPOSIUM: TOWARDS A MULTISENSORY EXPERIENCE IN VR"

Interoceptive stimulation technology reduces chronic pain in musculoskeletal, primary, and neuropathic conditions: a parallel randomized clinical trial

Daniele Di Lernia and Giuseppe Riva (Università Cattolica del Sacro Cuore)

Chronic pain (CP) severely disrupts the daily life of millions. Interoception (i.e., the sensing of the physiological condition of the body) plays a pivotal role in the etiology and maintenance of CP. Given that pain is inherently an interoceptive signal, interoceptive frameworks provide important, but currently underutilized, approaches to this condition. In this study we first developed a novel interoceptive technology, then we tested its effects and demonstrate its capacity to reduce pain severity in CP, thus potentially providing effective complementary analgesic treatments. We tested our promising new interoceptive technology for CP, in a single-blind between-subjects (N=51) randomized parallel design with primary, secondary musculoskeletal, and neuropathic CP patients. The technology specifically activates the C-Tactile system, using controlled stimulation of interoceptive unmyelinated afferents, at 3cm/s with a force of 2.5mN. This treatment led to significant pain reduction (mean 23%) in the CP treatment group, while CP controls who received comparable but non-interoceptive stimulation reported no change in pain intensity. Together, these results highlight the importance of interoceptive approaches to CP and demonstrate the potential of this novel stimulation technology to reduce chronic pain severity. Moreover, this brand new technology can seamlessly be integrated with existing solutions such as Virtual Reality, providing multisensory advanced treatment protocols to reduce chronic pain and address the current opioid epidemic.

Visual size matters for touch. The embodiment of fake bodies with different sizes affects the perception of tactile distances

Giorgia Tosi**, Angelo Maravita* and Daniele Romano* (*Universita' degli Studi di Milano-Bicocca, **University of Salento, Lecce)

To move and interact with objects around us, we must ground our body's perception, size, and shape in mental representations. During our life, body representations can change accordingly with experiences and can be temporarily manipulated by sensory input. In the Full-Body Illusion (FBI), participants see a virtual (or filmed) body that receives a tactile stimulation while they get a similar touch on their body. Previous studies (Banakou, Grotenac, & Slater, 2013; van der Hoort, Guterstam, & Ehrsson, 2011) suggested that the FBI can induce a

subjective experience of embodiment toward avatars of different body sizes. We wondered whether the FBI might impact the morphological representation of the body in its metric representation. In two experiments, we evaluated the replicability of the FBI for bodies of different sizes and their impact on body metric estimation.

In the first experiment, 20 healthy volunteers underwent two identical sessions of bodily illusion. In each one, participants saw through a set of Head-Mounted Displays pre-recorded videos of three artificial bodies recorded from a first-person perspective with a 360° camera that facilitated the immersion in the visual experience. The mannequins had three different sizes: a standard size (1m length legs), a small body (½ of standard length), a big body (twice the standard legs). The fake bodies were shown during two different conditions: from an anatomical viewpoint (experimental conditions), or misaligned to the participant body with a 45° clock-wise angle (control condition). We measured the Skin Conductance Response (SCR) to collect a physiological index of embodiment (van der Hoort et al., 2011), and we administered a questionnaire to obtain a measure of the subjective experience of the illusion. We found the main effect of Session in the SCR, with decreasing values in the second one suggesting that participants familiarised themselves with the procedure and responded less prominently. Regarding the subjective experience of embodiment, the main effect of Orientation confirmed a stronger embodiment in the anatomical condition than the misaligned one. Moreover, we found a significant effect of Size, obtaining comparable embodiment scores with the big and the standard legs, which were both more embodied than the small ones. In the second experiment, we demonstrated that the same illusion is so pervasive as to affect the perception of body metric, assessed through tactile distance perception task. Twenty-four volunteers underwent the same FBI conditions of Experiment 1. After each video, we administered a Tactile Distance Task (TDT) (Longo & Golubova, 2017; Longo et al., 2015) to investigate a possible distortion of the metric representation of the body. During TDT, two locations of the leg are stimulated in sequence. Participants have to estimate the distance between them in centimetres. We applied Multidimensional Scaling and Procrustes Alignment to analyse shape differences between the perceived and the actual location of points. Moreover, we calculated the percentage of perceived distance misestimation. The results revealed the underestimation of distances running along the proximo-distal axis as compared to the mediolateral one only for the anatomical standard legs and not for the bigger one. After embodying the bigger legs, participants perceived their limbs longer as compared with the other conditions suggesting that the body metric representation can be modulated by the seen size of the embodied fake body. Notably, the metric representation of the body was shown to be quickly malleable, adapting to the seen body size. Crucially, the visual influence of the body size is impacting only if the avatar is anatomical respect to the real body and is incorporated, suggesting that body representation is a complex adjustable system responding to the integration of internal models and sensory feedback.

Defining the multisensory parameters, in a virtual reality application, that can decrease stress and improve performance in professional rugby players

Solène Neyret*, Jean-Rémy Chardonnet*, Julien Ryard Ryard*, Valentin Grillet* and Mickaël Campo** (*Arts et Métiers Institute of Technology, LISPEN, Institut Image, **Université Bourgogne Franche-Comté, Laboratoire Psy-DREPI)

It has been shown that many parameters can have an impact on the athlete's performance in professional team sports. It seems that different environmental and social parameters can influence the individual stress level of an athlete. Social emotions related to their team, supporters and opponents appear to be particularly important. Social situations including ingroup and outgroup dynamics can be recreated in virtual reality, and past research has shown that people tend to have realistic emotional and behavioural reactions to these situations. In our study, we present a virtual reality program which recreates a situation of high-performance expectation for professional rugby players. We investigate different multi-sensory parameters (creating different kind of social feedback) aimed at inducing different levels of stress in the athlete immersed in the virtual environment. We show how interaction with these different parameters can help professional athletes to reduce their levels of stress. We believe that an exposure of athletes to highly realistic stressful situations in virtual reality could help them to be better prepared for facing similar emotions when being with their team on the rugby field.

Motor planning and execution of retargeted reaching actions in virtual reality

Antonella Maselli**, Brian A. Cohn*, Eyal Ofek* and Mar Gonzalez-Franco* (*Microsoft Research, **Institute of Cognitive Science and Technology, CNR)

In reaching actions all available multisensory information about the object to reach and the state id the reaching hand are exploited online. When available, vision dominates, with the online control of the action mainly guided by minimizing hand-to-object visual distance. If the apparent location of the target or the hand is altered using prisms or virtual displays, minimizing hand-to-object distance remains the dominant strategy, in spite of introducing visuo-proprioceptive conflicts. Researchers in virtual reality capitalized on this evidence for enhancing the flexibility of passive haptics. In haptic retargeting, a dynamic offset of the virtual hand position is introduced ad-hoc so that, when reaching for a virtual object, the participant's hand can be redirected to a different location in the real world. A single physical prop — fixed in space — could therefore provide an effective haptic feedback for objects placed at different locations in the virtual world. Previous studies have shown how haptic retargeting can be adopted without participants noticing the manipulation, provided the real to virtual target distance is not too large. However, the extent of this effect has not been systematically examined with respect to body-relative reach position, handedness, and virtual displacement. We present a psychophysical and kinematic evaluation of action retargeting in virtual reality (n=12 participants). We evaluated how the subjective experience of a retargeted reaching action and its motor execution is modulated by the distance between the virtual and the real targets, by the handedness of the reaching hand, and by the spatial arrangement of

real and virtual targets with respect to the participant's body midline. Both the subjective experience of seamless reaches and the motor efficiency of retargeted actions is significantly modulated not only by the spatial offset between virtual and real targets, as expected, but also by the spatial configuration of the targets with respect to the body. This condition-dependency has important implications both for field of motor control and for the optimization of the design of action/haptics retargeting applications.

The effect of embodiment as a victim of ipv on attitudes of victim blaming in the general public

Tania Johnston*, Caterina Suitner***, Mel Slater** and Mavi Sanchez-Vives* (*IDIBAPS, ** EVENTLAB, *** UNIPD)

Attitudes of the public towards Intimate Partner Violence (IPV) and its victims are important targets for prevention, as they determine their responses to such situations as well as the responses of offenders, professionals and victims themselves. Although IPV is generally considered unacceptable by the public, attitudes of victim blaming remain prevalent in certain situations. Infrahumanization (the propensity to attribute to someone more primary emotions -that are shared with animals- than secondary emotions -that are uniquely human, Demoulin et al., 2004) is an implicit form of prejudice against the victim and is also related to explicit victim blaming.
To test the potential of virtual reality to reduce victim blaming, participants from the public were immersed in a virtual scene depicting an IPV event. The role of the perspective from which participants experience the scene on self-reported and implicit attitudes of victim blaming was studied: 20 participants were embodied as the victim of the abuse (1pp condition), and 19 participants experienced the same scene, but from the perspective of an observer across the room (3pp condition).
A between groups analysis showed that several outcomes relative to self-reported victim blaming attitudes were higher in the 1pp condition, compared to the 3pp condition. However, there was a trend for participants in the 1pp condition to infrahumanize her less than those in the 3pp condition.
Future studies are necessary to understand the potential of immersion in virtual reality and of embodiment as the victim for the reduction of explicit and implicit victim blaming.

THEMATIC SESSION: HUMAN-TECHNOLOGY INTERACTION- 1

Embodied Robot, Telecommunication, and Level of Controllability

Myeongul Jung*, Jejoong Kim* and Kwanguk Kim* (Hanyang University)

Humanoid robots are known to be social interaction partners; recent studies have suggested that they can be telecommunication partners as well. The present study aimed to facilitate

physical telecommunication using a humanoid robot with three different levels of controllability. In this study, we used static, head-turn, and full-embodied robots and investigated how controllability levels affected the participants' telecommunication experiences. The results showed that embodiments, copresence, and eye-contact telecommunication experiences were controlled by the level of controllability, but participants' verbal communication was not.

Smartphone Application for Wheelchair User's Transportation Mode Detection: A Preliminary Study

Sungjin Hwang*, Jiwoong Heo*, Jucheol Moon**, Hansung Kim*, Jaehyuk Cha* and Kwanguk Kim* (*Hanyang University, **California State University)

By understanding the mobility of people, transportation mode detection can improve our daily lives from social and individual aspects. However, previous studies have only focused on people without disabilities, and as mobility and accessibility are significantly related to the quality of life and social inclusion of people with mobility disabilities, it is important to extend transportation mode detection to them. In this study, we developed a smartphone application that collects sensor data for transportation modes, collected 4,900 min of data from seven transportation modes including manual and electric wheelchairs, and conducted detection using two deep learning models. The model based on long short-term memory layers successfully classified transportation modes with an accuracy of 95.44%. Although this is an ongoing study, our findings can be applied to refined urban planning or navigation maps that benefit people with mobility disabilities.

Between benevolent lies and harmful deception: Ethical analysis of deceptive practices in dementia care technology

Ans Tummers, Rens Brankaert and Wijnand Ijsselsteijn (Eindhoven University of Technology)

In the context of dementia care, deception is a common yet controversial practice, generating substantial attention from scholars. Though complicated, consensus has seemed to emerge that, whereas lying is generally frowned upon, benevolent (white) lies can be acceptable if the aim is to improve the life of the recipient. However, with the increasing omnipresence of technology as a means of improving quality of life and care efficiency, many technologies, implicitly or explicitly, embody deceptive practices. In the current paper, we expand our ethical analysis and understanding of deceptive practices to include technological designs and human-technology relations in dementia care settings, by reviewing current literature and exploring relevant case studies.

1. Introduction

Imagine, if you will, the following three scenarios:

(i) An elderly lady with middle stage dementia loses her pet dog. After weeks of intense grief she is given an interactive robot cat, to which she immediately develops a deep attachment – she cares for, and caresses, the robot continuously and her grief over the lost dog is significantly lessened. She calls the robot cat "her dog" and uses the name of her deceased dog. When the batteries of the cat run low, she is deeply distressed and calls her informal carer, telling him "the dog is dying".
(ii) The garden of a nursing home for people with middle to late stage dementia has its own bus stop. It is designed with all the familiar bus stop signs, timetables, a booth, and a bench to sit on. However, no bus will ever arrive at this stop. It is a fake bus stop erected with the express purpose to attract people with dementia prone to wandering around, or off the nursing home grounds – a significant source of stress for caregivers and care facilities. Here, they sit and wait for the bus.
(iii) An elderly lady in the later stages of dementia occasionally shows intermittent episodes of significant restlessness and emotional distress. The nursing staff, responding to her calls, hand her what looks like an old-fashioned dial telephone that connects the lady to the prerecorded voice of her son. The system responds through scripted questions and answers, where AI-based language recognition and voice stress analysis allow for some level of flexibility and tuning of the conversation. Believing she is talking to her son, the conversation has a soothing effect on the elderly lady who ends the conversation by asking when her son is coming over to visit her again. The computer responds, in the voice of her son: "I'll be over this evening" – an answer that puts a big smile on her face.

All three scenarios are based on actual, existing technological interventions. They all share the aim of wanting to improve the quality of life for people with dementia (PwD) and/or alleviate the care burden for informal and professional carers. They also share the use of deceptive practices to reach that aim. Whereas in recent literature on nursing and dementia care, attention has been growing regarding the use, boundary conditions, and ethical implications of people using benevolent (white) lies as part of caring for PwD, there has been scant attention to the implications of technology embodying deceptive practices in dementia care. The current paper aims to address this urgent issue.

2. Methods

We combine a literature review, case studies emerging from this review, and subsequent ethical analysis of this corpus, to explore the topic of deception in dementia care, with a particular focus on deceptive properties of technologies, and effects of their use in the lived reality of PwD. We queried major academic search engines using "dementia care", "deception" and related words, further focusing our search by the keywords "ethics", and "design" or "technology". Next, we analyzed the resulting papers for both empirical insights and ethical reflections. Our analysis is then structured around specific categories relevant to technological interventions in dementia care.

3. Results & Discussion

In recent literature on nursing and dementia care, consensus exists that so-called therapeutic lying is acceptable if the goal is to improve the life of the recipient, and a number of ethical

guidelines are adhered to. However, in practice, health care professionals often struggle with the interpretation of these ethical guidelines. A recent study using a sample of PwD and their carers, stresses that in addition to having good intentions, "the carer telling the lie had to really know the person, and be cognizant of family preferences" (Casey et al, 2020). The introduction of care technologies brings new challenges and complexities to the fore in the way they can, intentionally or unintentionally, be embodiments or conduits of deceptive practices. Despite their increasing use in dementia care practice, these technologies typically lack the intelligence and empathy required to really know a person, or their context, life history, or family preferences. Moreover, technologies cannot take an 'all things considered' approach that is required to support ethical decision making. Based on our review, we distinguish deceptive practices in (i) simulated or mediated social or empathic relationships, (ii) simulated or mediated artefacts or environments, (iii) illusory versus actual system intelligence, and (iv) tensions between lab-based technology design practices versus real-life deployment of care technologies. Our ethical analysis combines traditional approaches (e.g., virtue ethics, care ethics), with perspectives drawn from philosophy of technology (e.g., ethics of persuasive technology), design practice, and reports of lived experience of PwD. With our analysis, we hope to create awareness and proactive engagement of technology developers, interaction designers, as well as care professionals, who want to ethically develop and deploy care technologies containing benevolent deceptive elements.

THEMATIC SESSION: HUMAN-TECHNOLOGY INTERACTION- 2

Can a robot lie? A study on intentionality comprehension in 5- and 6-year-olds children

Giulia Peretti*, Federico Manzi*, Cinzia Di Dio*, Angelo Cangelosi**, Davide Massaro* and Antonella Marchetti* (*Università Cattolica del Sacro Cuore, **University of Manchester)

Abstract: The current socio-cultural scenario shows a widespread use of robots in various everyday environments, including educational contexts within which children are increasingly more likely to interact with robot agents. From this perspective, it is important to know whether children believe that robots' actions are driven by intentionality. Understanding the intentions underlying behavior also entails knowing if, under specific circumstances, another person is lying or has unintentionally made a mistake. This aspect is fundamental in regulating relational dynamics. The ability to lie and recognize an intention to lie or not represents a significant developmental stage in children, also characterized by the acquisition of an important social skill, i.e. a Theory of Mind. From the age of 4, children begin to distinguish between a lie and a mistake, i.e. between making false claims that are intentional (lie) and unintentional ones (mistake). Gilli and colleagues found that 4- and 5-year-olds, but not 3-year-olds, evaluated intentional false statements negatively, although this was not so for unintentional wrong statements. In the present study, we aimed to explore the ability of 5- and 6-year-old children to discriminate between intentionally and unintentionally false statements acted by a human and the humanoid NAO robot that made a false statement

that was either untrue or simply wrong. Besides supporting previous findings with humans, our results further showed that children are less judgmental towards robots in the lie condition, generally suggesting that children may perceive the robot's behavior as unintentional.

1. Introduction: The ability to lie and recognize behaviour determined by the intentionality to lie or not represents a significant developmental stage in children, also characterized as the acquisition of an important social skill [3]. With increasing age, children tend to have a more sophisticated mental representation of intentionality, whereby they can more accurately distinguish a lie from a mistake and display a more refined moral judgement in evaluating the action observed. The growing use of robots in everyday contexts allows an interesting reflection on the attribution of intentionality to different agents, not only human but also robots. Therefore, it seems relevant to understand whether children, at critical ages for understanding intentionality in language, discriminate between statements in which the false is intentionally declared and statements in which it is not intentionally declared, performed by different agents. This study aims to analyze the ability of 5- and 6-year-olds children to discriminate between lie and mistake performed by a human and NAO robot.

2. Method and Materials: Data were collected on 97 Italian children aged 5-year-olds (N=45, 27 female) and 6-year-olds (N= 52, 27 female) from Kindergarten and Primary School in Milan area. Children were tested individually in a quiet room and the researchers conducted the sessions during school hours. The sessions lasted approximately 30-35 minutes. A familiarization phase with the task was carried out before testing. The following tasks were used: Lie-Mistake Video; Theory of Mind Task; Executive Function skills (switching and inhibitory control); Intentionality Task; Attribution of Mental States (AMS); Two language sub-tests of NEPSY II. For the Lie-Mistake assessment children viewed videos where either a human or the NAO robot made a statement that was either intentionally false (lie) or unintentionally wrong (mistake). Videos were inspired by the task of Gilli and colleagues.

3. Results: To assess the comprehension of the distinction between lies and mistakes attributed to agents (Human, Robot), non-parametric analyses were performed. The McNemar's test showed a significant difference for 5-year-olds, only for the human condition ($p=.006$), in the feelings experienced by those who find out that a person has lied compared to those who find out that the other person has made a mistake; i.e., children attributed more negative emotions to humans who had told a lie. Additionally, a significant difference was found for 6-year-olds in the attribution of the behavioral valence in the lie-mistake comparison for the robot only ($p=.002$): there was less coherence in the attribution of behavioral valence and the robot's actual behavior in the lie condition compared to the mistake condition. That is, six year-olds did not attribute a negative behavioral valence to the robot's lie (i.e., naughty), thus suggesting that the robot's behavior is perceived as unintentional.

