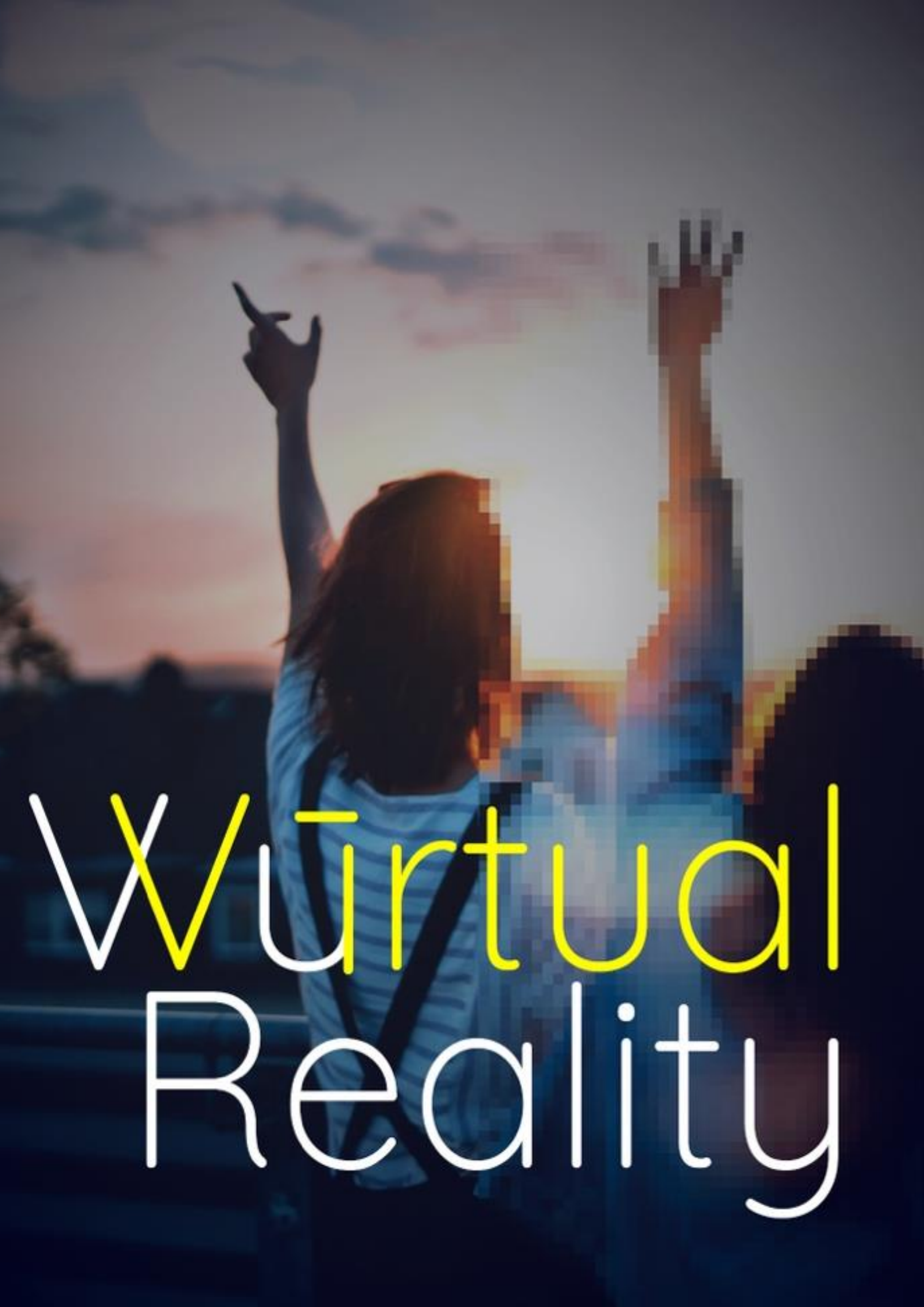

Wūrtual
Reality

GENERAL INFORMATION

Contact

Website: https://www.wuertual.org
E-Mail: kontakt@psychologie.uni-wuerzburg.de

Team

We are a team of PhD students and employees of the Department of Psychology I of the University of Würzburg. We collaborate with partners from our University, the Technical University of Applied Sciences Würzburg-Schweinfurt, the University Hospital Würzburg and the Würzburg Institute for Traffic Sciences.

Steering Committee

Isabel Neumann (Speaker)
Sabrina Gado
Prof. Dr. Ivo Käthner
Dr. Lea Hildebrandt
Prof. Dr. Marta Andreatta

Student assistants

Hannah Hecker
Anna Hellmold
Gina Lehmann
Patricia Schaar
Hannah Zinke

Co-Organizers & Hosts

Prof. Dr. Marc Erich Latoschik
Prof. Dr. Carolin Wienrich
Prof. Dr. Volker Bräutigam
Maximilian Rosilius
Prof. Dr. Uwe Sponholz
Florian Schuster
Prof. Dr. Grit Hein
Dr. Martin Weiß
Prof. Dr. Martin Herrmann
PD Dr. Oliver Herbort
Thomas Brand

Funding & Sponsors

Impressum

CONTENT

WELCOME TO WÜRZBURG

Dear Colleagues,

We are pleased to welcome you to the inaugural Würtual Reality XR Meeting in Würzburg from April 11-13, 2023!

Initialized by the Department of Psychology I of the University of Würzburg, in cooperation with the Human-Computer Interaction Group at the University of Würzburg, this meeting aims to bring together researchers from many fields who use VR/AR/XR. Our goal is to connect interested scientists from students to seniors, discuss newest mixed reality research and developments and encourage researchers to use the mixed reality toolbox.

Besides many interesting symposia, poster sessions and social events, we are proud to announce our two keynote speakers Domna Banakou and Anna Felnhofer. You can be excited about topics such as Benefits and Challenges, Social Interaction, Applied XR, Fear and VR, Body and Gestures, Brain and Cognition. Another highlight of the program is the demo session at the HCI department.

Würtual Reality will take place in Würzburg at the main building of the University. Hopefully you will find some time to enjoy our beautiful city Würzburg as a region of Franconia in the north of the German state of Bavaria.

We wish you lots of great opportunities for networking and community building and we are looking forward to meeting you at Würtual Reality 2023!

Isabel Neumann & Sabrina Gado
on behalf of the organization team

Würzburg, April 2023

TUESDAY | 11.04.2023

08:00 REGISTRATION

09:00 **OPENING | Paul Pauli**
Audimax (lecture hall 216)

09:15 **KEYNOTE | Domna Banakou**
Enhancing Prosocial Behaviour in VR Through Embodiment
Audimax (lecture hall 216)

10:15 COFFEE BREAK

10:30 **BENEFITS AND CHALLENGES**
Audimax (lecture hall 216)

SYMPOSIUM 1 Chair: Cornelia Wrzus

- The Brain in Virtual Reality: A Novel Perspective on Psychological Science
  Marike Johnsdorf
- Opportunities and Challenges of Using Immersive Virtual Reality With Older Adults and Age-Heterogeneous Samples
  Cornelia Wrzus
- FutureU - A Virtual Reality and Smartphone App Intervention to Reduce Criminal Behavior
  Aniek Siezenga
- Presence and Emotional Processes in VR: What are the Effects of Automation?
  Julia Diemer
- Exploring Plausibility and Presence in Mixed Reality Experiences
  Franziska Westermeier

12:00 LUNCH

13:30 **SOCIAL INTERACTION**
Audimax (lecture hall 216)

SYMPOSIUM 2 Chair: Grit Hein

- Social Influence of Virtual Characters on Pain Perception and Presence
  Isabel Neumann
- Investigating Reciprocity in Face-to-Face Dyadic Interactions in Virtual Reality
  Leon Kroczek
- Face Perception in Virtual Reality: A Comparison of Psychophysiological Markers in VR and the Conventional Laboratory
  Merle Sagehorn
- Challenges and Chances Replicating a Regular User Study in Immersive Virtual Reality
  Daniel Hepperle
- From A(vatars) to Z(ero) Latency - Determinants of the Metaverse
  Marc E. Latoschik

15:00 **LIVE DEMONSTRATIONS AT THE HUMAN-COMPUTER INTERACTION LAB** & COFFEE
Am Hubland

19:00 **DINNER @ ALTER KRANEN**
Kranenkai 1

WEDNESDAY | 12.04.2023

09:15 **KEYNOTE | Anna Felnhofer**
Presence, Agency and VR-Based Social Stress Research Across the Lifespan
Audimax (lecture hall 216)

10:15 COFFEE BREAK

10:30 **APPLIED XR**
Audimax (lecture hall 216)

SYMPOSIUM 3 Chair: Volker Bräutigam

- Virtual Reality Scientific Toolkit (VRSTK)
  Matthias Wölfel
- Retrospective of an AR-Research Project Towards Science in Industrial Context
  Volker Bräutigam
- Augmenting Medical Education: Designing an AR Application for Abdominal Examination Learning
  Lovis Schwenderling
- From AR-Manuals to Remote Assistance - Industrial XR-Use-Cases
  Fabian Rücker
- Augmented Reality for Supporting Spatially Dispersed Teams
  Lisa Thomaschewski

FEAR AND VR
lecture hall 224

SYMPOSIUM 4 Chair: Andreas Mühlberger

- A Novel Virtual Reality Fear Conditioning Paradigm to Investigate the Influence of Expectancy Violation on Fear Extinction
  Daniel Gromer
- Looking Fear in the Eye: Children's Experience With Gamified Virtual Reality Exposure Towards Spiders Using Gaze Interaction
  Theresa F. Wechsler
- Virtual Companions: Does the Co-Presence of a Wooden Avatar Buffer Fear in VR?
  Martin Weiß
- Co-Located Virtual Exposure Therapy: A Multi-User Mixed Reality Approach
  Daniel Badeja & Florian Schier
- The Application of Virtual Reality Exposure Versus Relaxation Training in Music Performance Anxiety: A Randomized Controlled Study
  Kristin Wehrmann

12:00 LUNCH

13:30 **BODY AND GESTURES**
Audimax (lecture hall 216)

SYMPOSIUM 5 Chair: Oliver Herbort

- Using VR to Understand Pointing Gestures
  Oliver Herbort
- Analysis of Pedestrian Gestures in a Virtual Traffic Environment
  Thomas Brand
- The Impact of Avatar and Environment Congruence on Plausibility, Embodiment, Presence, and the Proteus Effect in Virtual Reality
  David Mal
- Linking Emotions and Body: Using VR to Induce Emotion and Generate Musculoskeletal Behaviour
  Peter Collins
- A Cardio-Visual Full Body Illusion Improves Body Size Estimation in Healthy Women
  Lynn Erpelding

BRAIN AND COGNITION
lecture hall 224

SYMPOSIUM 6 Chair: Martin Hermann

- Utilizing a Virtual T-Maze to Objectively Validate the Effects of Low-Intensity Transcranial Focused Ultrasound Neuromodulation
  Philipp Ziebell
- Modulations of Brain Oscillations Under Virtual Reality Conditions
  Joanna Kisker
- Exploring the Dynamics of Cognitive Control Using Virtual Reality and Mobile EEG
  Leon Lange
- Feature Integration Affects Working Memory Performance in PC and VR
  Eda Bakkal
- Stroop, Stress, and VR: Developing the Virtual Reality Stroop Room
  Veronika Ringgold

15:00 **POSTERS** & COFFEE
Atrium

15:30 **POSTER PITCHES**
Audimax

17:00 **POSTERS** & COFFEE
Atrium

19:00 **SOCIAL EVENT @ ROOFTOP BAR HOCH3**
Panel Discussion "Quo vadis, Metaverse?" & Awards
Beim Grafeneckart 10

THURSDAY | 13.04.2023

09:15 **WORKSHOPS**

- Hands-on Hololens: An Introduction to Augmented Reality for Microsoft Hololens 2 With Unity 3D (*Technical University of Applied Sciences Würzburg-Schweinfurt*)
  lecture hall 224
- Medical tr.AI.ning: An VR-Based Training Platform to Train a Full-Body Dermatological Examination (*University of Münster*)
  Marcusstr. 9-11, R113
- Insights Into the Virtual Reality Scientific Toolkit (VRSTK) (*University of Applied Science Karlsruhe*)
  Audimax (lecture hall 216)
- Excursion to the MAVEL Lab (*TU of Applied Sciences Würzburg-Schweinfurt*)
  Franz-Schubert-Str. 10, Schweinfurt

KEYNOTES

DOMNA BANAKOU

Tuesday, 09:15 I Audimax

Domna Banakou is Visiting Assistant Professor of Interactive Media at NYU Abu Dhabi. Before, she worked as a PhD student and postdoc in the research group of Mel Slater at the EVENT-LAB in Barcelona. Her research interests range from bodily representation, exploring the perceptual, behavioral to higher-level cognitive correlates of body ownership illusions.

Enhancing Prosocial Behavior in VR Through Embodiment

This talk will focus on the use of VR to induce body ownership illusions over virtual bodies distinct to one's own and how such embodiment techniques can lead to positive behavioural change. Emphasis will be given on the influence of owning a different race body on racial discrimination, a social phenomenon of increasing interest over the past decade, with concrete examples from the literature on how implicit biases can be modulated in the long-term and under different social contexts. Drawing from experimental evidence we will consider the pitfalls of the infamous concept of using VR as an 'empathy machine' whereby putting people into the viewpoint of a member of a disadvantaged group and then subject them to the usual type of indignities that the group suffers, may increase empathy toward the group. We will explore new avenues of fostering prosocial behavioural change and consider important ethical considerations that arise from the use of VR related to the above topics.

domna.banakou@nyu.edu

ANNA FELNHOFER

Wednesday, 09:15 I Audimax

Anna Felnhofer is a research associate (post-doc) and clinical psychologist and health psychologist at the Department of Pediatrics and Adolescent Medicine of the Medical University of Vienna. She is founder and director of the PedVR-Lab and founder and (co-)editor of the international scientific journal Digital Psychology.

Presence, Agency, and VR-Based Social Stress Research Across the Lifespan

As digital representations of humans are increasingly employed in a range of virtual reality (VR) applications, the field of human computer interaction (HCI) is challenged to keep up with this development. Studies show that people generally tend to respond in a social manner to all kinds of virtual entities. Yet, evidence also indicates that in some instances this may not – or not entirely – be the case. In particular, social reactions like behaviors towards the interaction partner or social presence experiences may be influenced by the virtual character's agency. In other words, users may react differently depending on whether they think that they are interacting with a human-controlled avatar or with a computer-controlled agent. As this has wide ranging implications for HCI, the current keynote will pick up on this pertinent issue. First, it will provide a comprehensive overview of essential theoretical conceptualizations such as the Threshold Model of Social Influence (Blascovich 2002) and the Media Equation Concept (Nass & Moon, 2000). Second, relevant research across different age groups will be introduced. Findings will mainly be illustrated by the field of social stress research, and especially by experiments using VR versions of the Trier Social Stress Test (TSST; Kirschbaum et al., 1993) and the Cyberball-Paradigm (Williams, 2001). Finally, ensuing open questions and methodological challenges shall be highlighted, and implications will be provided not only for theory development but also for designing and implementing virtual humans in both research and practice.

anna.felnhofer@meduniwien.ac.at

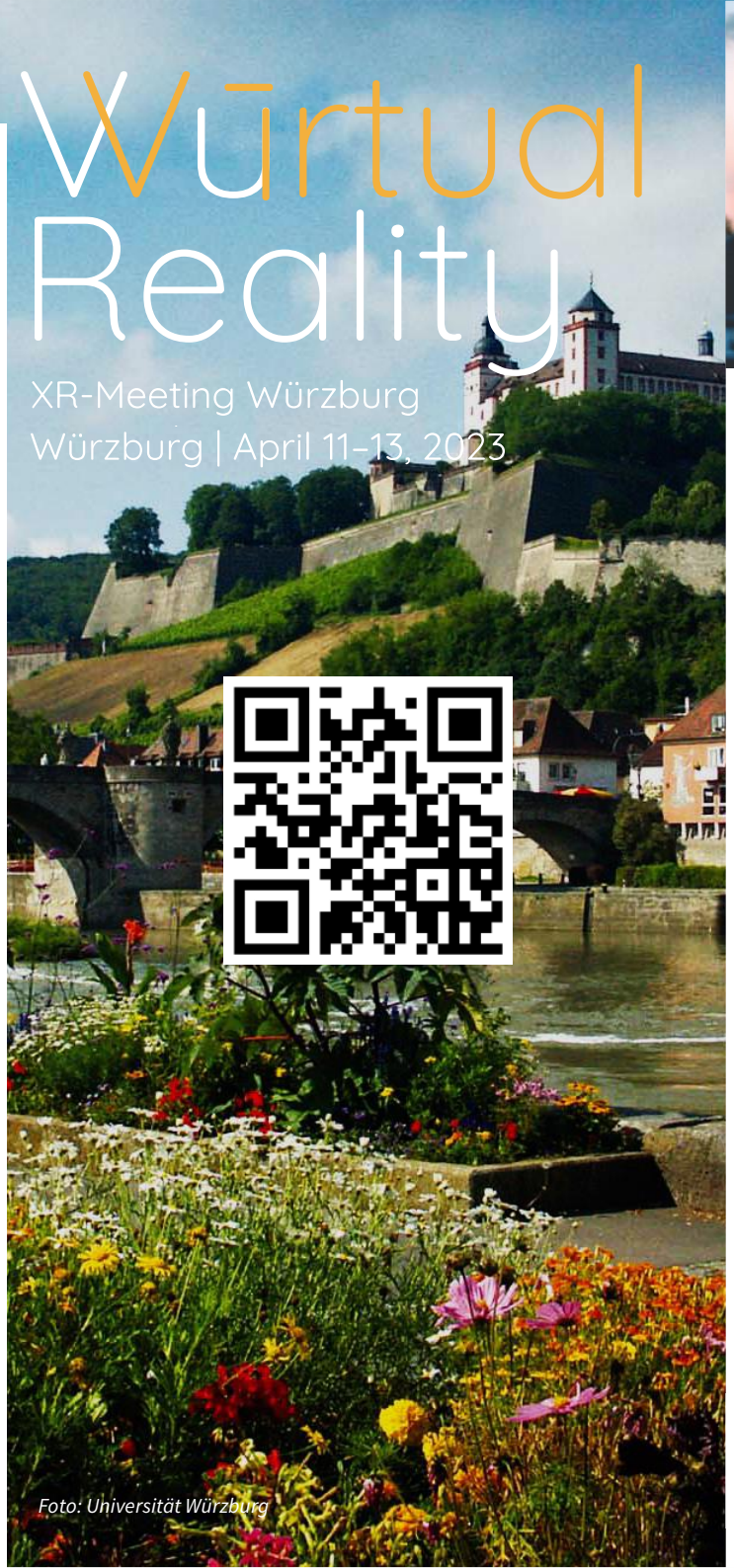
WUERTUAL 2023

Würtual Reality

XR-Meeting Würzburg

HCI Lab – Live Demonstration

Human-Computer Interaction
Psychology of Intelligent Interactive Systems
Games Engineering
Media Informatics