4. Conclusion: In the present study, we investigated the comprehension of the distinction between lies and mistakes in 5- and 6-year-old children to a human and a NAO robot. Our data suggest that, at this age, children are more sensitive to the emotional consequences of human intentional statements than those of the robot. The ability to understand the intentionality of the agent, which is acquired with the development of ToM, allows the child to understand that the robot's statements are not guided by intentionality and therefore, for the child, there is no difference in the attribution of mistake and lie in the robot's claims. In this light, we could argue that – in young children's eyes - the robot's behavior is somehow more

justifiable than the human one because its actions are beyond its will but rather attributable to someone who has programmed it to be “naughty” and tell a lie.

Human-cobot interaction: an overview of the factors affecting workers' well-being based on the SHELLO model

Mattia Chiappini*, Fabio Alexander Storm*, Caterina Piazza*, Elisabeth Andre**, Nadine Bender***, Ingrid Brdar****, Antonella Delle Fave*****, Patrick Gebhard******, Matteo Malosio*******, Alberto Peña Fernández********, Snježana Štefok********* and Gianluigi Reni* (*IRCCS "E. Medea", **Augsburg University, ***Corporate Research KUKA, ****University of Rijeka, *****Università degli Studi di Milano, ******Center for Artificial Intelligence GmbH, *******National Research Council of Italy, ********BioRICS, *********Croatia Ministry of Labour)

In the new era of Industry 4.0, large, medium and small enterprises are currently facing the challenge of pushing their manufacturing processes to a new level of automation. One of the most rapidly emerging aspects of this transformation is the advanced collaboration between humans and machines (Yilma et al., 2019). Up to now, most of the industrial scenarios of collaborative robots (cobots) rely on non-collaborative applications. However, it is reasonable that, in future, human operators and robots will collaborate more closely, as dyads or teams (Schmidtler, Knott, et al., 2015). Considering the evolution of research in the field of human-robot collaboration, it is necessary to understand both the risks and the opportunities that workers face when interacting with cobots, with a particular reference on well-being aspects. The aim of the present work was to investigate the current state of the art concerning factors affecting physical and mental health and well-being of workers using cobots in manufacturing industries. The identified factors were classified through the SHELLO model (Chang & Wang, 2010), a conceptual framework that provide a systematic analysis of the human factors in complex sociotechnical systems. The SHELLO model delivered a good classification of the overall factors investigated in the human-cobot interaction research; to our knowledge, this is the first time that this model was applied in that field of research, with expected outcomes on the design of future generation of cobots.

Introduction/Problem

The concept of a collaborative robot (cobot) was introduced two decades ago to describe the direct interaction between human and robots. Up to now, most cobots applications have simply entailed removal of protective fences between the robot and the worker. In the direction of fully exploiting the possibilities offered by the human-cobot collaboration, a comprehensive understanding of the risk factors involved in the interaction is of interest. The aim of the present work was to investigate the issues typically overlooked in the Industry 4.0 studies: cobots are designed to promote productivity performance, to reduce the uncertainty coming from the reciprocal interaction; also, the main topics in collaborative robotic research concern the development of technical solutions to implement human-robot physical interaction and to preserve the workers’ physical safety. The identified factors were classified through the SHELLO model (Chang & Wang, 2010), a conceptual framework that provide a

systematic analysis of the human factors in complex sociotechnical systems. The model includes a central human component (L – the Liveware) and five related interactions: Liveware-Hardware (L-H), referring to the study of people 'performance and their interaction with machines and instruments'; Liveware-Software (L-S), related to the procedures, rules and policies that govern activities; Liveware-Environment (L-E), concerning the physical location in which activities occur; Liveware-Liveware (L-L) discussing the person-to-person interaction, and Liveware-Organization (L-O), related to organizational issues.

Method/Tools

A scoping review was conducted in January 2021. Following PRISMA criteria, 4 electronic databases (PubMed, Scopus, PsycINFO, Web of Science) were consulted and 13678 records were identified. After applying the established exclusion criteria, 69 papers were included in the review. A data-charting table was developed to determine the variables to be extracted from the included papers: bibliographic information, type of document, type of publication, purpose of the study, investigated risk factors, conclusions.

Results

Of the 69 identified papers, 27 were proceedings and 42 were articles; considering the publication type, 16 papers were literature reviews, 36 experimental and 17 discussed methodological aspects.

Most studies (43 papers, 62,3%) identified at least one risk factor associated to the L-H interaction. The second most frequent interaction was L-S (16 papers, 23,2 %), followed by L-L (11 papers, 15,9%), the intrinsic component L (10 papers, 14,5%) and, finally, L-O (8 papers, 11,6%) and L-E (8 papers, 11,6%). The most common factors identified within the L-H interaction cluster were risk of collision, general hard safety risks, robot behavior (i.e., speed and movement) and excessive physical effort due to human cobot interaction. The factors mostly identified within the L-S cluster were task-related and workflow issues during the use of the cobot, whereas the L-E interaction referred to the general environment where the human operator is located, like noise, temperature and lighting. The factors belonging to the L-O interaction related mostly to the risk of job loss or job displacement, the L-L ones were mostly related to the social elements associated with the cobot (e.g., its impact on the interactions between colleagues). The L intrinsic factor, finally, encompasses the human operator's core characteristics that might affect the human-robot interaction, such as skills to cope with the task-related activities, flexibility to adapt to new situations, abilities to employ in the daily activities.

Conclusion

Through this review, we identified important challenges posed by the introduction of cobots within Industry 4.0. Their classification using the SHELLO model allowed to provide a useful framework for their understanding: this comprehensive approach encompasses factors related not only to the safety or ergonomics background, but also components that might affect the mental well-being of workers interacting with cobots.

Facial expression analysis for assessing emotional impact raised by online art experience: an empirical evidence

Maurizio Mauri, Rosanna Clavelli and Daniela Villani (Università del Sacro Cuore)

Several studies showed the ability of virtual reality to induce emotions. However, it is not completely clear yet which factors, coupled with virtual reality technologies, may enhance the emotional experience played by art within online contexts, especially during the pandemic world effects of COVID-19. In this research project, aimed to bring a better understanding of these topics, 32 subjects were enrolled and divided into two groups of 16 participants. One group (control group) was exposed to an online visit to a museum exhibiting different paintings, where the whole virtual 360° tour was performed in a silent context (no narrative stimuli were presented). The other group (experimentalgGroup) was exposed to the same virtual tour of the same art museum, however this time the whole virtual 360° tour was guided by narrative stimuli providing explanations accompanying paintings' presentation. Facial expressions have been recorded during the visit from all participants, and they have been processed automatically by a software aimed to analyze all emotional facial expressions. Before and after the visit, all participants were asked to fill in different questionnaires (Emotional states through a VAS scale and the engagement scale of the ITC-SOPI questionnaire). Preliminary results show that happiness was significantly higher in the Control Group in comparison to Experimental Group. No significant differences emerged from self-questionnaires, due to the limited number of participants. Implications of these findings are presented and discussed.

Design for Phygitally Enriched Interactions in Social Organizations. Towards an 'Ultradisciplinary Stance'

Carlo Galimberti*, Giuseppe Leoni*, Ilaria Vergine*, Beatrice Galimberti** and Eleonora Brivio* (*Università Cattolica del Sacro Cuore, **Politecnico di Milano)

Technology opens up new possibilities for designing and constructing buildings that are increasingly phygital. Phygital buildings can capture people while they inhabit the place, automate processes, decrease the amount of people mediation required, and empower human behaviours, making human-machine interaction natural and multimodal. Designing phygital buildings is a challenging path that requires the skills of different practitioners: architects, building engineers, ICT experts, the client –who is co-creator–, UX designers, business designers, and social psychologists. This contribution –which is part of the TECVAL-InterPhy research project– argues that to realize a phygital building, it is not enough for the project team to be multidisciplinary. The team should go beyond disciplines, becoming ultradisciplinary, opening a breach to explore outside and between the disciplines involved, and sensemaking in the chaos. As the analysis conducted over four concepts and two actual phygital buildings in Italy – examples of what we call ultraplaces – have shown, the practitioners of an 'ultrateam' ought to master their disciplines and navigate freely among disciplines searching for knowledge through experimenting with innovation. This work - that we consider as a contribution to the development of Social Psychology of cyberplaces - aims

to present some features of an 'ultradisciplinary' approach to the design and making of phygital buildings based on a 'good enough' level of professional intercomprehension and intersubjectivity. Therefore, we will show why these elements could be considered fundamental to maximizing the integration between the phygital tools made available to users and the objectives of which individuals, groups, and organizations are bearers.

15.30-17.00 PARALLEL SESSIONS

"SYMPOSIUM: ASSISTIVE TECHNOLOGIES AND REAL-WORLD EVIDENCE: FINDINGS FROM THE ITALIAN IRCCS AGING NETWORK"

Technologies for frailty and geriatric syndromes: a systematic review of research designs

Alessia Gallucci, Pietro Davide Trimarchi and Fabrizio Giunco (Fondazione Don Carlo Gnocchi)

Objectives. Frailty and geriatric syndromes cause a significant impact at clinical, social and economic level, mainly in the context of the aging world. Recently, Information and Communication Technologies (ICTs), virtual reality tools and machine learning models have been increasingly applied for the care of older patients to improve diagnosis, prognosis and interventions. However, in so far, the methodological limitations of studies in this field have maybe prevented to generalize final data to real-word. This review provides a systematic overview of research designs used by the literature exploring technologies application for the assessment and treatment of aging-linked syndromes in older people.
Methods: Following the PRISMA guidelines, records from PubMed, EMBASE and Web of Science were systematically screened to select original articles in which interventional or observational designs were used to study technologies applications in samples of frail, comorbid or multimorbid patients. Results: Thirty-four articles met inclusion criteria. Most of the studies used diagnostic accuracy designs to test assessment procedures or retrospective cohort designs to build predictive models. A minority were randomized or non-randomized interventional studies. Study quality evaluation revealed a high risk of bias for observational studies, while a low risk of bias for interventional studies.
Conclusions: The majority of the reviewed articles use an observational design mainly to study diagnostic procedures, and suffer from a high risk of bias. The scarce presence of methodologically robust interventional studies (e.g. Randomized controlled trials) may suggest that the field is in its infancy. Methodological considerations will be presented on how to standardize procedures and research quality in this field.

Robots for the elderly: facts or fantasy?

Antonio Greco, Daniele Sancarlo, Francesca Romana Greco, Filomena Addante, Grazia D'Onofrio, Sergio Russo and Francesco Giuliani (Ospedale Casa Sollievo della Sofferenza)

This paper aimed to review our bedside experience on the use of robotic platforms to cope with the frailty of older people. Managing Active and healthy ageing with the use of caRing servIce robOts (MARIO project) was our first experience as partners of an EU funded project. MARIO addressed the difficult challenges of loneliness, isolation and dementia in older persons through innovative and multi-faceted inventions delivered by service robots. The effects of these conditions are severe and life-limiting. They burden individuals and societal support systems. Human intervention is costly but the severity can be prevented and/or mitigated by simple changes in self-perception and brain stimulation mediated by robots. Agile CoCreation of Robots for Ageing (ACCRA project) aimed to test in our outpatients service the usability, acceptance and satisfaction of two robotic platforms Buddy by Bluefrog and Astro by Istituto S. Anna Pisa to improve respectively conversation and movement in frail elderly people. Virtual Round project was realized by Pepper platform produced by Humanizing Technology. It was used to test the psychological well-being of the inpatients admitted to our geriatric ward after a virtual round session as compared to a video call made by Cisco Webex System. The usefulness of this technology was also investigated using the HADS Hospital Anxiety and Depression Scale and the Beck depression inventory for primary care, for the care of elderly people affected by COVID 19 pneumonia to prevent isolation and reduce their anxiety and promote better communication with families in the Geriatric Sub Intensive Care Unit.

Abstract

MARIO robot was tested in 30 patients admitted to our geriatric ward. These patients underwent to Mini-mental State Examination (MMSE), Cornell Scale for Depression in Dementia (CSDD), Quality of Life in Alzheimer Disease (QoL-AD), Comprehensive Geriatric Assessment (CGA), Multidimensional Scale of Perceived Social Support (MSPSS), Observational Measurement of Engagement and the 14 item-resilience at the baseline after a 7 days session with the robot. The Multidimensional Scale of Perceived Social Support (MSPSS) was used as proxy measures to capture the impact of MARIO on loneliness and isolation following engagements with MARIO. A statistically significant improvement was seen in cognition (CSDD 7.0± 3.77 vs 6.15±2.56 $p<0.01$), in the resilience (RS-14 26.1±3.6 vs 28.0±2.6 $p<0.01$), quality of life (QoL-AD pat 33.25±2.78 vs 34.1±4.61 $p<0.05$). No significant difference was found in QoL- AD for families, MPSS for patients, families, friends and special person. The high levels of enthusiasm and engagement of people with dementia with MARIO were also confirmed in the OME quantitative data. People with dementia often referred to MARIO as he or she, conceptualising him as an embodied presence. A few participants with dementia also demonstrated affection toward MARIO wanting to embrace him during their engagements.

Agile CoCreation of Robots for Ageing (ACCRA) project (21partecipants)

The project aimed to test socialization and ability to move that are two important domains in the aged people by two robotic platforms: Buddy and Astro.

Buddy

Appearance robot Buddy

Elders are mainly positive about Buddy as a robot. They think it is cute, likeable, attractive, innovative, a safe instrument and easy to get familiar with.

The quality of the functionality

With regard to the quality of the conversation, functionality elders are mainly negative.

Astro

Astro robot aimed to evaluate and improve people's mobility by interacting with the patient as a guide during their walking. Usability and perceived safety by the patients were evaluated. The results show that the elders feel completely safe when they are in proximity of or use ASTRO. At T0 only one elder gave a score of 4 out of 5 on the dichotomy agitated-calm, Usability refers to the appropriateness of a system given the context within it is used. The elders' opinion of the usability of ASTRO is the same at the start of the experiment as it is at the end. They score the usability with a rounded mean of 73,0, which means that they assess the usability as being above average. According to Sauro's criteria, the scores mean that the usability of ASTRO can be interpreted as scoring a B-. elders gave the maximum score of 5.

Virtual round

Virtual round is a powerful tool to enhance the collaboration between health care providers, patients and their relatives. More recently robotic virtual round has been proposed and adopted in many hospitals in different countries. To our knowledge, no previous experience was conducted on elderly frail patients in severe clinical conditions. We used Pepper robot platform to realize a robotic virtual round in a sub intensive care setting of patients affected by covid 19 pneumonia. 36 patients underwent a 30 minutes daily virtual round session for 5 gg. All these patients and their caregivers showed a reduction in their level of anxiety and depression.

Conclusions

Robots are a very promising tool to cope with the frailty of elderly people. They show good levels of acceptance and usability among elderly patients. Some technical problems, however, like instance speech recognition still limit their widespread in the real clinical setting but, in any case, we are on the way.

Assistive technologies to support fragile older adults: lesson learned from European experiences

Elvira Maranesi, Lorena Rossi, Roberta Bevilacqua and Vera Stara (IRCCS INRCA Scientific Direction)

The demographic changes and the rapid increase of ageing population in Europe is expected to have a great impact on the society, especially where the dominant care model for supporting older people in living independently at home continues to rely on informal caregivers' assistance. To respond to the above challenges new ICT technology based care models could have a role in supporting seniors to remain active and independent, for as long as possible, in their chosen home environment[1]. Although the wide number of project financed and some really interesting experience classified as good practice [2] the penetration of technology based assistive models for fragile older adults is still lower than expected. This is due to different and complex motivation. Among these, there is the lack of a coherent set of guidelines and regulations across different European countries. In this work, we will present a preliminary analysis of the availability of specific set of regulatory document concerning ICT technology used to support fragile older adults. In the light of this context, moreover, a synthesis of strategies will be provided, by the experience of a currently modest number of European states that can represent, nevertheless, the "front-runners" in the domain of ICTs for health and care.

Mapping technologies use and efficacy in frailty, multimorbidity and comorbidity: preliminary results from a systematic review

Silvia Cavedoni, Cosimo Tuena and Marco Stramba-Badiale (Istituto Auxologico Italiano)

Research in the field of aging has been focusing on frailty, multimorbidity and co-morbidity, conditions that accelerate the physiological deterioration of physical and cognitive abilities, leading to adverse chronic outcomes. These conditions have received increasing attention by the field of technology, particularly Information and Communication Technologies (ICTs), and other tools such as Virtual Reality (VR) and Machine Learning (ML) techniques have proved useful for the assessment and rehabilitation of older people, as well as predicting disease progression. Despite the growing consensus towards technology use in the field of aging, several challenges are still present. The present work is a systematic review of the current literature on the use and efficacy of technologies (ICTs, VR and ML) in the assessment of frailty, comorbidity and multimorbidity occurring in older people. The review was conducted according to PRISMA guidelines and the quality of studies was assessed depending on the study design, either observational or interventional studies. Preliminary results will be presented as the data are currently being extracted.

THEMATIC SESSION: MEDIA AND EDUCATION IN THE DIGITAL AGE

Mind your time: The implications of prolonged Instagram use and drive for thinness in university students

Alexandra Ghita, Teuntje Elfrink, Adriana Bülter, Svenja Gabriel, Marie Geise, Greta Grewe and Gerben Westerhof (University of Twente)

Objective: The aim of the study was to explore the relationship between prolonged versus limited Instagram use and drive for thinness in university students.
Method: 201 international students (Mage = 21 years, SD = 2.5; 35 male and 166 female) from the University of Twente participated in this study. The students completed a survey with emphasis on socio-demographic data, daily Instagram use, present or past mental health diagnoses, and Drive for Thinness (DT) scale, which assesses concerns about the body shape or weight, diet and fear of gaining weight. A cut-off score of (daily) 60 minutes was set for Instagram use (N<60 = 119 respondents, N≥60 = 82 respondents).
Results: There was a significant group difference in DT between students who spend less than 60 minutes versus more than 60 minutes daily on Instagram. There was a significant relationship between DT and prolonged daily Instagram use (≥60 minutes), but not in the group with limited Instagram use (<60 minutes). In addition, there were gender differences in DT and Instagram use. Females have a greater tendency to experience DT compared to males. Regarding Instagram use, females spent approximately double the amount of time on Instagram on a daily basis compared to males (Mmale = 31 minutes vs. Mfemale = 59 minutes). Moreover, there was a significant relationship between DT and Instagram use in females, but not in males. 18% of the respondents (N = 40) indicated a current or past mental health diagnosis (mostly anxiety disorders, depression and eating disorders); however there were no differences in DT or daily Instagram use between respondents with or without an official mental health diagnosis.
Conclusions: Drive for a thinner body is a major component in predicting the development of formal eating disorders. This study shows the importance of social media use for facilitating a strong desire to have a thinner body, particularly in female students with prolonged social media exposure.