PROGRAM

15:00	Bus-Shuttle from Sanderring to Hubland Süd
15:30-18:00	Coffee & Live Demonstrations at the HCI Lab
18:00	Bus-Shuttle from Hubland Süd to Sanderring

11th of April 2023 | 03:30 – 06:00 pm | Hubland Süd

We thank our
SPONSORS AND DONORS

Human Dynamics Centre University of Würzburg
XR HUB BAVARIA WÜRZBURG
virtual therapy + research systems

DEMOs

	DEMO	ROOM
1	Multi-User Markerless Avatar System *Rapid Embodiment of Virtual Avatars* *HiAvA Project*	E39
2	Avatar Scanner *Fast Photorealistic Avatar Generation* *XR Hub Project*	E35
3	Flood Simulation *Digital Twin For Increasing Risk Awareness* *XR Hub Project*	E33
4	AIL @ Work *Working together with AI* *AIL at Work Project*	E32
5	Resize Me! *Embodying Realistically Modulatable Avatars in VR* *ViTraS Project*	E31
6	Virtual Gait Rehabilitation *VR-Medical Platform* *VRGait Project*	E30
7	Social XR Collaboration Platform *XR-based Education Application* *ViLeArn More Project*	E29
8	Scalable Hybrid Avatar-Agents *VR and Mobile Avatars for Everyday Social Interaction in XR* *HiAvA Project*	E29
9	Mixed-Reality Avatar Reflection *Studying Avatar Effects in Mixed-Reality* *ViLeArn More Project*	E27
10	Deliverables of the Research Project PlanAR *Get in Touch with the immersive Application and feel the Experience* *Technical University of Applied Sciences Würzburg-Schweinfurt (Guest Demo)*	E23
11	Medical Training *An AI and VR-based simulation and training platform for medical education* *University of Münster (Guest Demo)*	E22
12	Racial Bias Reduction in VR *An Intervention with two Virtual Agents* *MI Group Project*	E20

ROOM PLAN Z8

Snacks & Drinks

Information

DEMOs

	DEMO	ROOM
13	Tunnelling Through Time in VR *Studying Avatar and Time Perception Distortion* *VirtualTimes Project*	E16
14	My Avatar, My Time! *Studying Avatar and Time Perception Distortion* *VirtualTimes Project*	E14
15	Virtual Presentation on STAGE *VR-Training Platform* *ViLeArn More Project*	E36
16	Cybermobbing - Too Close VR *Emphasizing XR for Education and Resilience* *XR Hub Project*	E36
17	Virtual Maze and Virtual Humans Trust *Measuring Interpersonal Trust towards Virtual Humans with a Virtual Maze Paradigm* *PriMa Project*	E36
18	Virtual Impostor *Emphasizing AI for Identity Management in the Metaverse* *XR Hub - PriMa Project*	E36
19	Virtual Gambling *VR-Teaching Platform* *Dark Sides of VR Project*	E36
20	Drug-use prevention in VR *VR-Training Platform* *VIA-VR Project*	E38
21	VR Authoring Tool *High-level Programming and Monitoring of VR Applications* *VIA-VR Project*	E38
22	Virtual Resuscitation *First Aid Training in VR* *VIA-VR Project*	E38
23	Virtual Library *Virtual Reality Historical Library Experience* *BibVirtuell Project*	E37
24	Horde Battle *VR Game About Swarm-Based Network Dismantling* *GE Project*	E37
25	femtoPro *Interactive Femtosecond Laser Laboratory Simulator* *femtoPro Project*	E37

SYMPOSIA

SYMPOSIUM: BENEFITS AND CHALLENGES

Tuesday, 10:30 – 12:00 I Audimax

Chair: Cornelia Wrzus

The Brain in Virtual Reality: A Novel Perspective on Psychological Science

Marike Johnsdorf[1], Joanna Kisker[1], Merle Sagehorn[1], Leon Lange[2], Roman Osinsky[2], Thomas Gruber[1], Benjamin Schöne[1]

[1]Experimental Psychology I, Institute of Psychology, Osnabrück University, Osnabrück, Germany
[2]Differential Psychology and Personality Research, Institute of Psychology, Osnabrück University, Osnabrück, Germany

Virtual reality (VR) has emerged as a valuable tool for studying cognitive and affective functions of the brain under more realistic conditions. Traditional two-dimensional (2D) laboratory studies, while widely used in psychological research, do not accurately replicate the complex and dynamic three-dimensional (3D) environment and its constraints in which the human brain has evolved to function. In these 2D studies, stimuli are often presented on a flat computer screen, which does not capture the brain's ability to process and respond to stimuli in a way that is influenced by the body's movements and interactions in and with a realistic environment. VR technology, on the other hand, allows researchers to present stimuli in a 3D environment that appeals to the brain's evolutionary history, yielding a more comprehensive understanding of realistic cognitive and affective functions.
This talk discusses the benefits of using VR to create more realistic experiences and the challenges it poses for traditional laboratory setups. The EEG studies presented in this talk directly compare attentional, mnemonic, and affective processes in VR and conventional laboratory conditions. Differences in functional properties of the respective cognitive and affective mechanisms as well as different electrophysiological and neural correlates between the two modalities suggest that results obtained under laboratory conditions may not generalize to (more) realistic environments.

marike.johnsdorf@uni-osnabrueck.de

Opportunities and Challenges of Using Immersive Virtual Reality With Older Adults and Age-Heterogeneous Samples

Cornelia Wrzus[1]

[1]Ruprecht Karls University Heidelberg

Currently, the majority of VR users are young gamers; similarly, research strongly relies on young adults. At the same time, preventive and therapeutic VR interventions target people across the entire lifespan and often specifically in old age. While first interventions applied iVR for example, in stroke rehabilitation with older adults or during cancer treatment of age-heterogeneous groups, comprehensive examinations of the applicability of iVR and associated opportunities and challenges are scarce. This study examined how age, vision, hearing, and general health affected how realistic different iVR scenarios felt for participants (N = 212, 18-80 years, 60% female) and how many side effects, such as cyber sickness, they experienced. The results showed that overall, experiences of presence were high and cyber sickness was low in the current sample, without substantial age differences. Cybersickness was experienced somewhat stronger with higher neuroticism and with hearing impairments, albeit still on a low level. We discuss that currently samples might be biased towards healthy older adults interested in iVR. Among such samples, iVR is applicable for a broad range of research areas. Ongoing studies indicate that with careful setup of iVR content, application in clinical and older samples seems feasible and equally useful as with younger adults – highlighting the broad potential of iVR in diverse contexts from education and leisure to prevention and therapy.

wrzus@psychologie.uni-heidelberg.de

FutureU - A Virtual Reality and Smartphone App Intervention to Reduce Criminal Behavior

Jean-Louis van Gelder[1,2], Esther Mertens[2], Tiffany Tettero[2], Aniek Siezenga[1,2]

[1]Department of Criminology, Max Planck Institute for the Study of Crime, Security and Law, Freiburg, Germany
[2]Department of Education and Child Studies, Leiden University, Leiden, The Netherlands

Self-defeating behaviors (e.g., drinking too much, overspending, speeding, delinquent behavior) are known to be associated with short-term thinking. Such behaviors tend to offer quick rewards, whereas their costs tend to be more remote. Short-term mindsets lead to the neglect of such costs in people's decision making. In this presentation, I will discuss a virtual reality and smartphone app intervention, FutureU, that aims to stimulate future oriented thinking and to reduce self-defeating behaviors by strengthening people's identification with their future self. More specifically, 3D age-progressed renderings of participants are created and through either VR or a smartphone app, users are introduced to and interact with their future self. These interactions are designed to trigger thinking about the future and to generate a stronger sense of vividness of, and connection to the future self. This increased identification with the future self is hypothesized to reduce self-defeating behavior by making people more aware of the fact that they will be suffering the costs of their behavior themselves. In addition, I propose how we can deepen our understanding of the effectiveness of VR and mobile health applications by analyzing engagement and usage data.

a.siezenga@csl.mpg.de

Presence and Emotional Processes in VR: What are the Effects of Automation?

Julia Diemer[1]

[1]kbo-Inn-Salzach-Klinikum Fachbereich Psychosomatische Medizin, Kompetenzschwerpunkt Angst, Versorgungsforschung, Wasserburg am Inn, Department Psychologie, Ludwig-Maximilians-Universität München

Presence, i.e. the illusion of being physically present in a virtual world, is an important process variable in virtual reality (VR), and in particular, in VR exposure therapy. Presence is known to covary with emotional experience in VR, and previous research suggests that this correlation is bidirectional (Diemer et al., 2015; Peperkorn et al., 2015). In a recent project, we investigated the effects of automation on presence and emotional activation in VR.

This talk focuses on the relation of presence and emotion. A brief overview of previous research into presence is given, followed by the presentation of two experiments of our research group. We investigated whether the way instructions are delivered to participants in VR affects presence, navigation, and emotion, comparing (a) instructions delivered by the investigator (live) and (b) previously recorded audio instructions (automated).

We observed different effects of automation, which reduced presence and emotional activation in some subsamples. Possible reasons for this effect are discussed, as are the implications of our findings for the design of therapeutic VR scenarios. We conclude that design features of VR systems should be investigated in greater detail in order to discover possible desirable and unwanted effects on emotional experience.

julia.diemer@kbo.de

Exploring Plausibility and Presence in Mixed Reality Experiences

Franziska Westermeier[1,2], Larissa Brübach[1,2], Marc Erich Latoschik[1], Carolin Wienrich[2]

[1]Human-Computer Interaction (HCI) Group, University of Würzburg
[2]Psychology of Intelligent Interactive Systems, University of Würzburg

Our study investigates the impact of incongruencies on different information processing layers (i.e., sensation/perception and cognition layer) in Mixed Reality (MR), and its effects on plausibility, spatial and overall presence. In a simulated maintenance application participants performed operations in a randomized 2x2 design, experiencing either VR (congruent sensation/perception) or AR (incongruent sensation/perception). By inducing cognitive incongruence through the absence of traceable power outages, we aimed to explore the relationship between perceived cause and effect. Our results indicate that the effects of the power outages differ significantly in the perceived plausibility and spatial presence ratings between VR and AR.

franziska.westermeier@uni-wuerzburg.de

SYMPOSIUM: SOCIAL INTERACTION

Tuesday, 13:30 – 15:00 I Audimax

Chair: Grit Hein

Social Influence of Virtual Characters on Pain Perception and Presence

Isabel Neumann[1], Paul Pauli [1,2], Ivo Käthner [1,3]

[1]Department of Biological Psychology, Clinical Psychology, and Psychotherapy, Institute of Psychology, University of Würzburg, Würzburg, Germany
[2]Center of Mental Health, Medical Faculty, University of Würzburg, Würzburg, Germany
[3]Department of Physiological Psychology, University of Bamberg, Bamberg, Germany

Pain is a multidimensional phenomenon and laboratory studies could show that verbal support can reduce pain. Virtual reality (VR) is a powerful tool to distract from pain, e.g., through higher presence. However, the potential of social pain modulation in VR is unclear. Furthermore, it is unclear what features of virtual characters impact social influences on users.
In a mixed design, healthy participants (N = 97) underwent four within-conditions in VR. In two conditions, virtual characters differing in number of social cues (low: static figure, high: virtual human) provided verbal support during pain stimulation. In two other conditions, no support was provided, but in one condition neutral words were read aloud. Agency of the virtual characters served as between-subjects factor. In the avatar group, participants were led to believe that another participant controlled the virtual characters. In the agent group, participants were told that they interacted with a computer. In fact, in both groups the virtual characters were computer-controlled. Three heat pain stimuli were applied per condition. Pain ratings, presence ratings and psychophysiological measurements were recorded.
Conditions with support compared to no support reduced pain intensity and unpleasantness, albeit with smaller effects than studies with real humans. More social cues led to less pain unpleasantness and higher presence. Agency had no impact.
This means that independent of the perceived agency, virtual characters providing verbal support can reduce pain. Social cues affected not only pain, but also presence, indicating beneficial effects of more human visual appearance on social pain modulation in VR.

isabel.neumann@uni-wuerzburg.de

Investigating Reciprocity in Face-to-Face Dyadic Interactions in Virtual Reality

Leon Kroczek[1] & Andreas Mühlberger[1]

[1]Clinical Psychology and Psychotherapy, Regensburg University, Regensburg, Germany

Face-to-face interactions include the mutual exchange of actions, words, and non-verbal facial expressions between interactive partners. This reciprocity is thought to modulate attitudes and impact reactions within interactions. Yet, mechanisms of reciprocity remain largely unknown, mostly due to the challenge of presenting paradigms that are both interactive and experimentally controlled. Virtual Reality (VR) allows to present naturalistic and interactive paradigms with full control over behavioral parameters and therefore offers an opportunity to study reciprocity in social behavior. In the present VR study participants engaged in short interactions with two virtual agents. Importantly, participants' gaze direction and facial expressions were continuously monitored allowing to detect direct gaze and smiling. Agents' gaze behavior and facial expressions were manipulated to be either contingent on participants' behavior or random. In case of the contingent agent, the detection of direct eye gaze or smiling resulted in reciprocal behavior of the virtual agent (i.e., mutual eye contact/returned smile). Attitudes and emotional experience were measured via ratings over the course of the interactions with the virtual agents and gaze direction and physiological effects (skin conductance, facial EMG) were assessed in separate test phases. We found that interacting with a contingent but not random virtual agent increased sympathy ratings and resulted in increased emotional mimicry. These data provide evidence for reciprocity as a driving factor for social responses and the formation of attitudes in interactions. Finally, the study highlights the potential of closed-loop VR paradigms for the experimental manipulation of face-to-face interactions.

leon.kroczek@ur.de

Face Perception in Virtual Reality: A Comparison of Psychophysiological Markers in VR and the Conventional Laboratory

Merle Sagehorn[1], Marike Johnsdorf[1], Joanna Kisker[1], Sophia Sylvester[2], Thomas Gruber[1], Benjamin Schöne[1]

[1]Experimental Psychology I, Institute of Psychology, Osnabrück University, Osnabrück
[2]Semantic Information Systems Research Group, Institute of Computer Science, Osnabrück University, Osnabrück

The perception of faces is one of the most specialized visual processes in the human brain and has been investigated by means of the early event-related potential component N170. However, face perception has mostly been studied in the conventional laboratory, i.e., monitor setups, offering rather distal presentation of faces as planar 2D-images. Increasing spatial proximity through Virtual Reality (VR) allows to present 3D, real-life-sized persons at personal distance to participants, thus creating a feeling of social involvement and adding a self-relevant value to the presented faces.
The present study compared the perception of persons under conventional laboratory conditions (PC) with realistic conditions in VR. Paralleling standard designs, pictures of unknown persons and standard control images were presented in a PC- and a VR-modality. To investigate how the mechanisms of face perception differ under realistic conditions from those under conventional laboratory conditions, the typical face-specific N170 and subsequent components were analyzed in both modalities. Consistent with previous laboratory research, the N170 lost discriminatory power when translated to realistic conditions, as it only discriminated faces and controls under laboratory conditions. Most interestingly, analysis of the later component [230-420 ms] revealed more differentiated face-specific processing in VR, as indicated by distinctive, stimulus-specific topographies. Complemented by source analysis, the results on later latencies show that face-specific neural mechanisms are applied only under realistic conditions. In a follow-up study, response-related analyses furthermore reveal distinct post-decisional processing of faces under realistic conditions when compared with perceptual and object controls, both in the ERP and frequency domain.

merle.sagehorn@uni-osnabrueck.de

Challenges and Chances Replicating a Regular User Study in Immersive Virtual Reality

Daniel Hepperle[1,2], Matthias Wölfel[1,2]

[1]Karlsruhe University of Applied Sciences
[2]University of Hohenheim

Carrying out research within an immersive VR environment instead of the real-world can offer several benefits including increased control of the experimental environment, the ability to conduct experiments that would be ethically or logistically difficult as well as conducting studies at the same time with multiple participants. Furthermore, in terms of replication, the entire procedure can be performed in almost exactly the same way anywhere in the world due to its computational nature (i.e., everything is manifested in the code itself).
However, it can also present certain challenges, such as ensuring that the virtual environment accurately represents the real-world conditions being studied and ensuring that participants' responses in the virtual environment accurately reflect their real-world behavior.
Within this presentation we want to present challenges that arose from an experiment conducted recently within a remote multiuser VR environment. The aim of the experiment was to create a replication of the mere exposure effect within a VR environment in order to assess the cross-reality validity of VR. The mere exposure effect is particularly suitable because it has been successfully replicated several times and with different stimuli with an appropriately strong effect. Also, there is a prior study carried out on a 2D monitor sufficiently well documented with stimuli and procedures to access online.
We address challenges in technology and organization of such experiments, including display technology (2D Monitor vs. HMD), differing interaction concepts, the general onboarding process, collection of consent as well as handing out compensation for expenses.

daniel.hepperle@h-ka.de

From A(vatars) to Z(ero) Latency - Determinants of the Metaverse

Marc E. Latoschik[1]

[1]Human-Computer Interaction (HCI) Group, University of Würzburg

Extended Reality (XR) is considered as one of the hot key technologies with an estimated growth of 40%-60%. If plans of the big global IT players for an envisioned Metaverse take on reality, it will drastically impact our private and work lives. A virtualized Human-human and human-computer interaction in hybrid societies of interacting avatars and agents has great potential and provides promising use-cases. However, this development calls for a broad and in-depth understanding of the important technological, psychological, and sociological determinants of the Metaverse, to create compelling, enjoyable, efficient and effective user experiences, and - not least - to support the users by fostering their understanding and self-determination. This talk will present fundamental embodiment effects in XR and highlight prominent use-cases, from training, learning and teaching, therapy, to interacting with Artificial Intelligences and more. We introduce state-of-the-art technologies to develop photorealistic avatars and agents, to simulate and animate them in real-time, and to measure and assess the impacts of such technologies on users in multimodal social XRs. We also demonstrate detrimental effects of XR and motivate and illustrate solutions to ensure important aspects of privacy and trust, to overall develop a comprehensive understanding of the potential risks and chances of XR technologies and a future Metaverse.