Learners' attitudes towards immersive virtual reality in higher education

Anna Flavia Di Natale*, Daniela Villani**, Claudia Repetto** and Emanuela Bricolo* (*Universita' degli Studi di Milano-Bicocca, **Università Cattolica del Sacro Cuore)

Immersive virtual reality (IVR) has shown to be a powerful tool for learning. One key advantage of IVR over other technologies is the possibility of providing concrete experiences, allowing the learners to be active creators of their knowledge rather than passive receivers of information. However, for a technology to be effective in educational contexts, learners' attitudes towards that technology must be positive. The present study investigated Italian students' (n=379) attitudes towards IVR's use in higher education. Specifically, our goal was to understand the relationship between the determinants of behavioural intention (BI) to use IVR. Specifically, we looked at participants' IVR's performance expectancy (PE) in terms of the degree to which they expect IVR to help them in their learning process. IVR's effort expectancy (EE), defined as the anticipated complexity of using IVR. We further considered age, gender and experience with technologies as possible moderators of PE and EE on BI. Finally, we explored the role of students' personality traits, learning styles, and their evaluations of the different opportunities offered by IVR to actively engage them in the

learning process on BI and its determinants. Based on the results, we will discuss theoretical and practical considerations and recommendations to researchers and educators.

Gaming Streetwork: The Need for Outreach Approaches in Media Education and Addiction Prevention

The presentation identifies high potential for media education to increase its effectiveness by gaining access to adolescents' everyday digital life. To overcome technical, emotional and social gaps that withhold adults and educators from entering and being accepted in digital worlds of adolescents, this study suggests the low-threshold and conversational techniques of outreach social work as bridging factor. A theoretical process model shows how digital streetworkers may help young people to develop media literacy skills by accompanying them in games, social networks or on news boards. Empirically, this idea was discussed with 20 German executive practitioners in media education, social work, psychotherapy and gaming. This research yields two main results. First, practical media education supports low-threshold, accompanying approaches. Second, all major aspects of offline streetwork can be and have been applied to the digital sphere, as a detailed and ready-to-implement digital streetwork concept for the field of gaming with special focus on the risk factor of video game addiction shows. It is now possible to define the organizational structure of a digital streetwork initiative, the professional qualification and personality of a fit digital social worker, promising strategies of digital self-representation as well as suitable meeting points (the digital street), conversation and relationship building techniques, and relevant social turning points (addictive behavior or inadequate emotional closeness). This presentation therefore strongly supports empirical evaluation of hands-on media literacy training in gaming, as well as the conceptual adaption of the gaming approach to other important virtual worlds in adolescents' lives.

Primary schoolers' response to a multisensory serious game on Cartesian plane coordinates in VR

Sarah Cooney*, Luigi Cuturi**, Giulia Cappagli**, Fiona Newell*** and Monica Gori** (*University College Dublin, **U-VIP, Istituto Italiano di Tecnologia, ***Trinity College Dublin)

Coherent perception of our environment is dependent on how we integrate information across the senses: with optimal integration occurring after 8 years of age. Recent research has shown that multisensory information provides a more efficient means for learning than via a single modality. While primary school classrooms are inherently multisensory, mathematics is usually instructed through vision. The goal of this study was to validate a novel VR Cartesian Garden serious game that was designed to teach numerical and spatial concepts via multisensory inputs. Cartesian plane coordinates were explored in Virtual Reality: the game includes body movement, sonification and haptic feedback. Children explored a Cartesian garden, i.e., a field of flowers in which each flower corresponds to x and y coordinates. The

goal of the study was to test the response of primary schoolers to the game. Children (n = 48; age 7-11) were divided into experimental (n = 24) and control (n = 24) groups. The experimental group explored the Cartesian garden and picked flowers corresponding to target coordinates; the control group performed a VR game not related to Cartesian coordinates. To quantify potential improvements, children were tested before and after the training with perceptual tests investigating number-line comprehension, proportional reasoning, and geometry-related spatial abilities. The results show age-related improvements in number-line and spatial abilities. This study provides the guidelines for a successful use of the Cartesian garden game, beneficial for specific ages during primary school.

THEMATIC SESSION: INNOVATION IN GAMING RESEARCH

Further Validation of Russian Video Games Addiction Scale (VGAS)

Nataliya Bogacheva*, Vitalii Epishin* and Diana Medakovskaya* (*Sechenov University)

The study re-examines the psychometric properties of the Russian Video Games Addiction Scale (VGAS). A new sample of video gamers (N=361) was added to the existing data pool (N=515). Previously found 7-factor structure of VGAS was confirmed by principal component analysis with varimax rotation, with one highly cross-loaded item excluded. The alpha-values confirmed VGAS` good internal validity. Three sub-groups based on game-genre preferences were identified: shooters (N=125), RPGs (N=104), or other genres (N=132). Shooter and RPG gamers had higher gaming addiction compared to the third group. The Dark Triad traits were measured by the Dirty Dozen questionnaire. Machiavellianism positively correlated with gaming addiction in all groups except for RPG gamers. Psychopathy only correlated with gaming addiction in the “other genre” group. Those results matched the existing data, indirectly supporting VGAS construct validity as a new gaming addiction measurement.

Creativity and Virtual reality: effects of an ecological non immersive setting on creativity during a game session in MineCraft

Alice Chirico*, Elena Gianotti*, Andrea Gaggioli* and Luca Milani* (Università Cattolica del Sacro Cuore)

Literature analysis and previous researches showed that creative video games can improve creativity under specific instructions. Moreover, the social presence of observers during the task is a relevant factor to consider, as it decreases creative performance. However, the link between creativity and others' technology-mediated presence in a creative gaming task has never been explored. Therefore, this study connects knowledge on creative videogames, others' perceived mediated presence and creative performance, with the following main objectives: (i) testing the effect of instructions on creative performance; (ii) testing exploratively the effect of others’ mediated presence on the creative performance; (iii)

identifying eventual interaction effects. The study adopted a 2x2 between-subject design, with four different conditions for the manipulation of instructions (be creative vs no instructions) and the physical vs technology-mediated presence of the experimenter. 30 participants played a 30-minutes Minecraft session, through which they produced a creative artifact. They compiled some pre-task and post-task measures, and their creative product was assessed by examining four creative dimensions. Preliminary t-test evidenced a gender effect on creativity. Factorial ANOVAs highlighted: (i) several trends to significance of experimenter's mediated presence and instructions on some creativity dimensions; (ii) several interaction effects between mediated presence and instructions on participants' sense of presence.

The relationship between computer-game-type preference and personality traits, moral foundations and self-regulation among young adults

Liubov Glinkina* and Victoria Vasilenko* (Saint-Petersburg State University)

With the growing popularity of computer games and the rapid development of this industry, it seems critical to have an up-to-date classification of computer-game types that won't grow old as quickly as the genre-typed did. The study investigates the relationship between computer-game-type preference and personality traits in the context of O. A. Popov's classification of computer games. Split into two dimensions - having a playable character and an ability to make moral choices - young adults show numerous significant differences in levels of computer-game addiction, personality traits, self-regulation, and moralities. People preferring-existing-of-playable-character-or-characters-games appear to be more introverted, having problems with self-regulation, and having weaker moral foundations while being more open to new experiences. Preferring-to-have-moral-choices and haven't-decided-on-moral-choices show the same observation with the addition of short temper and fewer perfectionist tendencies. Moreover, haven't-decided-on-moral-choices appear to be more greed-avoiding than preferring-not-to-have-moral-choices.

17.00-18.30 PARALLEL SESSIONS

THEMATIC SESSION: ONLINE COMMUNICATION

Managing online reviews: promoting online reputation through expressions of gratitude

Ana Rita Farias*, Cláudia Simão** and Joana Reis*** (*Lusofona University, **CUBE – Católica Lisbon School of Business and Economics Universidade Católica Portuguesa, ***CICPSI, Faculdade de Psicologia Universidade de Lisboa)

Online reviews are critical for business thriving, but their management is not often effective. Using data from one Social Media platform, with more than 600 observations of public online interactions between business owners and customers, we showed that a strategic management of online reviews predicts a positive increment of online reputation. Publicly expressing gratitude (Study 1), and specifically, directing these expressions towards beneficial online reviews (Study 2), are effective strategies supporting a general increase of the business online score. These findings identify public expressions of gratitude as a responsive, attentive

gesture that signals care and consideration towards customers. Such gesture promotes the online reputation through satisfaction between business-community relationships.

Women Do It Too: Examining the Personality Characteristics of Female Digital Catcallers

Kathryn Seigfried-Spellar (Purdue University)

Catcalling, also known as street or stranger harassment, consists of unwanted verbal (e.g., comments, catcalls, whistling, yelling) and non-verbal (e.g., leering, following, vulgar gestures, touching) sexual attention. However, catcalling has gained a new medium through social media – referred to as digital or online catcalling. Although men are historically more likely to engage in catcalling behaviors, the internet has created an equal opportunity playground for digital catcallers. 161 female respondents completed the anonymous Internet-based survey measuring digital catcalling behaviors and individual differences. 45% (n = 74) of the women self-reported engaging in digital catcalling behaviors. The results indicated that women who engaged in digital catcalling behaviors scored significantly higher on neuroticism and extraversion compared to the women who did not engage in digital catcalling. Overall, although men are statistically more likely to engage in street harassment, the internet has created an environment where women are able to engage in digital forms of catcalling. In addition, there are personality differences between women who engage and do not engage in digital catcalling behaviors. Future research suggestions are discussed.

Online Behaviors in Emerging Adults: A Study in Italy and the U.S.A.

Martina Benvenuti* and Michelle Wright** (*ALMA MATER STUDIORUM - Università di Bologna, **Pennsylvania State University and Masaryk University)

The paper describes online behaviors, habits and experiences during emerging adulthood (e.g. social network use, time spent online, online interactions, etc.), and how these behaviors influence emerging adults' life in Italy and the U.S.A.. Specifically, in the U.S.A., the study describes emerging adults' technology habits (e.g., frequency of social networking website use), online behaviors (e.g., perpetration of trolling), and online experiences (e.g., doxing) over four years among 1.483 emerging adults. Findings indicated decreases in the perpetration and experience of cyber relational aggression, cyber verbal aggression, hacking, flaming, online social exclusion, doxing, online trickery, fraping, and masquerading over four years. In Italy, the study explored how 817 emerging adults used social media and the Internet, and how factors, such as self-esteem, online and offline social support, and self-control influence their use of the Internet in positive and negative ways. The study also distinguished between younger emerging adults (YoungerEA) and older emerging adults (OlderEA). Results showed that OlderEA and YoungerEA differed in their use of social media platforms and time spent online. Moreover, it was found that online social support, offline social support, self-control and self-esteem were factors that can significantly predict problematic internet use and functional internet use levels.

Personality traits and dynamics of direct communication on SNS

Maria Melnikova and Larisa Mararitsa (National Research University Higher School of Economics)

The study examines the relationships between personality traits of individuals and their communication patterns in Vkotnakte social network (SNS). Specifically, we investigate whether the stability of the distribution of the communication volume among user's online friends, also known as social signature, is related to the so-called Big Five personality trait set and the individual values defined according to Shwartz's Portrait Values Questionnaire. Our study is based on a sample of 89 users of the Vkontakte SNS, aged 19-32, 73% of whom are female and all of whom have expressed an explicit consent for access to their user account data. While stability of social signature has been calculated with a number of well-known metrics for distribution comparison, we use correlation analysis to derive associations with the variables of interest. The results of the study show that extroverts communicate with more people on SNS than introverts, but this is not accompanied by increasing the amount of text in their messages. People who have high scores on benevolence, security, and conformity are less likely to change SNS friends with whom they communicate online during a studied period of time.

"SYMPOSIUM: TOWARDS A SCIENCE OF COMPLEX EXPERIENCES"

Inspiring awe in high school teachers: Design and preliminary test of a virtual training in AltspaceVR

Alice Chirico*, Elena Gianotti*, Francesco Serafini*, Marta Pizzolante**, Roberta Malvezzi***, Carolina Micucci*, Eliana Manduca*, Clelia Carvelli*, Federica Vago*, Martina Renda*, Edoardo Cascio* and Andrea Gaggioli* (*Università Cattolica del Sacro Cuore, **Center for Mind/Brain Sciences (CIMeC), Università of Trento, ***Istituto Auxologico Italiano)

The emotion of awe, which arises from the encounter with something so vast to turn into something potentially transformative, has been recently introduced into the learning domain as a driver of knowledge-seeking behavior as well as of an authentic interest towards science. However, to date, an awe-inspiring training for people involved into the domain of science – specifically of STEM or STEAM – has not been designed and tested yet. In this study, we implemented recent scientific evidence concerning how to elicit intense instances of awe into an awe-inspiring training delivered through a social virtual reality (VR) platform - AltspaceVR. Nineteen high-school teachers (11 females) participated in this awe-inducing training. The experiential training involved an autobiographical recall of awe, as well as exposure to awe-inspiring virtual environments (VREs). At the end of the experience, participants were involved in a focus group aimed at collecting their feedback on the awe-

inspiring training. Overall, participants reported that they had felt a profound sense of awe and of other related emotions, as well as a continuous sense of presence in the VRE. This training can pave the way for a multitude of applications enhancing the involvement towards science and technology at any age.

Covid-19 Lockdown in Italy as a Potential Transformative Experience: A Pilot Study

Alice Chirico*, Marta Pizzolante**, Sofia Bastoni*, Elena Gianotti*, Matilde Scarcina*, Roberta Malvezzi*** and Andrea Gaggioli* (*Università Cattolica del Sacro Cuore, **Center for Mind/Brain Sciences (CIMeC), Università of Trento, ***Istituto Auxologico Italiano)

Transformation can be deemed as a process composed of specific emotional (e.g., awe) and cognitive components (worldview and mental schema) interacting together to trigger impactful experiences of transformation (TE). Several theories posited that one trigger of transformation can be something able to violate people' current worldview. In Italy, the lockdown – requested by the Government to limit the consequences of pandemic - represented an unprecedented experience for Italian citizens. Although COVID-19 home confinement significantly impacted psychosocial wellbeing and encouraged the adoption of new communication technologies to overcome lockdown loneliness, no difference emerged in relation to lockdown intensity. However, the potential transformative impact of this event has not been tested yet. In this study, we measured fluctuations of a nine healthy Italian people' cognitive worldview, personality traits, as well as their disposition to live the complex emotion of awe, in three timeframes (i.e., at the beginning of Italian Lockdown period, at the end and one month after the end of the lockdown). No significant changes emerged from data analyses, thus suggesting that, despite the potential impact of this worldwide event, people' stable worldview, personality factors and complex emotion dispositions persisted, at least, immediately after the first lockdown period.

Being pregnant during the Covid-19 pandemic: a complex experience

Giulia Corno*, Daniela Villani**, Francine de Montigny*, Tamarha Pierce***, Stéphane Bouchard* and Sara Molgora** (*Université du Québec en Outaouais, **Università Cattolica del Sacro Cuore, ***Université Laval)

Abstract. The Covid-19 pandemic has made pregnancy more complex and challenging for women, who had to spend this period of their life self-isolating from both their formal and informal social network. Perceived social support is a well-established protective factor for pregnant women mental health, and few studies have confirmed its importance during the Covid-19 pandemic. The objective of the present study was to investigate the role of perceived social support from different sources (i.e., family, friends, and significant other) on pregnant women mental well-being (i.e., state anxiety, depression, and satisfaction with life) during the Covid-19 pandemic. Results shown that, family and friends social support, which was particularly challenged during the pandemic, are key protective factors for pregnant women

mental health. The use of new technologies to support perceived social support from family and friends especially during lockdown periods will be discussed.

1. Introduction*

Pregnancy is a complex time in women's lives. It is a period of women's lives characterized by major life changes. Indeed, women have to rethink their identity as an individual, as well as a member of a family and a society. The Covid-19 pandemic has made pregnancy more complex and challenging for women, who had to face self-isolation, worries about the risk of infections, feelings of uncertainty and a significant decrease of perceived social support from both their formal and informal social network [1]. Perceived social support is a well-established protective factor for pregnant women mental health, and few studies have confirmed its positive effect even during the Covid-19 pandemic [2]. However, to the authors' knowledge, this is the first study attempting to investigate the role of perceived social support from different sources (i.e., family, friends, and significant other) on pregnant women mental well-being (i.e., state anxiety, depression and satisfaction with life) during the Covid-19 pandemic.

2. Method

274 pregnant women (74.82% Canadian residents and 25.18% Italian residents) participated to the study. Participants were asked to fill out an online survey about their pregnancy experience during the Covid-19 pandemic. The online survey assessed sociodemographic and pregnancy characteristics, as well as measures of mental health as depression symptoms (Edinburgh Postnatal Depression Scale), state anxiety (Six-Item State Anxiety Scale), perceived social support from family, friends and significant other (Multidimensional Scale of Perceived Social Support) and satisfaction with life (Satisfaction With Life Scale).

3. Results

Pearson's correlation analysis revealed significant positive correlations between the three sources of perceived social support (i.e., family, friends, and significant other). Furthermore, all three sources of perceived social support negatively correlated with both state anxiety and depression and positively correlated with satisfaction with life. Results from a between-subjects MANCOVA shown that perceived social support from family was a protective factor for depression and anxiety, while perceived social support from friends was significantly related to pregnant women's satisfaction with life.

4. Conclusion

Results of this study confirmed the protective role of perceived social support for pregnant women mental health. More specifically, this study shed light on the importance of two sources of social support – family and friends – in situations, such as the pandemic, in which social relations have been drastically restricted. New technologies, such as social networks and virtual reality could help maintaining and supporting pregnant women relationship with friends and family, especially during lockdown periods, during which pregnant women could feel particularly isolated. In conclusion, the present study provides preliminary evidence to

better understand the complexity of pregnant women experiences during the Covid-19 pandemic.

*Because the study is expected to be submitted to a peer-reviewed journal, this longer version of the abstract will focus on general information to avoid multiple publications of the same material.

THEMATIC SESSION: ONLINE INTERVENTION

Positive technology for emotion regulation: a virtual self-help intervention

Clelia Malighetti*, Daniela Villani*, Luca Bernardelli**, Federica Garbarino*, Sara Maestri* and Giuseppe Riva* (*Università Cattolica del Sacro Cuore, **Become Hub)

Emotions and stress experienced in the academic environment are known to be related to important outcomes, such as higher levels of physical comorbidities, decreased academic performance and increased college dropout, levels of problematic behaviors and social media use, and decreased general student health and well-being. Today, the situation appears even more critical in relation to the COVID-19 pandemic. Drawing on positive technology framework, this study aims to promote well-being in university students who are facing the challenging period of graduation, by increasing their ability in emotion regulation. Emotion regulation is defined as the initiation, maintenance, and modification of the occurrence, intensity, and duration of feeling states. Forty-two university students voluntarily participated in a self-administered modular intervention of 6 sessions spread over three weeks that involves virtual scenarios (used in 2D). Students were randomly allocated to an experimental group and to a waiting list group that started the intervention after 3 weeks. The scenarios consisted of narrative metaphors focused on encouraging students to reflect on their emotions and positive resources. We hypothesized that the intervention could increase students' ability to regulate their emotions and manage stress, resulting in an improvement in general well-being. Before and after the six sessions, participants completed an online assessment. The results showed an increase in emotional well-being and psychological well-being in the experimental group compared to the waiting list group. The present study showed that this novel virtual intervention might be an effective tool for improving well-being in students that are facing hard time in university.