marc.latoschik@uni-wuerzburg.de

SYMPOSIUM: APPLIED XR

Wednesday, 10:30 – 12:00 I Audimax

Chair: Volker Bräutigam

Virtual Reality Scientific Toolkit (VRSTK)

Matthias Wölfel[1], Jonas Deuchler[1], Wladimir Hettmann[1], Daniel Hepperle[1]

[1]University of Applied Science Karlsruhe

The Virtual Reality Scientific Toolkit (VRSTK) facilitates the creation and execution of user studies in immersive virtual reality (VR) environments within the Unity 3D real-time development platform. As an open-source project released under the MIT license, VRSTK extends the capabilities of Unity. It can be downloaded (https://github.com/ixperience-lab/VRSTK), used, and extended free of charge.
The main purpose of the VRSTK is to simplify user studies in immersive VR by providing a set of prefabs that can be dragged and dropped as well as easily configured. Functions supported include data acquisition (i.e., object and motion tracking), recording & replay, storage, and synchronization, as required in almost any user study in an immersive VR environment. Data can be collected from various sources and sensors, including EEG, ECG, or EDA, as well as within-VR questionnaires. Furthermore, the Ready Player Me avatar system and a multiplayer functionality based on the open-source networking library Mirror have been implemented. This allows the experimenter to be in the same virtual room, even if the participant and experimenter are in different locations, and to run an experiment with more than one participant at a time.
In our presentation, we aim to introduce the VRSTK and its core features by walking the audience through a hypothetical user study that uses some of the VRSTK's core features. In addition to describing the toolkit, we hope to inspire other scientists and interested developers to use and contribute to the VRSTK.

matthias.woelfel@h-ka.de

Retrospective of an AR-Research Project Towards Science in Industrial Context

Volker Bräutigam[1]

[1]Fakultät Wirtschaftsingenieurwesen, Technische Hochschule Würzburg-Schweinfurt

Based on the diverse requirements of the project "PlanAR", a research prototype of an industrial AR platform consisting of an AR content management system and an AR application was developed in an agile project Management approach. In various focus groups, the specific influences and effects of these prototypes on humans in an industrial context were scientifically researched. Here, the issues of human-machine interaction with regard to perception and information processing were primarily investigated using the Microsoft HoloLens 2 Head-Mounted-Device as an example. In the retrospective, the work packages from the project consortium set-up, the application Development and coding, the project management, the study implementation as well as the research and development results up to the stakeholder reporting are discussed as lessons learned and recommendations for future projects are pointed out.
The talk presents the research project PlanAR with focus on technology transfer processes between industry and science. In the retrospective, the work packages from the project consortium set-up, the application Development and coding, the project management, the study implementation as well as the research and development results up to the stakeholder reporting are discussed as lessons learned and recommendations for future projects are pointed out.

volker.braeutigam@thws.de

Augmenting Medical Education: Designing an AR Application for Abdominal Examination Learning

Lovis Schwenderling[1], Laura Hanke[2], Undine Holst[1], Tobias Huber[2], Christian Hansen[1]

[1]Otto-von-Guericke Universität & Research Campus STIMULATE Magdeburg
[2]Universitätsmedizin der Johannes-Gutenberg-Universität Mainz

The structured abdominal examination is a widely used medical procedure with many applications, e.g. in visceral surgery or general medicine. It follows a precisely defined structure, taking into account a variety of abdominal symptoms, diagnoses and therapeutic options. Both theoretical knowledge and practical skills are essential in its application. The training of medical students often starts with medical phantoms in dedicated training sessions. However, there is often a lack of time and resources to enable frequent repetition and practice or to address questions of understanding individually.
Using augmented reality (AR), a training application was therefore designed that enables individual learning and training of the examination. Information and instructions are presented in AR with the Microsoft HoloLens 2. A medical training phantom for abdomen examinations, as already used for teaching the procedure, provides haptic feedback, and allows for simulating various sounds and breathing movements.
Users are guided step-by-step through the patient preparation and the subsequent examination steps. The process is trained according to textbook guidelines, and possible findings are visualized. Special examinations, such as signs typical of appendicitis, are specifically addressed. Information is selected directly on the phantom and can be explored interactively and individually by users at their own learning speed.
Qualitative feedback was collected in initial pilot studies and usability evaluations with students and teachers. Positive feedback was collected regarding the teaching suitability and potential, as well as perspectives for further development. AR-training for structured abdominal examination can thus support common teaching methods in the future.

lovis.schwenderling@ovgu.de

From AR-Manuals to Remote Assistance - Industrial XR-Use-Cases

Fabian Rücker[1]

[1]Fraunhofer Institute for Computer Graphics Research (IGD) Darmstadt, Germany

Established remote-assistance solutions allow remote experts to set annotations and highlights directly within the on-site user's field of view. However, there is no shared realm of experience where both users can interact as if they were physically standing next to each other.
This talk presents an ongoing research project that aims to solve this problem by capturing and streaming the on-site user's real 3D-environment (including persons) to create a shared sense of space. The remote expert, who uses a VR-HMD, is able to move freely within the live 3D reconstruction, whereas the on-site user is able to see him using an AR-HMD. The result is an intuitive and natural collaboration experience that solves the shortcomings of current solutions.

fabian.ruecker@igd.fraunhofer.de

Augmented Reality for Supporting Spatially Dispersed Teams

Lisa Thomaschewski[1], Nico Feld[2], Benjamin Weyers[2], Annette Kluge[1]

[1]Department of Work-, Organizational-, and Business Psychology, Ruhr University Bochum, Germany
[2]Department IV, Computer Science Human-Computer Interaction, University of Trier, Trier, Germany

Since several years we investigate the application of Augmented Reality (AR) for work related contexts. Thereby we particularly concentrate on the design and evaluation of different AR-based interfaces to support spatially dispersed teams in their team experience and performance on interdependent team tasks. Against this background, we would like to contribute with a talk which covers our experiences and findings from our ongoing and past research. Thereby, we will 1) present a taxonomy aimed at supporting organizations in the development and implementation of AR-based assistance systems in teamwork contexts, 2) present the design and results of a study (N = 224) in which we evaluated a self-developed AR interface for the MS HoloLens (Ambient Awareness Tool), that aims to support the temporal coordination of spatially dispersed teams, and 3) present the design and results of a study (N = 23) in which we piloted the use of an avatar representation of a spatially dispersed team partner. In addition, we will present 4) the results of an exploratory analysis in which we compared data of the aforementioned studies and show that even minor changes in the interface design can significantly impact the team experience in spatially dispersed teams.

lisa.thomaschewski@rub.de

SYMPOSIUM: FEAR AND VR

Wednesday, 10:30 – 12:00 I lecture hall 224

Chair: Andreas Mühlberger

A Novel Virtual Reality Fear Conditioning Paradigm to Investigate the Influence of Expectancy Violation on Fear Extinction

Daniel Gromer[1], Paula Franz[1], Yannik Kraus[1], Bianca Lorenz[1], Yannik Stegmann[1]

[1]Department of Psychology, Biological Psychology, Clinical Psychology, and Psychotherapy, University of Würzburg, Germany

Fear conditioning is an experimental paradigm to investigate mechanisms underlying fear learning as well as mechanisms underlying the treatment of pathological fear and anxiety with exposure-based interventions. Classic fear conditioning paradigms use a high level of abstraction (i.e., pairing a yellow triangle displayed on a computer screen with a shock to induce a fear of the symbol), which may only loosely reproduce the complex nature of learned fear and its treatment outside the laboratory. Virtual reality allows to create more complex and dynamic paradigms and might thus be more suitable to investigate fear learning and treatment through its higher ecological validity.
In the current study, a novel virtual reality fear conditioning paradigm was developed in which participants learned that not an object per se, but its specific behaviors were associated with a threat (i.e., the closer the object approached the participant, the higher was the probability for the object to trigger an electric shock). This paradigm served as the reproduction of a situation in which, for example, a threatening dog might be more likely to bite if it's closer to a person. This learned threat allowed the experimental manipulation of expectancy violation (i.e., the discrepancy between the expectancy to receive a shock when shocks were actually no longer delivered) based on the object's behavior during a later phase of the experiment which represented an exposure-based treatment of the learned fear.

daniel.gromer@uni-wuerzburg.de

Looking Fear in the Eye: Children's Experience With Gamified Virtual Reality Exposure Towards Spiders Using Gaze Interaction

Theresa F. Wechsler[1], Martin Kocur[2], Sandra Schumacher[1], Mirjam Rubenbauer[1], Andreas Ruider[1], Martin Brockelmann[2], Michael Lankes[3], Christian Wolff[2], Andreas Mühlberger[1]

[1]University of Regensburg, Department of Psychology, Clinical Psychology and Psychotherapy
[2]University of Regensburg, Chair of Media Informatics
[3]University of Applied Sciences Upper Austria, Department of Digital Media

Many children around the globe suffer from spider phobia. Virtual reality exposure therapy is an effective phobia treatment but so far predominantly tailored for adults. A gamified approach utilizing gaze interaction would allow for a more child-friendly and engaging experience. We developed an application in which children make spiders change in positively connotated ways (e.g., make them dance or shrink) if sufficient visual attention towards them is captured via eye tracking. Thereby, motivation for exposure towards and positive experiences with spiders are aspired. In 21 children without (n=11) and with fear of spiders (n=10), we found that significantly more positive than negative affect was induced by the spiders' transformations. We reached a satisfactory sense of agency with 95% of all children attributing the transformations to their gaze. Fear of spiders was significantly reduced in spider-fearful children. Findings indicate eligibility for future clinical use and evaluation in children with spider phobia.

theresa.wechsler@ur.de

Virtual Companions: Does the Co-Presence of a Wooden Avatar Buffer Fear in VR?