Live-chats in postvention: an analysis of interventions with people recently bereaved by suicide

Lorenza Entilli and Sabrina Cipolletta (Università degli Studi di Padova)

Losing a significant other to suicide increases the risks of depression and suicide. Fear of stigma, fatigue and lack of services may hinder the help-seeking behavior of suicide mourners, or "survivors". The study aimed at exploring characteristics and needs of recent

survivors seeking for help online and the pros and cons of the use of live-chats as a first-aid tool in bereavement support. A data-driven thematic analysis with the software ATLAS.ti was carried out on 20 live-chat conversations from the major Italian association providing free-of-charge online support. Socio-demographics details were retrieved from the transcripts. Three categories were explored: users' features, users 'requests and online interactions. The users were mainly women (18 of 20), partners, siblings, or parents of the deceased (11 of 20), aged between 24 and 56 years, who had lost their significant other between one day and 12 months before. Users expressed needs to receive practical information on how and where to find support and requests to be emotionally reassured. Features such as anonymity and accessibility were fondly appreciated. Live-chat services represent a safe space where survivors can obtain useful information and start processing their loss. Because of its anonymity and accessibility, a live-chat service may represent a valid first line of support and a tool for prevention of suicidal ideation. The strengths of the study reside in its ecology: differently from a simulated user study, this analysis stems from a real context of emergency.

Empathic interactions in online treatment: experiences of mental healthcare practitioners

Milou Feijt, Yvonne De Kort, Joyce Westerink and Wijnand Ijsselsteijn (Eindhoven University of Technology)

Studies on practitioners' perceptions of eMental Health repeatedly report experienced difficulties in establishing empathic interactions with their clients online – a fact that plays an important role in the adoption, or lack thereof, of technology-mediated treatments. Especially now, in times when social distancing and lockdown measures are effectuated globally to combat the COVID-19 pandemic, the need for high-quality online formats of mental health care has become more urgent than ever. To increase our understanding of the process of achieving empathic interactions in technology-mediated communication, the current paper presents an online survey study using open questions on practitioners' experiences of establishing empathy in online therapeutic interactions (n = 363). Responses were analyzed using thematic analysis. From the derived themes, a conceptual model was built showing several properties of online communication that influence empathy and how these properties affect the therapeutic interaction on emotional, conversational and relational levels. Additionally, our findings highlight the behavioral strategies practitioners employ to find workarounds in order to manage these effects and attempt to (re)connect with their clients. Our findings thus provide experience-based insights into the process of building empathy in online treatments – insights that can be used to improve current and future eMental Health technologies, enabling practitioners to reach the desired level of empathic understanding during remote therapeutic interactions.

1. Introduction

A good empathic interaction and therapeutic alliance are considered crucial ingredients to successful therapeutic outcomes. In the research on eMental Health, there is a persisting mismatch between studies finding no differences in levels of therapeutic alliance and empathy between face to face and online psychological treatments, and the frequent reports of mental

healthcare professionals that online communication compromises the empathic interaction. So far, it remained difficult to pinpoint the source of these experienced difficulties; what are practitioners exactly missing when attempting to establish an empathic interaction online? The outbreak of the COVID-19 pandemic during Spring 2020, and corresponding distancing measures, led to a sharp increase in the use of online tools and technologies. While acknowledging the high burden this situation has had and still is having for both practitioners and clients, at the same time it offers the opportunity to gain more experience-based insights in online mental healthcare delivery, which could eventually contribute to improving the quality of remote mental health care. To this end, the current paper presents an explorative study on practitioners' experiences of the empathic interaction in technology-mediated communication with their clients, aiming to elucidate the most important factors in establishing empathy online and how these affect the therapeutic interaction.

2. Methods

A sample of 363 mental healthcare professionals (74% female, average age: 39.1 years) completed an online survey on eMental Health. Data was collected from May to September 2020, in the period after the first lockdown due to the COVID-19 pandemic. The survey included two open-ended questions on their experiences in establishing an empathic interaction with their online clients. Responses were analyzed using thematic analysis, going through the following steps: familiarization with the data, generating initial codes, extracting, reviewing, defining themes, and finally drawing up the results.

3. Results

Themes derived from the responses to the open-ended questions could be divided in three overarching categories that were incorporated in a conceptual model: influencing factors, effects on the therapeutic interaction, and behavioral strategies. The most frequently reported properties of technology-mediated communication influencing online empathic interactions were technological shortcomings, limited access to non-verbal cues, absence of regular physical procedures, and (un)suitability of clients. These factors then affected the therapeutic interaction on three levels; (1) emotional: harder to emotionally tune in with the client; (2) relational: more difficulties to keep aligned with clients and support them; (3) conversational: the communication becomes more explicit and verbal. To manage these effects, professionals reported to use the following behavioral strategies to establish an empathic interaction: use more verbalizing techniques, exaggerate non-verbal cues, make adaptions to the therapeutic contact, and modify the home setting.

4. Conclusion

The current study focused on practitioners' perceptions of establishing empathic interactions while conducting online psychological treatments. By probing actual experiences with online treatment from a large representative sample, we obtained insights emerging directly from practical experience, thus addressing the how and why of experienced difficulties in establishing empathic interactions. By learning about the specific properties that are of particular influence, we can derive directions for the development of future eMental Health technologies that can more precisely address practitioners' needs, and facilitate them in

achieving desired levels of empathy in online psychological treatments. Eventually, such improvements will contribute to eMental Health becoming a more satisfactory way of conducting mental health care, for both practitioners and clients.

An online intervention coupling psychological support and physical exercise for breast cancer survivors: A pilot study

Valeria Sebri*, Stefano Triberti*, Ilaria Durosini**, Nicole Trambagioli*** and Gabriella Pravettoni** (*Università degli Studi di Milano, **European Institute of Oncology (IEO), ***Independent Researcher)

The COVID-19 pandemic has posed several challenges to chronic patients (e.g., breast cancer survivors) in terms of health management and quality of life. Due to the strict social distancing policies, online interventions are to be preferred to help breast cancer survivors in terms of quality of life promotion. Guided physical exercises coupled with psychological support group sessions concur to improve quality of life and body image distress. Benefits of online interventions are related to the possibility of tailored programs, that are easy to implement, accessible, and without costs of participation. This pilot study aimed to assess a home-based combined regimen in which both psychological support and postural exercises were conducted through online groups. Twenty-six breast cancer survivors participated in nine postural exercise sessions and four psychological group interventions over six weeks while twenty-five acted as controls with no intervention. All participants filled in questionnaires on well-being, emotions (anxiety and depression), and body image before and after the intervention. Improvement was found in physical well-being in the experimental group compared with the control. Non-significant results in the other variables may be related to the relatively small, self-selected sample and the ongoing, complex context of the pandemic. However, the pilot study showed that the intervention is feasible and promising and could be improved within future efforts.

The key moderating role of telepresence on the strength of working alliance in videoconference-based psychotherapy. Or why can it work despite the use of such an imperfect medium?

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1. Introduction

A sound working alliance is a prerequisite for effective psychotherapies. Studies have repeatedly shown that it is possible to build a strong and effective working alliance when psychotherapy is delivered in videoconference (PVC) [1]. Results of studies on PVC are not

always matching well with our day to day experience with videoconference-based communications, which became very frequent in the context of the COVID-19 pandemic. Psychotherapists and patients have often attended meetings, classes, or conferences where the use of videoconference was frustrating, led to breaks in acceptance of the technology, or was felt as less interesting and involving than face-to-face meetings. Reconciling day to day experiences with empirical data collected in clinical trials is essential. It has theoretical implications, but it also impacts on the acceptance and dissemination of PVC as an effective treatment modality.

2. Aim

The goal of this study was to examine the contribution of telepresence to the strength of the working alliance rated by patients after the first third of a cognitive-behavior treatment (CBT) for anxiety disorders delivered in videoconference. Our a priori hypothesis was that telepresence would be a significant moderator of the working alliance.

3. Method

A sample of 65 adults suffering from anxiety disorders and engaged in CBT self-rated their working alliance with their psychotherapist after the first PVC session using the Working Alliance Inventory (WAI). After the fifth therapy session of a 15-week program, they self-rated their working alliance again with the WAI and completed a validated measure of telepresence. The CBT was manualized and the severity of patient's psychopathology was measured by assessing their main disorder as well as depressive mood.

4. Results

Pearson correlation analyses revealed a weak but significant correlation between telepresence and working alliance at Session 5 ($r=.29$, $p < .025$), and a strong correlation between working alliance at Session 1 and Session 5 ($r=.50$, $p < .001$). As predicted, a PROCESS analysis confirmed the statistically significant moderating role of telepresence on working alliance. A second analysis was conducted with the inclusion of the severity of the anxiety disorder and depressive mood as covariates. Again, the moderating role of telepresence was confirmed ($F(1,59) = 16.51$, $p < .001$; R2-change = .16). Probing the interaction between telepresence and working alliance with the Johnson-Neyman focal conditional analyses revealed a non-linear moderation relationship. The impact of telepresence on working alliance is highly significant when telepresence is low to moderate, statistically significant but with a smaller effect size when telepresence is high, and not statistically significant anymore when telepresence is very high (i.e., values above than 81).

5. Conclusion

Telepresence influences the development of a sound working alliance when CBT is delivered in PVC with people suffering from anxiety disorders. Its effect plays a key role when telepresence is low to moderate, and progressively fades away as the illusion of non-mediation is well established during PVC. To maximise acceptance and dissemination of PVC, it is essential that patients and psychotherapists do not based their appraisal of PVC on personal experiences where conditions for telepresence differ highly from psychotherapy (e.g., large

group meetings, interactions that are not focused on emotionally charged content and intersubjectivity, and topics that diverge from reducing distressing conditions and suffering).

From a 'minimal quality interaction' to 'intersubjectivity' in telepsychotherapy

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A 'minimal quality interaction' is one in which both speakers can express their point of view and be understood by the other. However, it's a necessary but not sufficient condition for a 'fully satisfying' level of intersubjectivity. This remains the constant objective of any communicative interaction characterized by professional goals, such as a telepsychotherapy session. In this framework, interlocutors have to face many traps and conversational difficulties along the process that leads from a 'minimal quality interaction' to an acceptable level of intersubjectivity. We intend to show how dialogue constitutes a psychosocial device capable of handling such difficulties, through some examples of the 'condensation' dynamics of intrapersonal, interpersonal, organizational, and institutional dimensions that characterize professional dialogues. In the analysis of the first session of a videoconference telepsychotherapy dedicated to the discussion of conditions and working methods for the possible continuation of the therapy as part of a research project, we will refer to analyzes of the production of speeches in professional contexts, with particular attention to works dedicated to the analysis of therapeutic processes. We will use the interlocutory analysis and focus on how the organization of the dialogue conveys the process of knowledge production (intrapersonal level), implementation of the tasks carried out jointly (interpersonal level), ways of dividing the work done given the set goals (organizational level) and development of a system of interpretation and evaluation of the interaction itself (cultural and institutional dimension). We intend to show how these levels intertwine in a synchronic and complementary way.

15 September 2021

11.30-13:00	THEMATIC SESSION: SOCIAL MEDIA	THEMATIC SESSION: ONLINE RELATIONSHIPS	THEMATIC SESSION: VR EMOTION AND COGNITION-2
13:00-14:00	LUNCH BREAK		
14:00-15.30	THEMATIC SESSION: TECHNOLOGIES FOR WELLBEING	THEMATIC SESSION: VR EMOTION AND COGNITION- 1	SYMPOSIUM: HIGH-END AND LOW-END VIRTUAL REALITY SYSTEMS FOR THE REHABILITATION OF FRAILTY IN THE ELDERLY
15.30-17:00	SYMPOSIUM: VIRTUAL REALITY FOR THE TREATMENT OF COMBAT AND NON-COMBAT RELATED POST TRAUMATIC STRESS DISORDER/POST TRAUMATIC STRESS		THEMATIC SESSION: 360° VIDEOS FOR ASSESSMENT AND INTERVENTION
17.15-18.15	KEYNOTE SPEECH PROF. PARSONS		
18.30-19-30	AWARDS AND CONCLUDING REWARDS		
19.30-21-00	SOCIAL EVENT: VIRTUAL TREASURE HUNT		

15 September

11.30-13 PARALLEL SESSIONS

THEMATIC SESSION: SOCIAL MEDIA

'Feed' or 'Unfeed'? The role of social networking use in the link between identity development and psychological functioning in emerging adulthood

Ágata Salvador*, Leonor Pereira da Costa* and Gabriela Fonseca** (*Lusófona University, **University of Coimbra)

This study aims to explore the moderating role of social networking sites (SNS) use in the relation between identity development and psychological functioning among emerging adults. Participants were 253 individuals, aged between 18 and 30 years. Self-report questionnaires were used to measure identity commitment making, psychological functioning (anxiety, depression, and stress), and SNS use (perception of feed refresh frequency). Results suggested that identity commitment was associated with lower depressive symptoms; and perception of higher feed refresh frequency was associated with increased anxiety, depression and stress. Additionally, perception of feed refresh frequency moderated the relation between commitment and psychological functioning: identity commitment was negatively related to depression and anxiety only for those who refresh SNS feed more frequently.

Predictors of problematic social media use in emerging adults: the role of basic needs frustration and fear of missing out

Daniela Villani, Andrea Bonanomi, Francesca Danioni, Christian Cugini and Sonia Ranieri (Università Cattolica del Sacro Cuore)

Given the exponential availability of social media and the increase of problematic behaviors related to their use, there is a need for greater understanding of individual and psychosocial predictors of this phenomenon. According to the Self-Determination Theory, individual differences in users' need satisfaction and frustration can respectively contribute to positive and negative social media experiences. Furthermore, fear of missing out has been recognized as a driver of social media engagement and problematic use. This study examines whether the basic needs satisfaction and frustration, the fear of missing out, and online social activity are significant predictors of problematic social media use. A survey carried out with 251 Italian college students reveals that basic needs frustration, especially relatedness and autonomy, the cognitive dimension of fear of missing out and greater social activity are positive predictors of problematic use of Facebook and Instagram. Implications for the promotion of a positive education of social media will be discussed.

Active and passive selfie use: Implications for mental health

Vojana Obradović and Bojana Bodroža (University of Novi Sad)

1. Introduction: There are two important aspects of selfie-related behaviors and experiences: taking and posting selfies and exposure to other peoples' selfies. These aspects correspond to the concepts of active and passive social networking service (SNS) use. Active use refers to actively creating content and maintaining interaction with other users of SNS. Passive use refers to consuming content without social interaction. The results of previous studies showed that passive SNS use can lead to detrimental consequences for mental health, while active SNS use is usually positively related to mental health. In this study, we wanted to apply the proposed distinction between active and passive SNS use on selfie-related behaviors to better understand the psychological dynamics of selfies and mental health. Therefore, we examined the relationship between active forms of selfie-related behaviors (taking and editing selfies; self-presentation through selfies) and passive form (exposure to and social comparison with others' selfies) with indicators of subjective well-being and mental health.
2. Method: The research involved 437 Instagram users who indicated that they post selfies (87.5% females; age M = 23, SD = 4.68, range 16 to 49 years). We used The Selfie-Related Behaviors and Experiences Questionnaire which measures three aspects of selfie-related behaviors on Instagram: self-presentation (active form), upward physical appearance comparison (passive form) and selfie preoccupation (active form). The Satisfaction with Life Scale and The Scale of Positive and Negative Experience were used to measure subjective well-being. Depression was measured by The Depression Subscale from the Depression, Anxiety and Stress Scale and loneliness was measured by The Jong Gierveld Loneliness Scale.
3. Results: Multiple regression analyses were used to test the relationship between selfie-related experiences and behaviors (as predictors) and subjective well-being and mental health variables (as criterion variables). All five regression models were statistically significant (Rs = [.24 - .40]). The only predictor of the mental health and subjective well-being variables was upward psysical appearance comparison ($|\beta s| = [.25 - .43]$), except for depression which was also negatively predicted by self-presentation ($\beta = .14$). Results showed that upward physical appearance comparison with others' selfies contributed to worse mental health and subjective well-being.
4. Conclusion: As opposed to previous studies on active SNS use, this study predominantly showed no effects of active selfie use on mental health, as preoccupation with taking and editing selfies and self-presentation through selfies were not related to (almost) any indicator of mental health and subjective well-being. The only exception was the result showing that self-presentation through selfies contributed to less depression. However, results regarding the passive aspect of selfie use showed that upward comparison with others' selfies consistently contributed to worse mental health and subjective well-being, giving support to other findings on detrimental effects of passive SNS use. It should be noted, though, that this study does not offer insight into the causal relationship between active and passive use of selfies and indicators of mental health.

Parent-child dysfunctional communication about sexting: The role of parental characteristics and parental mediation

Michal Dolev-Cohen and Tsameret Ricon (Oranim College)

Sexting (sending and receiving sexual messages) could entail risk for adolescent users; hence, it is important that parents are able to address their children's sexuality and mediate to them the implications of sexting. The goal of the current study was to identify parental factors that lead to dysfunctional communication about sexting among 427 parents of Israeli adolescents (ages 10–18) and to determine whether parents' perceived severity of sexting and perceived susceptibility of sexting function as mediating factors. Parents completed a set of questionnaires online. Findings indicated that of the parenting styles examined, authoritarian and permissive styles were positively associated with dysfunctional parent-child communication. Authoritative style was inversely related to dysfunctional communication and was mediated by positive attitudes regarding sex education. Additionally, authoritative parents were capable of assessing the severity and susceptibility of their children's sexting activities. It appears that the quality of the discussion initiated by authoritative parents enabled them to be aware of adolescent behaviors and phenomena and to modulate their communication about the implied risks. Findings suggest that perceiving the implications of sexting as too risky diminishes parents' ability to conduct a high-quality discussion. In conclusion, parents need to mediate and conduct constructive discussions with their children.

Two Dimensions of Problematic Smartphone use Mediate the Relationship Between Fear of Missing Out and Emotional Well-Being

Nino Gugushvili*, Karin Tåht**, Dmitri Rozgonjuk**, Maris Raudlam**, Robert Ruiter* and Philippe Verduyn* (*Maastricht University, **University of Tartu)

It has been shown that both fear of missing out (FoMO) and problematic (i.e., excessive) smartphone use (PSU) are negatively associated with indicators of emotional well-being. Moreover, FoMO has been found to be a key predictor of PSU. This suggests that PSU may mediate the relation between FoMO and decreased emotional well-being but this pathway has never been tested. Moreover, in most studies on PSU, the multidimensional nature of this construct has been ignored. The aim of the present study was to address these gaps by directly testing the mediating role of (subdimensions of) PSU in the association between FoMO and emotional well-being. We conducted a cross-sectional study with Estonian participants (n = 426). Using a simple mediation analysis, we found that PSU partially mediated the relationship between FoMO and decreased emotional well-being. Using a parallel mediation analysis, we found that two specific dimensions of PSU were significant mediators of the relationship between FoMO and decreased emotional well-being: Cyberspace-oriented Relations and Physical Symptoms. This suggests that the negative relationship between FoMO and decreased emotional well-being is due to FoMO stimulating (a) online relationships at the cost of offline interactions and (b) Physical symptoms associated with excessive smartphone use.