Martin Weiß[1], Lukas Treml[1], Philipp Krop[2], Marc E. Latoschik[2], Martin J. Herrmann[1], Grit Hein[1]

[1]Department of Psychiatry, Psychosomatics and Psychotherapy, Center of Mental Health, University Hospital Würzburg, Germany
[2]Human-Computer Interaction (HCI) Group, University of Würzburg, Würzburg, Germany

Social buffering refers to the protective effects of social support on stress and other negative experiences. In this study, we explored the effects of social buffering on fear-related psychological and physiological responses in virtual reality (VR). Participants were exposed to a fear-provoking situation in VR under three conditions: alone, co-presence (presence of a wooden avatar with human proportions that could be addressed by the participants), and neutral (mere presence of the same avatar). Based on previous studies, we expected that the co-presence condition would lead to a significant reduction in fear-related psychological and physiological responses compared to the alone and neutral conditions. Our study contributes to the understanding of whether the presence of a non-human avatar can help to reduce fear-related responses and thus may be useful in the treatment of anxiety disorders.

weiss_m11@ukw.de

Co-Located Virtual Exposure Therapy: A Multi-User Mixed Reality Approach

Daniel Badeja[1], Florian Schier[2]

[1]Technische Universität Dresden, Chair of Behavioural Psychotherapy
[2]Technische Universität Dresden, Immersive Experience Lab

With the recent addition of virtual reality based exposure therapies (VRET) to the German treatment guidelines for specific phobias and social anxiety disorder, use of VRET for some disorders can be considered to have reached a certain degree of maturity (Bandelow et al., 2022).
However, while many therapies are founded on the building of a strong communicative relationship between patient and therapist, current VR therapies tend to be single-user experiences, with the patient venturing alone into the virtual world and the therapist providing guidance from the outside. Not only is the virtual experience not shared, but due to the isolating nature of the technology, natural communication between patient and therapist is restricted.
To address this, whilst maintaining VRs capacity to stimulate realistic responses to certain stressful stimuli, we propose a multi-user mixed-reality platform for exposure treatment, allowing for shared virtual experiences between patient and therapist. With mixed reality allowing participants to see one another directly, the system permits more natural communication and interaction between patient and therapist. In considering multi-user mixed reality as fundamentally a tool for communication, we aim for interactions that more closely resemble those found in early states of in vivo-exposure therapy.
We will present a prototype and initial evaluation of an exposure treatment-centered multi-user extended reality (MUXR) system that allows for:

- Shared, coherent, and co-located experiences in both virtual and mixed reality,
- Natural communication and interaction between users,
- Remote and on-site psychotherapy,
- Smooth, flexible transitions from real to virtual world, and
- Monitoring of physiological arousal parameters.

florian.schier@tu-dresden.de

The Application of Virtual Reality Exposure Versus Relaxation Training in Music Performance Anxiety: A Randomized Controlled Study

Daniel Bellinger[1], Kristin Wehrmann[1], Anna Rohde[1], Maria Schuppert[2], Stefan Störk[3], Michael Flohr-Jost[4], Dominik Gall[4], Paul Pauli[4], Jürgen Deckert[1], Martin Herrmann[1,*], Angelika Erhardt-Lehmann[1,5,*]

[1]Department of Psychiatry, Psychosomatics, and Psychotherapy, Center for Mental Health, University Hospital Würzburg, Germany
[2]Hochschule für Musik, University of Würzburg, Germany
[3]Department Clinical Research & Epidemiology, Comprehensive Heart Failure Center Würzburg, University Hospital Würzburg, Germany
[4]Department of Psychology (Biological Psychology, Clinical Psychology, and Psychotherapy), Center for Mental Health, University of Würzburg, Würzburg, Germany
[5]Department of Translational Research in Psychiatry, Max Planck Institute of Psychiatry, Munich, Germany.
[*]Contributed equally

Music performance anxiety (MPA) can be defined as a subentity of social fears and is considered a common problem among musicians. Unlike to normal stage fright, MPA affects the musical performance with a significant impact on the artistic career and/or the well-being of the individual. Typical symptoms of MPA are amongst others the consequences of an increase in sympathetic tone with cardiac stress like an acceleration of heartbeat and blood pressure. The therapy of choice for anxiety disorders is cognitive-behavioral therapy with exposure. Hardly any therapy studies so far are applying virtual reality exposure on MPA. Therefore, we have designed a prospective, randomized and controlled clinical trial with a pre-post design and a follow-up after 6 months to analyze the effects of exposure treatment in virtual reality (VRET) for musicians with performance anxiety. Furthermore, we are investigating the therapy outcome and cardiovascular changes throughout the course of the therapy using a behavioral assessment test in virtual reality. 46 (semi)-professional musicians including music student will be recruited and randomized into a exposure-therapy group using virtual reality or a control group receiving progressive muscle relaxation, both over 4 single sessions. So far, we have carried out the therapy training with 17 musicians. We expect a reduction of anxiety but also a consecutive improvement of the heart rate variability with cardiovascular protective effects. We hope this study to give information about whether virtual reality can be a necessary tool in the treatment or prevention of music performance anxiety.

bellinger_D@ukw.de

SYMPOSIUM: BODY AND GESTURES

Wednesday, 13:30 – 15:00 I Audimax

Chair: Oliver Herbort

Using VR to Understand Pointing Gestures

Oliver Herbort[1] & Lisa-Marie Krause[1]

[1]Department of Cognitive Psychology, University of Würzburg, Würzburg, Germany

Pointing gestures are a ubiquitous element of human communication. They are typically used to guide the attention of others to specific locations in the environment – sometimes successfully, sometimes not so much. Pointing gestures have been studied from the perspectives of psychology, linguistics, anthropology, or human-computer-interaction studies. However, the geometry of pointing, that is, how we produce pointing gesture to refer to a location and how we infer a location from observing pointers, has received less scrutiny. In recent years, we examined pointing production and pointing perception with a variety of techniques, including virtual reality, real life interactions or collaborative virtual environments to fill this gap. Our experiments revealed that we typically misunderstand the pointing gestures of others. These misunderstandings can be attributed to the substantial effect of the perspective on how we point and understand pointing gestures of others. Our experiments also revealed that VR experiments provide a good approximation to real life settings. Finally, we discuss the potential and limitations of the use of pointing gestures in virtual environments.

oliver.herbort@uni-wuerzburg.de

Analysis of Pedestrian Gestures in a Virtual Traffic Environment

Thomas Brand[1] & Marcus Schmitz[1]

[1]Würzburg Institute for Traffic Sciences GmbH, Veitshöchheim, Germany

Road traffic is largely defined by clear rules and laws. However, there are situations that are not completely clear and in which communication between road users needs to take place in order to resolve misjudgements or ambiguities. As one mean of communication, gestures can be used to coordinate traffic. Gestures are able to convey different intentions, which refer, for example, to one´s own behaviour or the change in the behaviour of others. However, research on the topic of gestures in road traffic has not yet been carried out in detail. In our study we aimed at identifying and analysing such gestures focusing on the communication of pedestrians with motorists in inner-city traffic. For this purpose, we built and used a pedestrian simulator, in which participants were instructed to use gestures to communicate with an oncoming vehicle in different traffic scenarios. Furthermore, we also instructed the participants to do this in a real setting to investigate the validity of the recorded gestures in a virtual environment. From recorded video data we identified eighteen different pedestrian gestures. Additionally, we show that the type and the expressiveness of the gestures do not differ when performed in virtual reality or in real environment.

brand@wivw.de

The Impact of Avatar and Environment Congruence on Plausibility, Embodiment, Presence, and the Proteus Effect in Virtual Reality

David Mal[1], Erik Wolf[1], Nina Döllinger[2], Carolin Wienrich[2], Marc Erich Latoschik[1]

[1]Human-Computer Interaction (HCI) Group, University of Würzburg
[2]Psychology of Intelligent Interactive Systems (PIIS) Group, University of Würzburg

In 2007, Yee and Bailenson referred to the flexibility of transforming self-representation in virtual environments (VEs) and observed participants adapting their behavior to conform to their avatars' characteristics. They named this phenomenon the Proteus effect, which holds significant implications for serious applications of mixed, augmented, and virtual reality (MR, AR, VR: XR for short). The presented study considers the relationship (congruence) between the self-embodiment (avatar) and the virtual environment. We investigated the impact of avatar and environment types and their congruence on avatar plausibility, sense of embodiment, spatial presence, and the Proteus effect. In a 2×2 between-subjects design, participants embodied either an avatar in sports- or business wear in a semantic congruent or incongruent environment while performing lightweight exercises in virtual reality. The avatar-environment congruence significantly affected the avatar's plausibility but not the sense of embodiment or spatial presence. However, a significant Proteus effect emerged only for participants who reported a high feeling of (virtual) body ownership, indicating that a strong sense of having and owning a virtual body is key to facilitating the Proteus effect. We discuss our results and give insights into current theories of bottom-up and top-down determinants of the Proteus effect and contribute to a better understanding of its underlying mechanisms and determinants.