THEMATIC SESSION: ONLINE RELATIONSHIPS

Sexting and Pornography in the context of adolescent romantic relationships

Gaia Cuccì and Emanuela Confalonieri (Università Cattolica del Sacro Cuore)

Sexting, that is the online exchange of sexually explicit contents, in adolescence has recently emerged as a public health and social issue. It may be considered as a normative exploration and expression of sexuality, as suggested by the developmental perspective. Online pornography usage is another common online behavior among adolescents and it resulted to be positively associated with sexting. There are no studies investigating this association considering the context of adolescent romantic relationships.
The present study aims at investigating: 1) Differences in sexting behaviors and online pornography usage among adolescents according to romantic relationship status (i.e., in a relationship, in a relationship in the last year, never being in a relationship); 2) Associations between sexting behaviors and online pornography usage distinguishing between adolescent romantic relationship status. Participants were 405 Italian adolescents (Mean Age =17.56) who completed an online questionnaire investigating: sexting behaviors and pornography frequency, online pornography mode of use and violent pornography usage. Results showed that adolescents in a relationship engage in sexting, watch pornography alone and violent pornography more frequently than those in a relationship in the past and those who have never been in a relationship. Several significant positive correlations also emerged between sexting and pornography for those adolescents who already have a romantic relationship. In line with the developmental perspective, findings suggested that the establishment of romantic relationships and the consequent sexuality development may represent a context for adolescents to test and use sexting and pornography, probably as normative expressions of sexuality mediated by new technologies.

Idealization on dating apps: Seeing fewer photos of the potential partner leads to expectancy violation and lower attraction

Simona Sciara*, Clelia Malighetti*, Giorgia Martini**, Giuseppe Riva* and Camillo Regalia* (*Università Cattolica del Sacro Cuore, **Università Vita-Salute San Raffaele)

Online dating applications facilitate the initiation of romantic relationships, by helping users connect with new partners and meet them in subsequent face-to-face appointments. However, switching from online to face-to-face dating can induce expectancy violation and diminish romantic attraction, depending on the type and timing of the online interaction. Drawing on the expectancy violation theory, we hypothesized that seeing fewer photos of a potential partner can also lead to these negative effects. Users who cannot rely on many photos for forming their impression are expected to idealize the person and show, after a modality switching, lower levels of attraction, lower pleasantness of the person's characteristics, and

worse expectancies about her personality. To test this hypothesis, 57 single young adults were randomly assigned to one of two experimental conditions: half of them viewed a dating app's profile with 18 photos; the other half viewed the same profile but with just 4 photos. Participants then filled out a questionnaire assessing their impressions. Later, participants watched a video interview of the person and completed a questionnaire assessing their updated impression. The dependent variables (i.e., attraction, pleasantness, and expected personality) were assessed twice, before and after the video. Results supported our hypothesis. While participants who had seen more photos maintained their impression positive and stable, participants who had seen fewer photos showed, after the video, lower physical attraction, lower pleasantness of the person's characteristics (e.g., gestures), and worse expected personality traits. These results have important implications for the study of romantic attraction and online behaviors.

Structural characteristics in online dating apps: The development of a new taxonomy

Gabriel Bonilla, Mark Griffiths and Daria Kuss (Nottingham Trent University)

A review of the structural characteristics of nine dating applications (Tinder, Grindr, Bumble, Happn, Hinge, Plenty of Fish, OKCupid, Match.com, and Coffee Meets Bagel) was carried out using an ethnographic approach. A resulting taxonomy of structural characteristics (N = 49) includes four main categories: (i) profile formation, (ii) communication medium, (iii) behaviour modification, and (iv) habit creation. The findings of the present study contribute to (i) understanding the relationship between machine design and users' habitual behaviour, (ii) educating online daters to prevent problematic use, and (iii) assisting online dating application developers to have a better insight into SCs and users' well-being.

THEMATIC SESSION: VR EMOTION AND COGNITION-2

ANTaging: A Research Protocol for Active Navigation Training with Virtual Reality in Mild Cognitive Impairment

Cosimo Tuena*, Silvia Serino**, Elisa Pedroli*, Marco Stramba-Badiale*, Giuseppe Riva** and Claudia Repetto** (*Istituto Auxologico Italiano, **Università Cattolica del Sacro Cuore)

Navigation is a multimodal process that requires the active computation of cognitive and bodily cues along with external environmental information. Indeed, according to the embodied cognition framework, the body and the environment build our cognitive representation of the space. This view is supported by findings in the aging population where the decline of bodily information accounts for the deficits in spatial navigation. Consequently, it is crucial to develop innovative rehabilitation solutions in aging that require the active use of bodily and cognitive processing of the space and its elements, like landmarks. Mild cognitive impairment is a geriatric syndrome considered as a transitional stage between

normal aging and dementia. Consequently, it is a preferred time window to administer cognitive rehabilitation programs that could slow down cognitive deterioration. In the current paper, the ANTaging protocol will be presented in its three-step studies: pilot testing, usability study, and proof-of-concept trial.

Virtual Reality-Based Behavioral Activation: A Single Case Experimental Design

Desiree Colombo, Carlos Suso Ribera, Javier Fernandez Alvarez, Azucena Garcia Palacios and Cristina Botella (Universitat Jaume I)

Blunted positive affect forecasting represents a common characteristic of future-oriented cognition in individuals with depression. Negatively biased expectations could contribute to a cycle in which depressed patients are more likely to avoid pleasurable activities, which in turn could maintain depressive symptoms. In this sense, behavioral activation (BA) has been shown to represent a valid evidenced-based approach for the treatment of depression. The aim of this study is to test the efficacy of a four-session virtual reality-based BA protocol. To do so, a series of single case experimental designs with multiple baselines will be implemented, involving a total sample of 16 individuals with moderate to moderately severe depression. The Oculus Rift's Google Earth application will be used, which will provide the participants with a virtual spatial reference in which to anticipate, imagine and experience personalized pleasant activities. We expect that, at the end of the protocol, participants will show improved daily affect and reduced depressive symptoms, as well as enhanced motivation and time spent practicing positive activities. This study will provide an innovative VR-based procedure that could potentially be incorporated in a protocol for the treatment of depression.

Using a spatial-semantic task in virtual reality to study the specifics of switching between languages in bilinguals

Liudmila Shaigerova, Yuri Zinchenko, Roman Shilko, Alexandra Dolgikh, Olga Vakhantseva, Olga Almazova and Yuliana Novikova (Lomonosov Moscow State University)

This study focuses on the active use of language by bilinguals while performing cognitive tasks in Virtual reality (VR). A cross-platform virtual environment (VE) "Unity" was used to elaborate an original technique that involved a spatial-semantic task using two languages (Russian and Tatar) in different task conditions. Participants are asked to create target words by their definitions from the given letters. Also, the participants' spatial ability was measured in a series of mental rotation tasks in the test battery called "King's Challenge". The study involved 38 students aged 18 to 23 years (M = 20.2; SD = 1.2), fluent in both Russian and Tatar. Russian is the language of their education, while Tatar is used mainly for communication. Using VR technology, participants showed a more successful performance in the spatial-semantic task when the definition of the target word was presented in the language of their education (Russian). In the main series, the task "definition in Russian – word in Tatar" was performed significantly faster than tasks "definition in Tatar – word in Tatar" and "definition in Tatar – word in Russian". The study also showed an inverse

relationship between the spatial ability and the time spent on the trial “definition in Tatar - word in Russian”. The fact that spatial ability is associated only with success in one of the trials (switching from the language of everyday communication to the language of education) may indicate an increased complexity of this type of linguistic switch in this particular group of bilinguals.

Introduction: This study focuses on the active use of language by bilinguals while performing cognitive tasks in VR. VR technology is rarely used in research of cognitive processes in relation to bilingualism. However, development and evaluation of new technologies and methods in this area is relevant due to the multilingualism of modern society and the previously identified controversial effects of bilingualism on executive functions and learning.

Method: A cross-platform virtual environment (VE) "Unity" was used to elaborate an original technique that involved a spatial-semantic task. The hardware used in the technique included a VR helmet HTC Vive Pro Eye with two AMOLED screens with a diagonal of 3.5" each (resolution of 2880x1600 pixels). The developed VE is a visually observed space with a horizontally oriented surface with a marked area where the participant can move (Figure 1). On the virtual wall, the definition of the target word is visually presented. Bellow the definition, there is a row of square spaces, the number of which corresponds to the number of letters in the word. Letters in the form of 3D blocks are randomly arranged in the virtual space (VS). Participants are instructed to compose target words, out of the given letters. Participants performed two series which required to compose 8 different words. There were 4 different conditions, in which the language of the definition and the target word varied. The main indicator of the performance in spatial-semantic task is the time, spent on the word reconstruction in each of the trials. The participants’ spatial ability was measured in a series of mental rotation tasks in the test battery called the “King’s Challenge”. 15 tasks were sequentially presented; each task was presented for 20 seconds. The number of correct answers indicated success in the task performance. The study involved 38 students aged 18 to 23 years ($M = 20.2$; $SD = 1.2$), fluent in both Russian and Tatar. All participants live in the Republic of Tatarstan and get the university education in the Russian language. The Tatar language is mainly used for communication. Results: In the main series, the task “definition in Russian – word in Tatar” was performed significantly faster than the tasks “definition in Tatar – word in Tatar” ($t = 2.918$; $p = 0.007$) and “definition in Tatar – word in Russian” ($t = 2.164$; $p = 0.039$) (Student’s t-test for paired samples).

The result also showed a statistically significant inverse relationship between the spatial ability (the mental rotation task) and the time spent on the trial “definition in Tatar – word in Russian” of the main series ($r = –0.471$; $p = 0.010$, Spearman’s correlation coefficient). Thus, the use of VR technology showed a more successful performance in the spatial-semantic task under the condition of presenting the definition of a target word in the language which is used by participants in learning. The fact that spatial ability is associated only with success in one of the trials (switching from the language of everyday communication to the language of education) may indicate an increased complexity of this type of linguistic switch in this particular group of bilinguals. Other cognitive processes seem to be most involved in this situation.

Conclusion: The results obtained in the study showed the feasibility of developing VE and

using VR technology in order to study the features of cognitive activity and the interconnections between bilingualism and cognitive processes. The reported study was funded by RFBR, project number 17-29-09167.

14-15.30 PARALLEL SESSIONS

THEMATIC SESSION: TECHNOLOGIES FOR WELLBEING

SerenaMente Mamma: a Positive Psychology and Mindfulness App for enhancing expectant mothers' wellbeing

Claudia Carissoli*, Giulia Corno**, Elisa Di Gregorio*, Stefano Montanelli* and Daniela Villani* (*Università Cattolica del Sacro Cuore, **Université du Québec en Outaouais)

Women during pregnancy may experience symptoms of anxiety and depression which can negatively affect mother and child's physical and mental health, obstetric outcomes, development of the child and neonatal adaptation. Despite the high incidence of these psychological problems during pregnancy, treatment remains significantly low. The aim of this work is to investigate to investigate the effect of a multicomponent mobile self-help intervention on indices of women's prenatal well-being by using a case series design approach. The app SerenaMente Mamma integrates traditional positive psychology activities with mindfulness-based exercises, leading expectant mothers to learn strategies to better cope with anxiety, , and to positively adapt to pregnancy. The intervention is composed by five modules, for a total length of five weeks, and each module includes three activities.

Venturing through storm and stress. A virtual reality app for the assessment of Emotional Sensitivity

Ilaria Maria Antonietta Benzi* and Pietro Cipresso** (*Istituto Auxologico Italiano, **Università degli Studi di Torino)

Research has shown that emotion (dys)regulation is a central feature in adolescence, resulting from the mutual interactions between neurobiological and temperamental features: indeed, a lack in the ability to regulate affective states is related to a wide range of pathological outcomes and behavioral problems. Emotional sensitivity (ES) is a dispositional feature that drives individuals to perceive more negative emotions in response to a broad range of stimuli and has been shown to foster maladaptive emotion regulation strategies, both in clinical and non-clinical populations. Nevertheless, ES has not been uniquely operationalized and studied. This contribution's main objective is to suggest the development of a Virtual Reality (VR) app for assessing ES through different custom-made scenarios. A group of adolescents and a group of young adults will participate in 20 minutes evaluations using a new technological app to assess ES via a head-tracked Head Mounted Display (HMD). Each subject might be inside an emotionally neutral, positive or negative social environment. The subject must try

to recognize different emotions in specific characters (happiness, sadness, anger, fear, disgust and surprise) and then rate his/her emotional experience after every task. A validated device will record Heart Rate Variability as a further measure of emotion regulation. This innovative app allows to explore ES in an ecological and valid environment, providing useful information (1) on the individuals' ability to recognize others' emotions and (2) on the individuals' perception of emotions in a realistic context. The ES app will provide reliable information for clinical use and research.

Promoting well-being in tennis players through the Perform-Up Tennis App: a pilot study

Sara Bordo, Gabriele Costanzo and Daniela Villani (Università Cattolica del Sacro Cuore)

Mental preparation is a fundamental aspect for athletic performance.
The emotional aspect, as well as the cognitive one, can in fact have a decisive impact on sports performance. More and more scientific contributions have underlined the importance of enhancing these mental aspects along with the classic physical preparation. This research aims at investigating the feasibility and the preliminary effects in terms of the effectiveness of a mental well-being intervention supported by a multi-component "Perform-UP Tennis" self-help app. The use of mobile apps is increasingly used to build remote interventions aimed at promoting individuals' well-being. However, the assessment of the effectiveness of these tools through randomized controlled studies is still scarce. The intervention, consisting of eight weekly modules with variable and progressive contents, aims at allowing athletes to experiment with breathing and relaxation exercises. The experimental group, in which athletes will be trained in using the application, will be compared to a control group to assess the direct effect of the self-help intervention on athletes' psychological well-being.

A Virtual Reality experience to support the Loving Kindness Meditation

Maria Alejandra Quiros Ramirez*, Paul Vahlenkamp** and Stephan Streuber** (*Max Planck Institute for Intelligent Systems, **University of Konstanz)

Mindfulness meditation has been linked to a wide variety of positive health and psychological outcomes for its practitioners. Among the different kinds of meditations available, Loving Kindness Meditation (LKM), also known as metta, is based on the generation of kind intentions, compassion, and wishes of well-being towards oneself and others while visualizing the target individual those intentions are directed to. In recent years, several technological solutions have been introduced to support novices in their meditation practices. However, very few are dedicated to supporting the Loving Kindness Meditation. Here, we present – to our knowledge – the first Virtual Reality experience aimed at supporting the Loving Kindness Meditation. Given the particular properties of Virtual Reality (VR), such as immersion and presence, we hypothesize that VR has the potential of better supporting novice meditators in their practice. Our VR experience leads the user through a guided meditation and visualizations that represent the intentions sent and the target person to whom the intentions are directed to. Based on a design thinking process, while taking into account the feedback

and experience of seasoned and prospective meditators, we designed and developed a VR application for LKM. We evaluated the experience in terms of state mindfulness, compassion, and mood improvement. We discuss the results and summarize lessons learned for the further development of this and future VR meditation experiences. The VR experience will be available for conference participants to test.

THEMATIC SESSION: VR EMOTION AND COGNITION- 1

Gesture based word (re)acquisition with a virtual agent in augmented reality: A preliminary study

Manuela Macedonia*, Joachim Greiner**, Claudia Repetto*** and Selina Wriessnegger** (*Johannes Kepler University, **Technical University Graz, ***Università Cattolica del Sacro Cuore)

From an evolutionary perspective, language and gesture belong together as a system serving communication on both an abstract and a physical level. In aphasia, when language is impaired, patients make use of gestures. Laboratory research has provided evidence that gesture can support aphasia rehabilitation, more specifically anomia rehabilitation. Here, we test an anomia gesture-based rehabilitation scenario with a virtual trainer (VT) in augmented reality (AR) as a therapy simulation. Thirty German speaking participants were trained to 27 bi- and three-syllabic words of Vimmi, an artificial language. Each Vimmi word was paired to a function word in German. The participants were divided into two Groups of 15 and 15 persons. Group A learned words pairs by observing the gestures performed by the VT and additionally imitating them. Group B learned 27 word pairs by observing the VT standing still and listening to it. Participants were trained singularly on 3 days alternating one day of training with one day of rest for memory consolidation. Word retention was assessed immediately after each training session by means of free and cued recall tests subministered electronically. Group A and Group B did not differ in word retention. When subdividing participants in high and low performers interactions showed that high performers benefitted more of gesture based training than low performers. The data in this preliminary study do not speak in favour of VTs as possible tool in gesture based AR language rehabilitation. Technology might have in this case detrimental effects on word learning.

PROFFILO: a new digital assessment tool to evaluate learning difficulties in secondary school

Martina Benvenuti, Matteo Orsoni, Sara Giovagnoli, Elvis Mazzoni, Sara Magri, Lorenzo Bartolini, Samuele Bertani and Mariagrazia Benassi (Università di Bologna)

It is a fact that the assessment of cognitive profile in school-age students is fundamental to highlight learning difficulties in this population but the heterogeneity of cognitive profiles and the differences in learning styles lead to this purpose still quite challenging. In this

scenario, the present study aims to validate PROFFILO, a digital assessment tool for the evaluation of learning disabilities in Italian secondary school students.
PROFFILO is built on gamification. During the interaction with PROFFILO, the students must handle several games proposed by a robot. Each game was designed to assess a specific cognitive function. The cognitive functions taken into consideration are those typically assessed during the classical clinical evaluation of learning disabilities as logical reasoning, memory, visuo-spatial attention, visuo-perception, and phonological discrimination ability.81 students (32 Female, age range 11-14 years) belonging to Italian Secondary School took part in the study. To validate the PROFFILO instrument, each student was assessed with both PROFFILO games and the correspondent standard clinical tests. The Pearson's correlation analysis showed that four games to five were positively correlated to the counterpart clinical tests. In detail, this was true for logical reasoning, memory, visuo-spatial attention, and visuo-perception games. A weak correlation was observed only for the phonological discrimination ability game. These results showed as PROFFILO could be a reliable tool to evaluate the cognitive profile in secondary school students.

Using virtual reality to assess Mind Wandering and Episodic Memory

Philippe Blondé*, Dominique Makowski**, Marco Sperduti* and Pascale Piolino* (*Laboratory Memory, Brain and Cognition, **Nanyang Technological University)

Episodic memory encoding is highly influenced by the availability of attentional resources. Mind wandering corresponds to a shift of attention toward task-unrelated thoughts. However, few studies have tested this link between memory encoding and mind wandering, especially in an ecological setting. The goal of the present work was to systematically investigate the influence of mind wandering on episodic memory encoding using virtual reality. Fifty-two participants were asked to navigate in a virtual environment, where they encountered different scenes that, unbeknownst to them, were target items presented in a subsequent recognition task associated with a Remember-Know-Guess paradigm. Each item triggered a thought probe assessing mind wandering. We found a significant negative linear relationship between the ratio of correctly recognized items and the overall mind wandering reported after the task. Moreover, we found a quadratic reversed U-shaped relationship between the probability of giving a 'Remember' response and our measures of mind wandering. The nearer to the medium value the level of mind wandering was, the higher was the probability to have a recollection-based recognition. Our results indicate that, in a complex environment, the highest probability of actually remembering a scene would be when participants present a medium attentional level: neither distracted by inner thoughts nor too focused on the environment, thus allowing a better global processing of the environment. These results provide insights on the effect of mind wandering on episodic memory encoding and promote the use of virtual reality to investigate cognitive processes.