david.mal@uni-wuerzburg.de

Linking Emotions and Body: Using VR to Induce Emotion and Generate Musculoskeletal Behaviour

Peter Collins[1], Britta Schneider[1], Sofia Sánchez Aguirre[1]

[1]Lehrstuhl für Psychologie I, Universität Würzburg

Can we infer psychological states using musculoskeletal data?
As social animals, our ability to accurately decode the musculoskeletal behaviour of others is critical to our survival and the group's survival. Humans are adept at reading the body language of posture and movement, Given that there is something communicated that can be decoded and which is informative, the challenge facing science is to record and decode musculoskeletal behaviour in an objective systematic reliable manner that is transparent and reproducible.
How to decode musculoskeletal behaviour? Firstly, by generating homogenous interpretable data, and secondly, by exploring a variety of decoding approaches.
Paradigm: Psychological state was manipulated using establish emotion induction videos presented in VR and immersive VR environments designed to induce height anxiety. The key design considerations were to make the paradigm parsimonious, intuitive, to generate movement data, and to induce strong emotions.
Data: Subjective ratings, musculoskeletal data (full body IMU motion capture and bilateral EMG sensors over the erector spinae. upper trapezius, and medialis gastrocnemius) and physiological data (EDR and ECG) were recorded.
Analysis: Musculoskeletal data is visualised within the VR environment used to generate the data using custom interactive VR visualisation software. Both aggregate and continuous musculoskeletal data is analysed and compared to physiological measures.

peter.collins@uni-wuerzburg.de

A Cardio-Visual Full Body Illusion Improves Body Size Estimation in Healthy Women

Lynn Erpelding[1], Dimitri van Ryckeghem[1,2], Claus Vögele[1], Annika Lutz[1]

[1]University of Luxembourg
[2]Maastricht University

A cardio-visual full body illusion improves body size estimation in healthy women: Body image distortion (BID), i.e., the misestimation of one's own body size, is found in healthy women, and presents a risk factor for the development of eating disorders. BID has been linked to interoceptive deficits and can be improved by visuotactile body illusions. We investigated the effects of a cardio-visual full body illusion (cvFBI) on BID in 45 healthy women. The cvFBI was induced by presenting a 3D body scan of the participant in VR, flashing with a short (230 ms) or long (530 ms) delay after the R-peak of the participant's ECG, or not flashing at all. Short delays are typically perceived as being synchronous to one's heartbeat, long delays as asynchronous. The same conditions (short delay, long delay, no flash) combined with a 3D object (cube) served as control conditions. Before and after each illusion condition, participants indicated the width and circumference of their shoulders, waist, and hips. The results show that after the cvFBI, participants estimated their body size more accurately, especially shoulder and hip circumference. This effect was observed in all the illusion conditions, irrespective of VR content (3D-body, object) and flashing (short delay, long delay, no flash). These results demonstrate that BID can be changed with a cvFBI, but also by simply being in VR. Additional cardio-visual feedback might enhance multisensory integration and trigger body image updating. This study offers new implications for interventions to target BID in healthy women and women with eating disorders.

lynn.erpelding@uni.lu

SYMPOSIUM: BRAIN AND COGNITION

Wednesday, 13:30 – 15:00 I lecture hall 224

Chair: Martin Herrmann

Utilizing a Virtual T-Maze to Objectively Validate the Effects of Low-Intensity Transcranial Focused Ultrasound Neuromodulation

Philipp Ziebell[1], Johannes Rodrigues[1], André Forster[1], Joseph L. Sanguinetti[2], John J.B. Allen[2], Johannes Hewig[1]

[1]University of Würzburg, Würzburg, Germany
[2]University of Arizona, Tucson (AZ), USA

Low-intensity transcranial focused ultrasound (LITFUS) as a newly emerging non-invasive neuromodulation offers various benefits (e.g. ease of use, targeting precision, side effect avoidance). Its potential has been highlighted for scientific and practical applications (Beisteiner & Lozano, 2020; Darmani et al., 2022).
In this double-blind within-subjects study (N = 152), we applied right prefrontal cortex (RPFC) LITFUS, which was found to enhance mood, while decreasing anxiety and worrying (Reznik et al., 2020; Sanguinetti et al., 2020). To expand evidence on a physiological and behavioral level, a virtual T-maze was used for simultaneously recording approach vs. withdrawal and electroencephalographic midfrontal theta (MFT). Heightened MFT has been linked to heightened conflict experiences as well as withdrawal-like negative feelings and behavior (Cavanagh & Shackman, 2015; Gratton et al., 2018), for instance, increased anxious anticipation of social threat or less risky gambling decisions (Osinsky et al., 2017; Schmidt et al., 2018). We hypothesized RPFC LITFUS would induce MFT inhibition that should predict increased approach and decreased withdrawal.
RPFC LITFUS led to significant MFT inhibition, distinctly evident in scalp topography. As expected, this could significantly predict increased approach and decreased withdrawal, with prediction patterns once more revealing distinct scalp topographies. These findings suggest the promise of further basic and applied research, such as for supporting psychotherapeutic interventions regarding emotional and motivational disorders.

philipp.ziebell@uni-wuerzburg.de

Modulations of Brain Oscillations Under Virtual Reality Conditions

Joanna Kisker[1], Leon Lange[2], Roman Osinsky[2], Benjamin Schöne[1], Thomas Gruber[1]

[1]Experimental Psychology I, Institute of Psychology, Osnabrück University, Osnabrück, Germany
[2]Differential Psychology & Personality Research, Institute of Psychology, Osnabrück University, Osnabrück, Germany

Virtual reality (VR) is a more and more important research tool to investigate human cognition under ecological valid settings. Likewise, electrophysiological activities in specific frequency bands are regarded well-established indices to examine the cortical mechanisms underlying cognition. Our goal was to combine both techniques thereby addressing perks and pitfalls of acquiring EEG oscillations in immersive VR. In particular, we explore the modulation of brain oscillations directly after, or in immediate response to VR experiences. In the low-frequency theta- and alpha-band range, our data reveal both modulations and disparate responses under VR conditions compared to conventional desktop settings. For example, theta-band responses reflecting mnemonic processing are modulated after VR-based encoding compared to desktop-based setups, indicating divergent recognition mechanisms. Moreover, affective behavioral responses in VR are not reflected in alpha-band modulations to the extent predicted by established models on low frequency activity.
Going one step further, we aim to demonstrate the feasibility of capturing oscillations in the high-frequency gamma-band range (30-100Hz) in VR. Gamma-band oscillations are highly relevant to complement findings from the low-frequency range. However, 30-100Hz activity is even more prone to electrical and extracerebral artefacts as opposed to oscillations in the alpha- and theta-range. Our results reveal that gamma-band responses can be accessed during the use of a VR headset, and that the observed responses are in line with previous findings. We conclude that the acquisition of oscillatory electrophysiological markers under immersive VR conditions offers a promising approach to extend findings based on conventional EEG studies.

joanna.kisker@uni-osnabrueck.de

Exploring the Dynamics of Cognitive Control Using Virtual Reality and Mobile EEG

Leon Lange[1], Joanna Kisker[2], Roman Osinsky[1]

[1]Differential Psychology & Personality Research, Institute of Psychology, Osnabrück University, Germany
[2]Experimental Psychology I, Institute of Psychology, Osnabrück University, Germany

Dynamic assessment of cognitive control by combining virtual reality and mobile EEG: Advances in the development of VR and EEG technology open up new possibilities for neuroscientists to study the brain in dynamic situations. In a series of experiments we assessed frontomedial theta activity (FMT), an indicator for cognitive control, by combining mobile EEG and virtual reality (HTC Vive HMD).
In two shooting tasks participants shot at targets within a virtual environment. Missing shots evoked increased feedback-related FMT power in the EEG, indicating an increased need for cognitive control. Further, found a suppression of FMT power when participants can observe the projectile and anticipate the most likely outcome of the shot. Thus, the brain seems to continuously draw on incoming information and dynamically adapt the feedback-related cognitive control.
In an approach-avoidance task in a virtual environment, participants physically walked toward or away from a stimulus that had both appetitive and aversive motivational qualities, by concealing either a reward or a punishment. Situations with this type of conflicting motivations have been shown to trigger so-called approach-avoidance conflicts, whose neuronal correlates we can measure in the EEG. In addition, we can investigate the behavioral response based on the positional information in the virtual environment, e.g., by analyzing the movement speed, acceleration or hesitation. First findings will be presented and implications are portrayed with the combination of mobile EEG systems and VR opening up new possibilities for less restricted while still controllable experimental designs.

leon.lange@uni-osnabrueck.de

Feature Integration Affects Working Memory Performance in PC and VR

Eda Bakkal[1], Omar Jubran[1,2], Thomas Lachmann[1,2,3,4]