“SYMPOSIUM: HIGH-END AND LOW-END VIRTUAL REALITY SYSTEMS FOR THE REHABILITATION OF FRAILTY IN THE ELDERLY”

High-end and Low-End Virtual Reality protocol for Reducing the Physical Decline in the Elderly

Marco Stramba-Badiale*, Elisa Pedroli* and Giuseppe Riva** (*Istituto Auxologico Italiano, **Università Cattolica del Sacro Cuore)

We want to present an innovative virtual reality protocol for the rehabilitation of the Physical Decline in the Elderly with frailty. The protocol is divided into two step; one in hospital with an High-end technology and the other one with an Low-End technology for home rehabilitation. The hospital based protocol use a CAVE as technological support; this is an immersive, High-end virtual reality system that allow the perception of real body of the patients. The CAVE is connect to a stationary bike that allow the navigation in the virtual environment by riding. The low-end home-based system include an iPad and a portable cycle ergometer provide by the hospital to the participants. The tasks are designed to improve the balance and the resistance of patient. One is based on the dual-task protocol, patients have to ride in the park and press a button when see a target object. In the other, patient have to perform balance exercise; in the CAVE patients have to avoid rocks moving towards him. At home patients use the iPad to perform exercise that take advantage of the peculiarities of 360 videos, for example they have to maintain the iPad in their hand and explore a virtual room to find some target objects.

High-end and Low-End Virtual Reality protocol for Reducing the Cognitive Decline in the Elderly

Elisa Pedroli* and Giuseppe Riva** (*Istituto Auxologico Italiano, **Università Cattolica del Sacro Cuore)

We want to present an innovative virtual reality protocol for the rehabilitation of the cognitive Decline in the Elderly. The protocol is divided into two step; one in hospital with an High-end technology and the other one with an Low-End technology for home rehabilitation. The hospital based protocol use a CAVE as technological support; this is an immersive, High-end virtual reality system that allow the perception of real body of the patients. The low-end home-based system include an iPad provide by the hospital to the participants. The protocol focus on the stimulation of spatial memory and executive functions. The task are carried out in two different environments, a virtual city for spatial memory and a supermarket for the executive functions. In the city patients have to find and, then, remember the position of different objects placed around. In the supermarket patients have to buy some products following precise rules. The low-end protocol involve the same cognitive domains but use 360° videos to provide tasks. Each days of exercise include 2 or 3 brief task for each goal. Almost every exercise

includes watching a video and some questions to answer. All the videos are about activities of daily living and are recording inside houses, shops or in the hospital.

Brain M-App, a new application for cognitive rehabilitation at home: preliminary results of a usability study

Elisa Pedroli*, Valentina Mancuso**, Chiara Stramba-Badiale*, Pietro Cipresso*, Cosimo Tuena*, Luca Greci***, Karine Goulene*, Marco Sacco***, Marco Stramba-Badiale*, Giuseppe Riva* and Andrea Gaggioli* (*Istituto Auxologico Italiano, **Università E-Campus, ***Institute of Intelligent Industrial Technologies and Systems for Advanced Manufacturing)

Frailty is a preclinical state of increased vulnerability following minor stressor events, associated with a decrease in reserve and function across various physiological processes. Frail people may present also cognitive impairment, in particular in executive, attention, free recall and delayed free recall performances. Rehabilitation interventions aim at restoring the functional potential of persons with disabilities and at preventing more disabilities. The main purpose is to help patients to handle routine personal tasks without the assistance of another person or at least eliminate the need for additional assistance by using adaptive approaches and facilities. Therefore, an early and easy identification of frailty is important to delay the progression and to prevent disability in elderly. Rehabilitation interventions have received increasing attention by the field of technology, particularly Virtual Reality (VR) and 360° videos, thanks to their versatility, affordability, lower costs, and easiness. Considering the growing consensus towards the importance of rehabilitation for frailty and the use of technology for it in clinical setting, patients would benefit to continue their training also at home. We thus present Brain m-App, a tablet-based application with preliminary usability data. This tool is designed for home-based cognitive rehabilitation of frail subjects, addressing spatial memory, attention, and executive functions.

Investigating Virtual Reality technology acceptance by patients: preliminary results from a TAM-based model

Sandra Morelli*, Giuseppe D'Avenio*, Mirko Rossi** and Mauro Grigioni* (*Istituto Superiore di Sanità, **Università "La Sapienza")

In this work, a tool for evaluating technology acceptance is proposed, addressing the acceptance of the Virtual Reality (VR) technology used in rehabilitation programs for frail elderly. The proposed tool is able to identify the factors that determine the intention to use (determinants) of users (patients). The tool is derived from the Technology Acceptance Model (TAM), which, based on psycho-sociological behavioral theories, is a statistical model, predictive of the users' intention to use the technology. Other TAM-based models were subsequently developed (e.g., UTAUT, UTAUT2). To investigate the acceptance of "user patient" towards the use of the VR technology, questionnaires were administered to patients with physical and cognitive impairments, based on the UTAUT2 model.

15.30-17 PARALLEL SESSIONS

"SYMPOSIUM: Virtual Reality For The Treatment of Combat and Non-Combat Related Post Traumatic Stress Disorder/Post Traumatic Stress"

Virtual Reality to Achieve More Successful Therapy for Combat-Related PTSD: Reflections on the Conduct of Four Randomized Controlled Trials at Walter Reed

Michael Roy (Uniformed Services University)

Virtual reality has now been incorporated into therapy for service members with combat-related PTSD for more than two decades. This presentation will review salient lessons from the conduct of four different studies conducted over this time at Walter Reed, the flagship medical center of U.S. military medicine. The first study compared virtual reality exposure therapy (VRET) with prolonged imaginal exposure (PE) for, and found evidence of a more robust response to VRET than PE. In addition, a unique feature of this study was a comparison of functional magnetic resonance imaging 9fMRI), utilizing the Affective Stroop paradigm, before and after therapy, demonstrating significant improvement in regional brain activity in the key brain areas of the amygdala, hippocampus, and anterior cingulate gyrus. After the completion of this study, Walter Reed was the active duty site in a large, multi-center study which also compared VRET and PE, and was responsible for enrollment of the great majority of female study participants. Each of these studies used head mounted displays (HMD) to present the virtual environment, whereas a current, nearly completed study features an immersive "cave" and HMD presentations. This presentation will focus on the role of neuroimaging, the utility of VR in female veterans, the significance of comorbid depression, and the relative merits of HMD and cave presentations. Introduction: Posttraumatic stress disorder (PTSD) has been identified in 10-20% of US military service members returning from 21st century wars in Iraq and Afghanistan. Many have received "Alice in Wonderland" treatment, including stimulants or activating antidepressants in the morning, and multiple sedating medications at night, that have altered their personalities while scantly improving symptoms, and others have been proffered "talk" therapies that they have found unappealing or difficult to embrace. Virtual reality exposure therapy (VRET) can be particularly attractive to younger tech-savvy veterans, and has the potential to facilitate both the delivery of uniquely individualized therapeutic elements and the recall of traumatic events. Early reports of VRET focused largely, if not entirely, on male veterans, and it has been postulated that males are more likely to play video games and thus might find VRET more appealing, but there has been no evidence base to support this conjecture.

Objective: This presentation will provide evidence that: 1) VRET is effective in combat related PTSD, including improvement in regional brain activation levels; 2) VRET is appealing to female veterans, and is at least as effective, if not more so, than in male veterans; 3) VRET is effective in veterans with comorbid PTSD, mild traumatic brain injury (mTBI) and/or depression; 4) VRET can be effective when delivered by HMD or in an immersive cave, with future work seeking to determine whether one delivery mechanism is better than

another.
Methods: The 4 studies to be described involve participants at Walter Reed National Military Medical Center, Bethesda, MD, for whom PTSD has been documented by a standardized assessment, either CAPS or PCL. They have also been assessed for mild traumatic brain injury by the Ohio State University TBI identification method, and for depression by the PHQ-9. Depending on the study, participants generally receive 10-20 sessions of the therapy to which they are randomized. The first study, comparing VRET and PE, utilized the CAPS as the primary outcome measure, but also performed functional magnetic resonance imaging (fMRI) before and after treatment, using the Affective Stroop task during the scans. To assess for a practice effect, scans were also repeated 3 months apart in recently deployed service members, some of whom had mTBI, but who did not have PTSD. The second study also compared VRET and PE, and used the CAPS as the primary outcome measure. The 3rd study used the PCL5 as the primary outcome measure, while the final study uses the CAPS5. The 3rd and 4th studies both use Motion-assisted, Multi-modular Memory Desensitization and Reconsolidation (3MDR), which combines elements of VRET, walking on a treadmill while immersed in VR, exposure to self-selected music and pictures, and an eye movement task.
Results: The first study identified clinically significant improvement in PTSD symptom severity on the CAPS with VRET but not PE. Overall, all study participants had significant demonstrated improvement on fMRI, with resolution of hyperactivity in the amygdala and hippocampus, and significant improvement but not complete resolution of inhibition in the anterior cingulate gyrus. Discussion of the second study will primarily focus on those seen at Walter Reed, where women did especially well with VRET. In the third study in which all participants had comorbid mTBI and half were women, clinically and statistically significant improvement has been documented for 75% of all participants, and resolution of PTSD for 50%. Participants in this study were randomized to either receive an eye movement task or not, and both groups have had comparable significant improvement in PTSD symptom severity.
Conclusions: There is a compelling body of evidence that VRET is an effective treatment for combat-related PTSD, including in women veterans, and in those with comorbid depression or mTBI. Novelty/Discussion: VRET, whether delivered via head mounted display or in a "cave" is a novel and appealing treatment for combat-related PTSD. It can attract service members and veterans who may have little interest in traditional "talk" therapy or pharmacotherapy, and may keep them engaged at higher rates than more traditional approaches. VRET warrants particular consideration in female veterans and those with comorbid mTBI or depression.

Personality, posttraumatic stress symptoms, emotional regulation, and coping strategies: Virtual-reality task of Covid-19 infection

Ricardo Pinto, Pedro Gamito and Jorge Oliveira (Lusofona University)

This study explored an integrative model to explain the behavior during the covid-19 pandemic, particularly the risk of infection, using a virtual reality paradigm. It is known that psychological factors play an important role in adherence to public health measures and how

people cope with the threat of infection. For instance, personality traits play an important role in the method with which an individual copes with various problems and affect an individual's vulnerability and susceptibility to different stressors and risk-taking behaviors. Additionally, post-traumatic stress symptoms, emotional regulation and coping can also contribute to explain some variability in individuals with similar personality traits. The participants of the present study were young adults, university students, with age over 18. Participants completed questionnaires prior to a virtual reality experience who involved scenarios of daily situations of potential infection of covid-19. This virtual task generated indices of risk infection which was the dependent variable. The independent variables included narcissistic personality traits, impulsiveness, posttraumatic stress symptoms, coping style and emotional regulation. Our preliminary results found that narcissistic, impulsiveness and posttraumatic stress symptoms were associated with higher risk of Covid-19 infection, partially mediated by emotional regulation and coping strategies. This finding is important because it is easier to intervene in proximal factors, such as emotional regulation and coping strategies, than in factors related to personality traits. This evidence can contribute to the development of evidence-based programs that can be used as universal, selective, and indicated prevention strategies in future pandemic situations.

Predicting Post-Traumatic Stress Disorder Treatment Response Using Heart Rate Variability Response to Virtual Reality Environment and Modified Stroop Task: An Exploratory Study

Jeffrey Pyne*, Brenda Wiederhold**, Joseph Constans*, Timothy Kimbrell*, Susan Jegley*, Aline Rabalais***, Bo Hu**** and Mark Wiederhold** (*Veterans Affairs, **Virtual Reality Medical Center, ***University of Texas Health Science Center, ****University of Arkansas for Medical Sciences)

Background: Models explaining the development and maintenance of post-traumatic stress disorder (PTSD) emphasize arousal and dysfunctional information processing mechanisms. Accurately predicting treatment response can inform treatment decisions, response expectations, and optimize use of mental health treatment resources.
Objective: The goal of this study was to examine objective physiologic and cognitive reactivity predictors of PTSD treatment response and these included: heart rate, heart rate variability (HRV), and a Modified Stroop Task (MST).
Methods: Forty-five participants had deployed to Iraq or Afghanistan, were receiving outpatient mental health care for PTSD, completed baseline and 6-month follow-up assessments, and analyzed in this study. Data was collected in this order: baseline heart rate and HRV with no stimuli; MST; heart rate and HRV collected before, during, and after two 3-minute virtual reality (VR) simulations (combat and civilian scenes), and self-report measures. HRV measurements included: standard deviation of normal beat to beat intervals (SDNN), high (HF), and low frequency (LF) power. HRV recovery was defined as HRV after VR scene minus HRV during VR scene. MST threat variables were derived from the time to name the color of neutral, social threat, and combat threat words. Outcome variable was 17-item Clinician Administered PTSD Scale (CAPS). Generalized linear models were used for

multivariate analyses.
Results: Controlling for baseline CAPS and combat experiences, the following baseline HRV recovery variables were significant predictors of 6-month CAPS: SDNN after combat scene minus SDNN during combat scene and LF after civilian scene minus LF during civilian scene. The SDNN and LF recovery variables explained an additional 10% and 7% of the variance, respectively. HRV at rest, heart rate reactivity, heart rate recovery, and MST index scores did not predict treatment response.
Conclusions: HRV recovery variables in the context of a simulated stressor were significant predictors of PTSD treatment response after controlling for baseline CAPS and combat experiences. The direction of this relationship indicates that greater HRV recovery at baseline predicted lower 6-month PTSD symptom severity.

Using Virtual Reality to Enhance Exposure Therapy for PTSD: A Randomized Controlled Trial in an Active Duty Sample

Amie Newins*, Deborah Beidel*, Sandra Neer*, Clint Bowers*, Peter Tuerk**, Craig Cunningham***, Scott Mooney****, Heather Hauck***** and Marti Jett****** (*UCF RESTORES, University of Central Florida, **University of Virginia, ***Naval Medical Center Portsmouth, ****Dwight D. Eisenhower Army Medical Center, *****Naval Medical Center Camp Lejeune, ******US Army Center for Environmental Health Research, Fort Detrick)

In military populations, PTSD may result from combat experiences, moral injury, sexual assault, or other traumas that occur within the context of service (e.g., training accidents, witnessing civilian mistreatment). Military troops returning from Iraq and Afghanistan report high levels of combat-related PTSD symptoms (up to 18%; Hoge et al., 2006; Tanielian & Jaycox, 2008). Among one sample of nearly 980,000 veterans, 35.8% of women and 2.4% of men reported an episode of MST (Valdez et al., 2011). Exposure therapy (EXP) operates on long-established and fundamental principles of behavior therapy and offers hope for acute PTSD symptom alleviation (IOM, 2007; NICE, 2005). Its theoretical basis is that repeated exposure to the anxiety-provoking stimulus/event facilitates the process of habituation (Foa & Kozak, 1986). There is now a body of evidence that EXP and EXP assisted by virtual reality (VR) is beneficial for military PTSD in active duty personnel (McLay et al., 2012; Reger et al., 2011) and veterans (Goodson et al., 2013; Gros et al., 2011; Price et al., 2013; Rauch et al., 2014; Sutherland et al., 2012; Tuerk et al., 2011; Wolf et al., 2012; Yoder et al., 2013). While EXP generally results in improvements in physiological arousal, EXP does not necessarily improve social functioning, anger management, or depression. Trauma Management Therapy (TMT) is a treatment developed specifically for PTSD, which includes individual EXP enhanced by VR and a group treatment component (Social and Emotional Rehabilitation; SER) that targets anger management, social reintegration, and depression. We have previously demonstrated that the compressed three-week version (i.e., TMT IOP) is effective with military personnel who served in Iraq and Afghanistan (Beidel et al., 2017).

Objective: The current project is examining the effectiveness of TMT IOP, standard

Prolonged Exposure (PE; 12-week protocol), and compressed PE (CPE; two-week protocol). We hypothesized the following: (1) TMT IOP will produce significantly greater decreases in PTSD symptomatology (as assessed by the CAPS-5) than PE delivered in either a compressed or standard format and differences will be maintained at follow-up; (2) TMT IOP will produce significantly greater decreases in depression, anger, and guilt than PE when delivered in either a compressed or standard format and differences will be maintained at follow-up; (3) TMT IOP will result in significant greater increases in socialization, quality of life, and overall functioning than PE delivered in either a compressed or standard format and differences will be maintained at follow-up; and (4) TMT IOP and CPE will result in significantly lower dropout rates than the standard 12-week PE program.

Methods: Active duty personnel with PTSD are being recruited at three military bases in the United States. Participants are randomly assigned to received either TMT IOP, CPE, or standard PE, and they complete clinician-rated and self-report measures at pre-treatment, post-treatment, three-month follow-up, and six-month follow-up. Imaginal exposure is enhanced with the use of VR in the TMT IOP condition.

Results: Data collection is currently ongoing with approximately 30 participants enrolled to date; it is estimated that it will take an additional three years to collect data from the proposed sample of 300 participants.

Conclusions: This study will provide further evidence of the utility of VR to enhance EXP for PTSD in military samples. It will also provide information about whether compressed treatments are as efficacioius as longer interventions, which could allow a faster return to full active duty status. Additionally, it is important to determine whether the additional SER components of TMT offer benefits above and beyond PE to ensure the most efficacious treatment for the whole service member is used.

THEMATIC SESSION: 360° VIDEOS FOR ASSESSMENT AND INTERVENTION

Aphasia360°: A virtual reality intervention for anomia rehabilitation in post-stroke patients

Claudia Repetto*, Alice Cancer*, Claudia Rodella*, Marta Campagna** and Alessandra Maietti** (*Università Cattolica del Sacro Cuore, **Fondazione Poliambulanza)

Aphasia is an acquired deficit following acute damage to the central nervous system that involves the difficulty or impossibility of understanding and formulating language. A typical disorder of non-fluent forms of aphasia is anomia. The anomia refers to the difficulty in finding words, in particular when trying to name objects and actions. According to the Embodied Cognition approach (EC), language is tightly connected to the motor system. In this view, language rehabilitation programs should stimulate language through the activation

of the motor system. In this approach, since anomic deficits are often due to a weak link between the meaning of the word and its lemma, the Hebbs' principles of coincident and correlated learning can be exploited, i.e. by intensifying the synchronous activation of lexicon and semantics and connecting them with the motor counterpart. In this study we present an innovative training, based on the EC framework, in which we will make use of new technologies for anomia rehabilitation in post-stroke patients. Specifically, we will use 360° videos representing everyday actions displayed from the first-person point of view, experienced immersively with a head-mounted display. The training will be administered 3 times a week for 4 weeks. The control group will watch standard videos representing the same actions recorded from the third-person perspective. Naming abilities will be tested before and after the training, together with other cognitive and psychological measures. We expect that the group who will undergo the 360° videos training will show greater improvement of performance compared to the control group.

An innovative solution for an integrated evaluation of Executive Dysfunctions

Francesca Borgnis*, Francesca Baglio*, Federica Rossetto*, Giuseppe Riva** and Pietro Cipresso*** (*Fondazione Don Carlo Gnocchi ONLUS, **Istituto Auxologico Italiano, ***Università degli Studi di Torino)

In recent years, the traditional neuropsychological assessment of executive functioning has been enriched by introducing VR-based tools and identifying non-verbal physiological measures obtained with different devices such as Eye Tracker (ET) and electroencephalogram (EEG). This work wants to propose an innovative protocol for a multidimensional and multicomponent assessment of Executive Functions (EFs) through Executive-functions Innovative tool (EXIT 360°), an original task for EFs delivered via an innovative technological device, a comfortable mobile-powered VR headset combined with ET and EEG sensors. It is expected that this new assessment will allow for obtaining more information about executive functioning in real-time and a quicker diagnosis of executive dysfunctions. Overall, this innovative assessment wants to go beyond the effectiveness of VR-based tools or ET and EEG studies by combining different data for a multidimensional and multicomponent evaluation of executive functioning with high clinical usability and ecological validity.

Usability and Users Experience of EXecutive-function Innovative Tool (EXIT 360°)

Francesca Borgnis*, Francesca Baglio*, Lidia Uccellatore**, Giuseppe Riva*** and Pietro Cipresso**** (*Fondazione Don Carlo Gnocchi ONLUS, **Università Cattolica del Sacro Cuore, ***Istituto Auxologico Italiano, ****Università degli Studi di Torino)

Executive dysfunction represents a health problem due to its high impact on everyday life. Thus, the early assessment of these impairments appears crucial. The ecological limitations of traditional neuropsychological batteries and difficulties in administering tests in real-life scenarios have led to the use of technological tools for the assessment of executive functions in real-life. This work wanted to test usability and users experience of EXecutive-function

Innovative Tool (360°), a 360°-based tool for the assessment of executive dysfunction in a pilot evaluation study that involved 23 healthy young subjects. This evaluation consisted of 1) usability assessment using the System Usability Scale; 2) evaluation of user's engagement using ICT-Sense of Presence; 3) evaluation of users experience by the User Experience Questionnaire. Results showed encouraging and interesting data in terms of usability, user experience and engagement of EXIT 360°. Overall, EXIT 360° appeared as a usable, engaging, creative and challenging tool with good spatial presence, excellent ecological validity and irrelevant negative effects. Further studies will have to be conducted for evaluating all these aspects in healthy adults and elderly subjects and also in clinical population.

The 360° Mental Screening (MS-360°): A Screening Test for an Ecological Assessment of Everyday Cognitive Functioning

Luca Pieri*, Valentina Moro**, Giuseppe Gambina***, Elena Facci***, Stefania Amato*** and Daniele Romano* (*Universita' degli Studi di Milano-Bicocca, **Università degli Studi di Verona, ***Verona Memory Center)

Background: Comprehensive neuropsychological evaluations are often time-consuming and may not be suitable for every situation. Screening tests represent a useful tool to detect the altered status of cognitive functioning briefly. However, the majority of currently available tools show low to moderate ecological validity, limiting their capability to detect real-life impairments. Virtual Reality (VR) technology emerged as a possible solution as it can simulate everyday tasks maintaining a standard setting in almost any possible situation. Many VR-based cognitive tests are now present in the literature, but their psychometric properties are rarely assessed. Objective: The project has two objectives: achieving incremental evidence toward the feasibility of using 360° photos and videos in the neuropsychological assessment and creating a screening test for a valid and reliable clinical application.
Methods: We are developing a new screening test (The 360° Mental Screening - MS-360°) that, instead of using computer-generated environments as scenarios, employs 360° photos and videos to generate an innovative, highly immersive VR environment. This media can simulate real-life situations in a photorealistic fashion, providing ecological stimuli and recording meaningful behavioral measures. The MS-360° uses videos recorded with an omnidirectional camera (Insta360 One X) as virtual environments, which can be administered wirelessly using a portable head-mounted display (Oculus Quest 2) and a 5GHzWi-Fi network. The test consists of a set of 360° videos including fourteen different scenarios: in each of these, the participant is asked to perform some ecological tasks aimed to elicit specific cognitive functions. We quantified the accuracy in each specific task as a measure of outcome. We are studying two groups at the current stage: patients reporting subjective cognitive impairment recruited from the CEMS Memory Center of Verona and healthy controls matched for age and education. We analyze differences and correlations between the score obtained at the MS-360° test and scores obtained in other established paper-and-pencil

screening tests (e.g., MOCA, MMSE). We also analyze the user-experience, including usability and immersivity/presence measures.
Results: Data collection is in due course. We expect that the MS-360° will show adequate user-experience rates as compared to similar technology. We also expect to find correlations between our test and the paper-and-pencil screening tests (range between |.5| and |.8|). Finally, we expect that the MS-360° will be able to distinguish patients' and control's performances.
Conclusions: VR is emerging as a valid tool to design neuropsychological tests. However, the lack of proper validation studies limits the evidence for widespread use of this technology for a reliable assessment of cognitive functions. Moreover, the study of the ecological value of 360° scenarios compared to paper-and-pencil tests or computer graphic VR has the potential to unlock a new, easy-to-use, technological improvement.

Using 360-degree videos for virtual bodily illusions: a preliminary study

Silvia Serino, Daniele Di Lernia, Alessandra Parisi and Giuseppe Riva (Università Cattolica del Sacro Cuore)

Illusions that induce a feeling of ownership over a virtual body have been extensively used to explore the bodily experience. Given the potential advantages in using 360° technology in terms of more flexible vary aspects of bodies and experimental conditions, here we tested the viability of a full-body ownership illusion induced using a 360° video in both first- and third-person perspective (1PP vs. 3PP). 46 female participants participated in the study. The illusory ownership over a recorded real-life body of a young woman visualized in a 360° scenario was induced through a synchronous visuo-tactile stimulation. Half of the participants visualized the recorded body in 1PP, while for half of the participants in 3PP. For both groups, a control condition (asynchronous visuo-tactile stimulation) was carried out. The strength of illusion was measured through the Embodiment Questionnaire. Our results revealed a significant difference between the two different conditions, with the synchronous visuo-tactile stimulation inducing globally higher levels of embodiment. These findings preliminary suggest the feasibility of using immersive 360° scenarios for delivering virtual bodily illusions.

POSTER SESSIONS

14 SEPTEMBER 14.00-15.00

A brief online intervention to promote gratitude using ecological momentary assessment: a study protocol

Alberto González-Robles*, Adriana Mira**, Amanda Díaz-García*, Azucena García-Palacios*** and Cristina Botella*** (*Universidad de Saragoza, **Universitad de Valencia, ***Universitat Jaume I)

Gratitude is a positive emotion that can be trained through psychological interventions to improve subjective wellbeing. This study aims to analyze the effects of a psychological intervention for the promotion of gratitude. We have developed a manualized videoconference-delivered brief intervention protocol, which aims to enhance a sense of gratitude. The effects of the intervention on gratitude, positive affect, RDoC positive valence systems and social processes, and several additional clinical and well-being measures will be assessed through a multiple baseline, across components design using traditional measures along with the incorporation of ecological momentary assessment. Assessments will take place at baseline, throughout the intervention process, at post-intervention and at 1-month follow-up. This work describes the study protocol**.**

Body based mental imagery and its relationship to body image disturbances and interoception from adolescence to late adulthood

Akansha Mahesh*, Naraindas* and Sarah Cooney* (*University College Dublin)

The ability to manipulate visual perspective during mental imagery is thought to incorporate various aspects of bodily processing that require complex sensory-perceptual interactions with long-term memory. However, individuals with Body Image Disturbances (BID) are thought to have deficits in the ability to alternate visual perspectives due to maladaptive self-processing. This study aims to investigate the role of multisensory function and body image in mental transformation ability in adolescence through to old age to better understand the developmental trajectory of BID. Participants completed questionnaires assessing objectification, body attitudes and interoceptive awareness. Participants then completed an online mental Own Body Transformation (OBT) task to assess visual perspective taking. We predict that performance on the OBT will be mediated by age, BID and interoception. We also predict that interoceptive awareness will be predicted by levels of BID. This study will yield unique insights into the developmental trajectory of BID and self-processing across the young and late adult life span.

Testing a music-based virtual reality intervention for upper limb motor rehabilitation in post-stroke hemiparetic patients

Alice Cancer*, Claudia Repetto*, Alessandra Maietti** and Alessandro Antonietti* (*Università Cattolica del Sacro Cuore, **Fondazione Poliambulanza, Brescia)

Hemiparesis affects the majority of stroke patients in the acute phase. In post-stroke motor rehabilitation patients can re-learn motor sequences through repetitive training. Research showed that virtual reality (VR) can be effectively used in upper limb motor rehabilitation by training motor coordination and gestures in an immersive virtual environment. Another promising line of intervention in post-stroke rehabilitation is the use of music, with evidence supporting the notion that a rhythmic accompaniment promotes the recovery of motor coordination in patients with hemiparetic stroke. Furthermore, studies showed a beneficial effect of the observation of movements performed by a third person in patients with post-stroke hemiparesis. Based this evidence, the present study aims at testing the feasibility and efficacy of a novel music-based VR intervention designed for upper limb motor rehabilitation in post-stroke hemiparetic patients. The treatment consists in upper limb repetitive training activities through the imitation of movements synchronized with a musical accompaniment and is delivered in 10 sessions over 2 weeks, supervised by a physical therapist. Participants wear a VR headset through which they observe egocentric 180° 3D videoclips. The experimental condition (group A) will be compared with a no-music condition (group B), to test the specific effect of music, and with traditional physiotherapy rehabilitation (group C), to test the efficacy of the approach. We expect that the patients undergoing the experimental intervention (group A and group B) will show a greater upper limb motor function improvement, as compared to the active control group. As a secondary endpoint we expect the music component to induce a greater motor improvement as compared to the experimental condition without music.

The effects of the COVID-19 pandemic on body image and eating habits in a non-clinical sample of adult women

Amelia Paquette*, Giulia Corno*, Johana Monthuy-Blanc** and Stéphane Bouchard* (*Université du Québec en Outaouais, **Université du Québec à Trois-Rivière)

Early reports suggested that lockdown measures associated with the COVID-19 pandemic are impacting people with a current/past diagnosis of eating disorders. They reported significantly greater difficulties with concerns with weight/shape, body dissatisfaction and eating habits, especially for women. However, impacts of the COVID-19 pandemic on the body image and eating habits of women from a non-clinical sample is still unclear. This study aims to investigate, in a non-clinical sample of adult women, the impact of COVID-19 on concerns about weight and shape, body dissatisfaction and their relationship with eating habits. Recruitment started in December 2020 and is still ongoing. 303 adults have participated so far. Participants in the final sample will be non-clinical women (aged 18 and older), who will complete a self-report questionnaire about eating habits, restrictions in eating habits, binge eating, emotional eating, weight/shape concerns and body dissatisfaction. Specifically, body

image dissatisfaction will be assessed with a non-immersive version of the eLoriCorps Immersive Rating Scale, a 3D virtual body image scale. Descriptive statistics will be performed, and correlation analysis will be used to analyze the relation between the body image variables (weight/shape concerns and body dissatisfaction) and the eating habits variables (eating habits, restrictions in eating habits, binge eating and emotional eating). This study is the first to use a virtual body image figure scale to measure body dissatisfaction during the COVID-19 pandemic. Findings will also contribute to the literature by exploring the effects of the COVID-19 pandemic on the body image and eating habits in a non-clinical sample of women.

1. Introduction: In January 2020, the COVID-19 pandemic emerged, resulting in a high proportion of countries implementing a lockdown, with restrictions on social life and travels. There is preliminary evidence of the COVID-19 pandemic impacts on people with a current/past diagnosis of eating disorders. These people reported significantly greater difficulties with concerns with weight/shape, body dissatisfaction and eating habits. Weight and shape concerns refers to an individual's preoccupation, or over-interest in their body image and the assessment of their self-worth largely in terms of their body shape and weight. Rather, body dissatisfaction refers to an individual's subjective and negative evaluation of their body or a specific part of their body. Concerns about weight and shape and body dissatisfaction are both components of the body image, who has emerged has a specific predictor of eating habits, such as restriction in eating habits, binge eating and emotional eating. Concerns about body shape, weight and eating habits, as well as body dissatisfaction are common among women. However, impacts of the COVID-19 pandemic on body image and eating habits of women from a non-clinical sample is still unclear. The aim of this study is therefore to explore, in a non-clinical sample of women, the impact of COVID-19 pandemic on weight and shape concerns, body dissatisfaction and their relationship with eating habits.

2. Method/Tools: Recruitment started in December 2020 and is still ongoing. As of mid-May, 303 adults have participated so far. Participants in the final sample will be non-clinical women (aged 18 and older), who would have completed a self-report questionnaire on Lyme Survey web platform about eating habits, restrictions in eating habits, binge eating, emotional eating, weight/shape concerns and body dissatisfaction. More specifically, eating habits, restrictions in eating habits, binge eating, and emotional eating will be assessed with single items formulated ad hoc. Two subscales of The Eating Disorder Examination Questionnaire (EDE-Q) are being used to measure body shape and weight concerns. Finally, body image dissatisfaction will be assessed with a non-immersive version of the eLoriCorps Immersive Rating Scale, consisting of seven female 3D virtual body figures drawn in black and white, and presented in an allocentric perspective. These 3D body figures are ranging from 1 to 7 with BMI increasing from 15.00 to 33 kg/m2 (with an increase of 30% between each pair of virtual body). Using the eLoriCorps Scale, participants will be asked to indicate the virtual body that corresponds to their real body and to indicate the one that corresponds to their ideal body. Body dissatisfaction corresponds to the participant's perceived body size minus the ideal body size. The study protocol was approved by the ethic committee of the Université du Québec en Outaouais and the Université du Québec à Trois-Rivière.

3. Results: Descriptive statistics will be performed, and correlation / regression analyses will be used to analyze the relation between the body image related variables (i.e., weight/shape

concerns and body dissatisfaction) and eating habits related variables (eating habits, restrictions in eating habits, binge eating and emotional eating).
4. Conclusion: The results of this study will contribute to the literature by exploring the effects of the COVID-19 pandemic on the body image and eating habits in a non-clinical sample of adult women. Furthermore, to the authors' knowledge, this study is the first to use a 3D virtual body image scale to measure body dissatisfaction. This software already improves on traditional assessment methods based on Figure Rating Scales, where people have to compare themselves to figure drawings, by adding the third dimension to the figures, making it easier for the user to identify with them, and so providing a realistic perspective on body image dissatisfaction.

Transposing a paper-and-pencil neuropsychological test into an immersive virtual environment

Andrea Onali and Paolo Francesco Cottone (Università degli Studi di Padova)

In the field of neuropsychological studies, virtual reality (VR) has established itself as a useful assessment tool. Indeed, VR offers the opportunity to obtain more data, a higher level of standardization and more precise measurements, compared to traditional paper-and-pencil tests.
Objective: The main aim of this study was to verify the possibility of transposing a paper-and-pencil neuropsychological test, the Color Trails Test (CTT), into an immersive virtual environment. The secondary aim was to assess the quality of the VR environment used, in terms of user experience and potential adverse symptoms induced by VR.
Methods: For this purpose, a VR environment was developed ad hoc. Study participants were asked to complete the two CTT tasks (CTT-A and CTT-B) and two virtual tasks (Task-A and Task-B). The tasks' order was counterbalanced. Completion times of all tasks and the number of errors in the VR tasks were recorded, to check for possible correlations. Subsequently, participants were asked to complete the Virtual Reality Neuroscience Questionnaire (VRNQ). VRNQ results were analysed to investigate user experience and overall quality of the VR environment and to detect potential VR induced symptoms.
Results: The preliminary results, obtained from a previous pilot study, appeared promising. However, due to the Covid-19 pandemic, the experimental phase underwent a momentary stop. However, we are confident that we can resume data collection in the coming months.
Conclusions: If the correlation between CCT and the VR test were verified, this could be the first step towards developing a VR version of the CTT. Moreover, good results in the VRNQ would indicate the VR environment developed for this study is suitable for neuropsychological testing.

Emotional Wandering in a VR real world: a preliminary study

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Virtual reality is an effective tool to stimulate emotions in positive psychology. Different applications cover various fields ranging from health to entertainment. In this preliminary study we aim to test the emotional impact of Wander, an application providing the chance to explore real geographical places, considering also the sense of presence and the sense of place that the 14 participants experience during its usage and the feeling they develop towards the places just visited virtually. The findings suggest that the emotional link with a geographical environment plays an important role in a meaningful VR experience. Future directions are discussed.

Understanding the Overall Utilization of a Chatbot for Depression

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Research on mental health chatbots is in the early stages of development. While outcomes studies have shown promising results, little information on usage patterns is available. The aim of this analysis is to describe the overall utilization of a mental health chatbot, the number of interactions with depression modules, user messages, characters typed, and average time engaged with depression modules.
Methods: A total of 354 users interacted with twelve depression modules of the chatbot. Descriptive statistics are provided for the frequencies of user messages, characters typed, and average time engaged with depression modules.
Results: 354 participants had at least one interaction with one of the modules (M= 2.18, SD= 1.56, range = 1-10 modules); sent a total of 6,220 user messages (M= 17.57, SD= 19, range= 1-73 messages) with a total of 86,298 characters (M= 243.78, SD = 299.29, range = 2-1644 characters).
Conclusion: Participants engaged on average with 2.18 modules, and exchanged a considerable amount of messages across time. Participants have shown interest in chatbots, but there is large heterogeneity in user engagement in terms of time and characters typed and a large attrition rate. Implications: If users engage on an average of two modules, chatbot developers should focus on improving the first modules to increase the chances of continuing chatbot usage. The dose of the chatbot intervention may not be enough to produce long-lasting effects.

Progetto Savor, a pilot study: effectiveness of e-savoring training on subjective well-being and the role of future time perspective in older and young adults

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Background: Savoring is the ability to be mindful of positive experiences and to be aware of and regulate positive feelings about these experiences. Literature showed that savoring interventions can be effective at improving subjective well-being in people with different ages. Nevertheless, no savoring intervention has been implemented online.

Objective: this pilot study aimed to evaluate the feasibility and effectiveness of "Progetto Savor" - a self-help e-savoring training - on savoring beliefs and strategies, on satisfaction with life and positive and negative emotions. It also examined the role of future time perspective in relation to age differences and savoring.
Methods: 26 participants (10 older adults and 16 young adults) completed the training and the assessments through online questionnaires related to the investigated variables. This study consisted in two online activities per week for three weeks, reaching six total exercises. Repeated measures ANOVA were conducted to compare the effects of the intervention in young and older adults.
Results: the collected data revealed significant improvements in savoring beliefs, self-congratulation and memory building strategies and in positive emotions. Furthermore, perceived future opportunities were negatively associated with the absorption strategy, while time left to live and future time perspective were positively associated with it. The online platform was positively evaluated and most of the participants considered the training useful. The analyses also revealed that perceived usefulness of the training was positively associated with satisfaction with life and savoring beliefs and negatively associated with negative emotions.
Conclusion: future research could involve a larger sample and evaluate long-term effectiveness. These findings are promising and suggest that "Progetto Savor" has the potential to enhance savoring and subjective well-being in different age groups.

"ConsapevolM€NT€": an application to empower management money competences

Davide Cavallo, Angela Sorgente, Paola Iannello, Margherita Lanz, Chiara Valenti and Chiara Rolla (Università Cattolica del Sacro Cuore)

A great number of studies identifies the individual level of financial literacy as a significant predictor of a satisfactory financial decision-making. However, among general population, financial literacy has been found to be quite low and even lower among fragile populations. The current contribution aims at presenting a mobile application developed to respond to the need for financial education among cognitive disables. In particular, we devised an application specifically targeted to emerging adults with Down syndrome. Through the application, the user's tutor can create a personalized path for him/her, focusing on the user's specific needs. The application is designed to improve, through training videos and guided exercises, users' planning competences, foster autonomy, and, ultimately, enhance the quality of life.

Meta Cognition on the Internet: Expected Accuracy of Human and AI Virtual Assistants' First Impressions about Us Online

Elena Tsankova and Ergyul Tair (Institute for Population and Human Studies, Bulgarian Academy of Sciences)

On the Internet we encounter different types of interaction partners—some human, some AI. How we believe they perceive us upon our very first encounter sets the ground and may determine the outcome of the subsequently unfolding interaction. In a between-subject online experimental design we studied the expected accuracy with which imagined human and AI Internet virtual assistants form first impressions. We measured expected meta accuracy as the absolute difference between participants self- and meta- (perceived interaction partner's viewpoint) perception along the two central dimensions of social cognition (warmth and competence). We anticipated that 1) expected meta accuracy would be higher for human than for AI virtual assistants and that 2) expected meta accuracy would increase with increasing perceived human-mind-like abilities of the virtual assistant. We found proof for the second prediction and uncovered evidence for primacy of the warmth dimension in Internet meta cognition. Our results are in line with and extend previous knowledge about mind perception to the field of Internet meta cognition. Our work is pioneering in the study of meta cognition of first impressions on the Internet and promises an interesting route for uncovering previously unexplored aspects of online communication. With the ultimate goal of applying theoretical knowledge to the practical facilitation of Internet communication we present ideas for further exploration of the area of online meta cognition. Our suggestions include different operationalizations of the primary phenomenon of interest as well strengthening the experimental manipulation to probe for the Uncanny Valley phenomenon in Internet meta cognition.

Relationship between Body Satisfaction and Social Media Platforms

Grace Weatrowski, Claire Voss, Katherine Turner and Jessica Mueller (San Diego State University)

The current study was conducted to examine the relationship between the social media platform that was most used by participants, Instagram, Twitter, Snapchat, Facebook, Tik Tok, or Tumblr, and their body satisfaction. It was hypothesized that body satisfaction was influenced by the social media platform most used by participants. A total of 280 undergraduate Psychology students from a Southern California university completed an online survey which asked about their social media use and body satisfaction, including which platform participants used the most. Findings revealed that there was no significant difference among social media platforms for participant's body satisfaction. These findings suggest that different social media platforms did not have a significant effect on participant's body satisfaction. Findings also revealed that participants who endorsed using Tik Tok the most had the lowest mean body satisfaction, while participants who reported using Facebook the most had the highest mean body satisfaction. Future researchers should examine further possible associations between social media platforms and body satisfaction, by focusing on participants of different education levels and ages or recreating this study. Another area of future research could focus on the type of content consumed on these platforms, and how certain content influences participant's body satisfaction.

Digital Career Guidance Technologies: Using Virtual Reality

Valeriia Demareva, Irina Petrova and Marina Zhukova (Lobachevsky State University)

In recent years, career guidance has become an increasingly technological phenomenon. In 2021, we conducted a series of experiments on testing representatives of different age groups with the author's and adapted methods using virtual and augmented reality together with technologies for collecting data on the subject's reactions to professional content and changing test conditions.
The study sample consisted of 10 high school seniors, 10 first-year students, 10 final-year undergraduate students, and 10 graduate students. These were participants in the career guidance tests according to their professional choice and, in addition, from possible related professions. A virtual reality helmet/glasses, an EEG recording device, as well as heart rate and skin-galvanic response sensors were used in the tests.
The first results of the analysis of the collected data allow us to talk about reliable differences in people's reactions to extreme conditions simulated during the experiment, such as a decrease in the test passage time, the introduction of a sound sequence accompanying real professional activity, as well as the simulation of sudden managerial decisions and possible man-made disasters inherent to various professions. The decrease in test passage time is accompanied by episodes of acute stress and general tension of regulatory systems.
The obtained results of changes in heart rhythm, skin-galvanic reaction, and brain activity data allow forecasting with high probability the behavior of the person in conditions of real professional actions, as well as possible ways of preparation and overcoming difficulties in mastering specific professions.

Impact of Perceived Agency of a Virtual Human on Social Modulation of Pain

Isabel Neumann, Ivo Käthner and Paul Pauli (University of Würzburg)

Pain is a multidimensional phenomenon influenced by biological and psychosocial factors. Several studies show that social support can lead to pain-reducing effects. The present study investigated social support in a standardized way with virtual humans in virtual reality. In particular, we were interested in how the perceived agency of the virtual human affects pain. Healthy participants were immersed into a virtual environment and received heat pain stimuli under different conditions in a within-subjects design. Conditions differed in perceived agency and social support. In one condition, participants were led to believe that the virtual interaction partner was controlled by an employee next door (avatar condition). In another condition, participants were told that they interacted with a computer (agent condition). In both cases, the virtual human was controlled by predefined computer script. A third condition was presented as a control condition without any social support. Subjective pain ratings and psychophysiological measurements (electrodermal activity and heart rate) were recorded. For the current study, data collection is ongoing. Preliminary data of sensory ratings revealed only small effect sizes between the different conditions. The current study contributes to understand virtual social support and its modulation of pain. Given the increase in social

interactions online, this research contributes also to understanding how humans respond to virtual characters and how these effects can be investigated in VR.

Happiness through virtual lens: The influence of immersion, social and non-social contents on positive emotion induction

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Head-mounted displays for Virtual Reality (VR-HMD) have become popular and more affordable than ever. Thanks to the high sense of presence and immersion they convey, VR-HMD may be an efficient tool for fostering psychological well-being by inducing positive emotions. However, the efficiency of VR-HMD for inducing positive emotions remains to be confirmed compared to traditional material used for inducing emotions by video (i.e., a screen). The present study investigates the induction of positive emotions by 360° video with a VR-HMD or a computer screen, with the novel idea of investigating the video contents used, such as social and nonsocial (landscapes) scenes. 28 healthy undergraduate students participated in the study consisting of watching videos with social and nonsocial content on computer screen and under a VR-HMD, while their skin conductance and heart rate were collected. At the end of each video, participants reported their subjective emotions, sense of presence and appreciation of the watched video. Main results showed that participant experienced VR-HMD as more positive, arousing and reported higher sense of presence compared to the screen presentation. Videos of social content also appeared as more positive and arousing compared to nonsocial contents. Preliminary results for physiological data show a heart rate deceleration for nonsocial contents in virtual reality, while this was not the case on screen. These preliminary results are encouraging for investigating positive emotion induction using a VR-HMD among vulnerable and/or isolated users, who may benefit even more from such interventions for their psychological well-being.

Acceptance and Commitment Therapy Interventions for Internet-Based Addictions: A Systematic Review

Kristina Axenova* and Albert Malkin** (*University of Western Ontario, **Western University)

The aim of this systematic review is to summarize the empirical research on the application Acceptance and Commitment Therapy (ACT) interventions to treat internet-related addictions. “Internet-based addiction” will be utilized as an umbrella term for problematic internet use and encompasses social media/networking, pornography viewing, and online gaming addiction. We searched multiple databases (Web of Science, PsycINFO Ovid, and Google Scholar) to include peer-reviewed English-language empirical research that implemented an ACT-based intervention with at least two of the following three criteria: measures of psychological flexibility, an intervention that targeted the development

of at least one of the six core ACT process (acceptance, defusion, self-as-context, present comment, values, and committed action), and an outcome variable that evaluated an internet-based addiction. Results of the systematic review found a total of 9 studies which met the inclusion criteria with applications of both individual and group-based modes of ACT. Although ACT has shown preliminary effectiveness for attenuating the issues associated with internet-based addiction, research in this area is still emerging. Future research directions of feasibility will be discussed.

Diffusion and the popularization of smart home technology. Can the use of psychological theory aid in the acceptance of smart home devices and accelerate global uptake?

Neil Daruwala and Ursula Oberst (Ramon Llull University)

The development of WIFI, the Internet of Things and machine learning have contributed significantly to the integration of smart tech in the home, but despite initial optimism, the general acceptance and uptake of smart home technology is regular. Possible explanations vary from consumer misunderstanding, lack of visibility and result demonstrability (Shih, 2013), pricing, long product life cycles (Yang et al., 2018) and complications in smart home infrastructure (Ricquebourg et al., 2006), but failed to include comprehensive psychological theories.

The present study aims to enrich the understanding of the psychological factors that contribute to people's intention to use Smart Home technologies (or not) by applying the Technology Acceptance Model (Davies, 1989) and Self-determination Theory (Ryan & Deci, 2000, 2017). Technology Acceptance Model, (TAM) is a framework that allows researchers to understand users' cognitive processes and how they will adopt and intergrade to a new piece of technology. According to Self-determination Theory (SDT), the fulfilment of the three basic psychological needs, autonomy (i.e., feeling of being the origin of one's own behaviours, acting under one's own volition), competence (i.e., feeling effective and skilled), and relatedness (i.e., sensing a connection to peers, stimuli or surroundings, feeling understood and cared for by others) lead to psychological growth and well-being. If a lack of autonomy, competence or relatedness within environments are present, frustration can arise, which leads to feelings of ill-being and distress.

The hypothesized moderation-mediation model of the present study predicts that perceived usefulness and perceived ease of use mediate the effect of satisfaction of autonomy, competence, and relatedness on participants' behavioural intention to use smart technology. In addition, the moderating effects of gender, nationality (British vs Spanish and age are examined.

Methods: A non-probability convenience sample of Spanish and British male and female adults owning at least one smart home device reply online to a series of questionnaires, comprising, among others, a version of the TAM (Davis, 1989) and the Need Satisfaction and Frustration Scale (NSFS) in its original English (Longo et al.,2016) or in its Spanish version (Longo et al., 2028).

Results: The results and conclusion for the study will be available for the presentation in

September. Implications for theory of consumer psychology and the limitations of the study will also be discussed.

Identifying prototypical trust signals in Open-Source Software depositories: A think aloud study

Rob Huw Peace, Dr Laura G.E. Smith and Prof Adam Joinson (University of Bath)

A huge (and increasing) amount of veracity neutral information is available to online information seekers in today's digital world. However, knowing which information to trust is difficult for users because of the existence of disinformation. Consequently, understanding which information to trust can have serious security implications for users. As an example, Open-source software (OSS) libraries are a useful resource for both experienced and inexperienced coders. However, the open nature of the OSS libraries allows malicious actors to hide numerous types of harmful code within scripts. This has ramifications for users because malicious code can be difficult to detect. For instance, inexperienced users may not have the know how to detect harmful code. Whereas experienced users may not correctly evaluate the trustworthiness of the code due to time constraints. Consequently, it is important to understand the digital trust signals that are being utilised by users to make credibility judgements about code within OSS libraries. This poster presents research on prototypical digital trust signals using a think aloud methodology. We recruited computer science students from the two UK Universities. Participants were asked to think aloud their credibility judgements, whilst interacting with a prototypical OSS library. The collected data will be analysed to identify prototypical trust signals for OSS users. The potential implications of helping to secure OSS libraries will be discussed.

The effect of virtual touch in the enhancement of the user experience in virtual reality

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Virtual Reality (VR) allows the interaction of users in real-time with objects and feels "being" in the virtual environment. The users' experience moderates the effects of VR, and this experience emerges from the interaction between the user's characteristics and the technological characteristics. Among the technological characteristic, the level of immersiveness is key. Immersiveness can be enhanced by incorporating new senses into the VR experience. The field of virtual touch is relatively new, and the effect of adding tactile feedback on the experience in VR remains unknown. The aim of this study is to test whether a VR enriched by tactile sensations impacts the user experience compared to a VR without tactile sensations.
Method: The study is a within-subject design with two conditions: Tactile-VR vs Non-Tactile VR. A total of 20 healthy adult volunteers will be included in the study. All participants will be randomly assigned to two conditions. One group will interact first with the VR enriched

by tactile sensations, and then with the VR experience but without the tactile sensations, while the other group will interact in the opposite order.
Before and after each VR condition, participants will rate their emotional status. After each VR condition, participants will rate their: Sense of Presence, Embodiment, level of satisfaction, degree of realism
Results: The study is currently ongoing and advances in immersiveness by including this information is a promising approach to improving the user experience in VR.

Exposure to beauty ideals via Social Networking Sites and body image: a systematic review of experimental studies

Sara Bocci Benucci, Giulia Fioravanti and Silvia Casale (Università Degli Studi di Firenze)

The aim of this systematic review was to summarize the growing body of experimental research that has investigated the effect of viewing idealized images (i.e., attractive, thin, and fit) and body positive (BoPo) content on SNSs on body image. A systematic search was performed in October 2020 on Medline, Scopus, Web of Science, and Science Direct databases. Inclusion criteria included being an original article available in English, which had examined the effect of the exposure to SNSs idealized images or to body-positive images on body image dimensions, with effect size reported. In total, 43 experimental studies were included (n = 8637; % F = 89.56; mean age= 21.58 ± 1.78). Overall, viewing idealized images on SNSs lead to increased body dissatisfaction (.03 < ηp2 < .29) among women and men. State appearance comparison significantly mediated the effect (05 < β <.36), whereas trait appearance comparison tendency was a significant moderator (-.11 < β < 1.83). Mixed results were found regarding the exposure to BoPo images/captions. It was concluded that viewing images on SNSs depicting unattainable beauty ideals (i.e., thin, attractive, and fit) is particularly problematic for body image, with appearance comparison processing playing an important role. More research is required to assess the long-term effects.

Virtual reality for relaxation in a pediatric hospital setting: an interventional study with a mixed-methods design

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Accumulating evidence supports virtual reality (VR) as a feasible and effective method to alleviate anxiety and pain in pediatric patients during specific medical procedures. However, adoption of VR in clinical practice is limited. To address implementation barriers, this intervention study with a mixed-methods design focuses on the feasibility, acceptability, tolerability and preliminary effectiveness of Relaxation-VR, a VR application aimed to provide relaxation, as used for anxiety, stress and pain reduction for children in hospital. Primary outcomes include intervention completion, technical issues, the pediatric Simulator Sickness Questionnaire (tolerability), and visual analogue scales (VAS) addressing ease of use, likeability (feasibility), and future use (acceptability). Secondary outcomes include pre-

to-post-changes in the Self-Assessment Manikin, VAS and Faces Pain Rating Scale-Revised to measure happiness and stress, anxiety, and pain, respectively. We present preliminary data of 51 participants of this ongoing study. a minority of participants (10/51) quit the intervention prematurely for reasons including discomfort, disliking the application, technical issues and willingness to see the medical procedure being performed. Only 5 out of 51 participants reported technical issues including start-up issues and low battery levels. Ease of use, likeability and future use of the intervention were favorably scored. No adverse events and minimal VR sickness symptoms were reported. Compared to baseline, participants reported less anxiety, less pain, less tension and more happiness while using Relaxation-VR. These preliminary findings indicate that Relaxation-VR is acceptable, feasible and tolerable and can reduce anxiety, tension and pain, and increase happiness in pediatric patients with various medical conditions.

Preliminary study of a gait rehabilitation based on Brain Computer Interface treatment

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Brain-Computer Interfaces (BCI) show important rehabilitation effects for patients after stroke. Previous studies have also shown improvements for patients that are in a chronic stage and/or have severe hemiparesis and are particularly challenging for conventional rehabilitation techniques. For this pilot study three stroke patients in chronic phase with hemiparesis in the lower extremity were recruited. BCI system was based on the Motor Imagery (MI) with Functional Electrical Stimulation (FES) and Avatar feedback. The results show improvements in gait and balance measured with 10 Meter Walk Test (10MWT) and Timed Up and Go Test (TUG). Walking speed for 10MWT when walking speed was measured in fast velocity improved in average for 0.16 m/s. Improvements were also measured in ankle dorsiflexion movement ability measured with Range of Motion (ROM). The findings of the current study demonstrate this kind of rehabilitation approach could be effective. However further studies are needed including more patients.

The benchmark and the study of feasibility of the 360-degree video-based virtual reality to induce a full body illusion

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To study the sense of embodiment, several technical Virtual Reality set-ups has been adopted to induce the body-illusion. Recently, the 360-degree camera emerged as an innovative instrument to generate immersive experience reaching positive results in terms of involvement with the scenario. The current study aims to test the feasibility of a 360-degree video to induce the full body illusion. We evaluated two groups receiving different levels of immersion: 3D immersive video and 2D non-immersive video. Self-reported sense of

embodiment and Heart Rate Variability (HRV) measures were analyzed. The results showed that the 360-degree video recorded can trigger a full body illusion with significant differences between 3D and 2D conditions. No difference was matched for RMSSD index of HRV measure. Based on these results, future works are needed to study the 360-degree technology as a medium to generate the sense of embodiment.

Become more human: positive changes on empathy and violent attitude after a study with male sample who embodied a female victim of sexual harassment

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Sexual Harassment (SH) has been associated with a limited ability to take the perspective of the others. This paper presents a pilot study with 35 Mexican men who take the perspective of a female victim of SH in two counterbalanced conditions: the 360-degree video, and a written narrative. The aim of the present study is to investigate whether the psychological states of violent attitude and empathy change from before, to immediately after the intervention and after the three months follow-up, and if the psychological trait of machismo changes from before to after three months of the intervention. Results show an increase on empathy, and a decrease on machismo and violent attitude variables.

Treatment expectations and acceptability results of brief psychological mindfulness-based intervention for the treatment of depression in primary care

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Introduction: According to the World Health Organization, depression is one of the main causes of disability worldwide. Several studies have reported high depression prevalence rates in Spanish Primary Care where lack of time and resources make it difficult to dispense evidence-based treatments. Mindfulness-based interventions (MBI) have shown to be effective to reduce anxious and depressive symptoms. Internet-based treatments have proven to be a promising tool to treat mental health problems and to enhance the dissemination of evidence-based treatments, moreover, have been well accepted by users. The aim of this study is to present opinion results data of a brief MBI for the treatment of mild to moderate depression in Primary Care.
Method: This study is part of a randomized controlled trial with three experimental conditions (TAU + mindfulness-based face to face intervention, TAU + mindfulness online intervention, and TAU group). We report opinion and satisfaction data from 88 participants recruited in Spanish Primary Care services who were allocated to the three arms: "MBI face-to-face + TAU" group (N = 30), "TAU + MBI online" group (N = 29), and "TAU alone" (N = 29). The Expectations and Opinion of Treatment Scales were used to assess the expectations before treatment and acceptability of the interventions. It includes 6 questions about the logic,

satisfaction, usefulness for this problem, usefulness for other problems, recommendation and aversion.
Results: Results showed statistical differences between groups in all items, participants who received the MBI interventions reported higher expectations and better general opinion and satisfaction than participants who received TAU intervention. An exception occurred in the item referred to treatment's aversiveness perceived by participants in both scales, being the score higher in the IBM online group.
Conclusions: This study revealed positive results about the expectations and acceptance of a brief mindfulness intervention to reduce depressive symptoms regardless of the application format (online vs. face-to-face). However, it would be necessary to review and rewrite the item related to aversion because it is a term with little used among the general population and cannot be understood.