[1]Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau (RPTU)
[2]Center for Cognitive Science
[3]Centro de Investigación Nebrija en Cognición (CINC), Facultad de Lenguas y Educación, Universidad Nebrija Madrid, Spain
[4]Brain and Cognition Research Unit, Faculty of Psychology and Educational Sciences, University of Leuven (KU), Leuven, Belgium

The present study investigates conceptual information binding and how it affects the encoding and retrieval of objects in working memory tasks. Previous studies have shown that real-world objects lead to better memory performance due to a large number of visual details. In addition, memory performance in a virtual environment (VR) has been found to be better when viewing three-dimensional (3D) objects than two-dimensional (2D) objects. In this study, participants performed a serial recall task with animal images using two different devices, a standard computer screen, and a VR headset. Performance was then compared in this condition and how it interacted with the typicality of the objects -varied by the color- and the dimension of the stimuli, resulting in a 2x2x2 design (VR or PC/ 3D or 2D/ typical or atypical color) within-subject design. Results show that typical items are better remembered in both PC and VR, while 3D animals showed slower reaction times but better memory performance. These findings extend previous research in feature binding with the comparison of the dimension feature in a virtual environment and demonstrate the role of features and image reality in working memory.

edabakkal@gmail.com

Stroop, Stress, and VR: Developing the Virtual Reality Stroop Room

Veronika Ringgold[1,2], Wolfgang Mehringer[2], Bjoern Eskofier[2], Nicolas Rohleder[1]

[1] Chair of Health Psychology, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany
[2] Machine Learning and Data Analytics Lab (MaD Lab), Department Artificial Intelligence in Biomedical Engineering (AIBE), Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany

Stress and executive functions – inhibition, working memory, and cognitive flexibility – are related, but that relationship is not yet well understood, mainly due to scarce data. Therefore, the first version of the Virtual Reality Stroop Room (VRSR) was programmed as a fun way to implement the Stroop Test, which assesses participants' ability to inhibit interfering information. Further, it allows the implementation of potential stressors, such as time pressure or feedback.
In the first step, we conducted a study with different configurations: One with additional time pressure, another with rotating walls, and the third as a control condition without additional stressors. In the next step, a Virtual Agent was developed, delivering feedback to participants. Both studies are yet to be published.
After these initial studies, the VRSR will be further developed to implement a social-evaluative component, without involving real-life people. A team of psychologists and computer scientists is creating different feedback modalities in the VRSR – auditory and visual – to heighten the perceived evaluation without implementing a Virtual Agent. In addition, the difficulty will be adapted as a function of the participants' performance. Our goal is to provide the psychological research community with a version of the VRSR that allows the analysis of participants' inhibition ability – measured by error rates, and reaction times – while also activating both stress axes: The sympathetic nervous system and the hypothalamus-pituitary-adrenal axis. Additionally, movement parameters from the VR system can be used to further our understanding of how movement and stress are connected.

veronika.ringgold@fau.de

POSTERS & POSTER PITCHES

Wednesday, 15:00 – 18:00 I Atrium & Audimax

LiVRSono - Virtual Reality Training With Haptics for Intraoperative Liver Ultrasound

Mareen Allgaier[1], Florentine Huettl[2], Tobias Huber[2], Bernhard Preim[1], Sylvia Saalfeld[1], Christian Hansen[1]

[1]Otto-von-Guericke University Magdeburg, Germany. Department of Simulation and Graphics
[2]University Hospital of the Johannes Gutenberg-University Mainz, Germany. Department of General and Abdominal Surgery

Virtual Reality Training for Intraoperative Liver Ultrasound using Haptics: One of the main challenges of using ultrasound (US) is learning to create a spatial mental model of the inside of the scanned object based on the US image and the transducer position. Since intraoperative liver US cannot be easily trained on patients, we present an immersive VR application with haptics to train this challenge.
The application comprises a texture-based approach simulating the US image using patient-specific 3D models. Based on the described learning goal and the workflow of intraoperative liver US, four training tasks were identified with medical experts.
The application was evaluated qualitatively with 11 participants, whereof six participants are experts in intraoperative liver US and five participants are potential users of the training system. The setting, handling of the US probe and US image were as realistic enough for the learning goal. Regarding the haptic feedback, a huge drawback is the limited range of movement of the input device. Three of four training tasks were rated as meaningful and one task should be replaced.
Besides the drawbacks of the input device, our training system provides a realistic learning environment with meaningful tasks to train the creation of a mental 3D model when performing intraoperative US. We also identified important improvements of the learning tasks to further enhance the training experience.

mareen@isg.cs.uni-magdeburg.de

Virtual Reality Relaxation Intervention in Psychiatric Outpatients During the COVID-19 Pandemic

Sabrina Baldofski[1], Annika Humbert[1], Elisabeth Kohls[1,2], Carola Epple[3], Christine Rummel-Kluge[1,2]

[1]Department of Psychiatry and Psychotherapy, Medical Faculty, Leipzig University, Leipzig
[2]Department of Psychiatry and Psychotherapy, Leipzig University Medical Center, Leipzig
[3]Lab E GmbH, Esslingen

Background: The COVID-19 pandemic presented a particular challenge for people with pre-existing mental disorders. Virtual reality (VR) offers the potential to support psychiatric outpatients by providing them with a relaxation tool that can be used independently. This study aimed to investigate the acceptability, feasibility, and user satisfaction of a supportive therapy-accompanying, relaxation VR intervention in psychiatric outpatients during the pandemic.
Methods: The study was conducted between January and July 2022 in N = 40 patients with mental disorders receiving treatment in a psychiatric outpatient department. During the four-week intervention, patients were asked to regularly watch relaxation videos in their home environment. Sociodemographics, feasibility, satisfaction, depressive symptoms, and quality of life were assessed.
Results: Participants using the VR device for at least three weeks (N = 29, 70.7%) were classified as completers. The majority implemented the relaxation intervention during all four weeks and two or more times per week (n = 26, 89.7%). User-friendliness was described by almost all participants as rather easy or very easy (n = 26, 89.7%) and satisfaction was high. Depressive symptoms were moderate and improved significantly in the pre-post comparison ($p < .001$). Further, psychological and physical quality of life improved significantly after the intervention ($p < .05$).
Discussion: A supportive therapy-accompanying relaxation intervention using VR is feasible in a psychiatric outpatient setting and shows high acceptance. The results on high satisfaction and user-friendliness suggest that VR can be an easy-to-implement relaxation tool to support psychiatric outpatients.

sabrina.baldofski@medizin.uni-leipzig.de

The Role of Feedback in AR-Enabled Assistance Systems at Work: An Augmented Video Vignette

Rabea Bödding[1], Anna-Lena Kato-Beiderwieden[1], Julian Schulte[1], Günter W. Maier[1]

[1]Bielefeld University

Feedback is a central element in pertinent work design models and research highlights its importance for work-related outcomes, such as work engagement, motivation, and satisfaction. However, many tasks and workplaces do not provide sufficient feedback to take advantage of this effect. Though originally designed to instruct workers, assistance systems, especially those implementing Augmented Reality (AR), may also offer real-time feedback on task execution and thus improve work attitudes. However, this effect is under-researched, because the technological implementation of such adaptive feedback features in AR-enabled assistance systems is still challenging, due to the need to evaluate complex and changing situations. We therefore conducted a one-factorial experiment through point-of-view video vignettes to test if real-time feedback (vs. no feedback) in AR-enabled assistance systems leads to higher task satisfaction (H1), higher work motivation (H3) and higher work engagement (H3). Participants (N = 165) were recruited through Clickworker and were presented with an AR-enabled assistance system to support an assembly task. The manipulation check was successful, and the subsequent analysis showed that task satisfaction was significantly higher for the feedback condition ($t(163) = 1.68$, $p < 0.05$, $d = 0.26$), supporting H1. However, there were no significant differences for work motivation ($t(163) = 1.14$, $p = 0.13$) or work engagement ($t(163) = 0.87$, $p = 0.19$), thus H2 and H3 are rejected. We discuss how our findings may impact implementation of AR-enabled assistance systems and future research, and provide an outlook to the role of adaptation and learning in assistance systems.

rabea.boedding@uni-bielefeld.de

Virtual Reality Exposure Therapy and Non-Invasive Brain Stimulation for Fear of Heights

Barbara Bohmeier[1], Lisa Cybinski[1], Daniel Gromer[2], Stefan Unterecker[1], Angelika Erhardt-Lehmann[1,3], Lorenz Deserno[4], Jürgen Deckert[1], Thomas Polak[1], Paul Pauli[2], Martin J. Herrmann[1]

[1]Center of Mental Health, Department of Psychiatry, Psychosomatics and Psychotherapy, University Hospital of Wuerzburg, Wuerzburg, Germany
[2]Center of Mental Health, Department of Psychology (Biological Psychology, Clinical Psychology and Psychotherapy), University of Wuerzburg, Wuerzburg, Germany
[3]Department of Translational Research in Psychiatry, Max Planck Institute of Psychiatry, Munich, Germany
[4]Center of Mental Health, Department for Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, University Hospital of Wuerzburg, Wuerzburg, Germany

Anxiety disorders are the most prevalent psychiatric disorders. The S3 guidelines recommend cognitive behavioural therapy and pharmacotherapy as standard of care. Studies show that virtual reality exposure therapy (VRET) is effective, especially in the treatment of specific phobias. A major advantage of VRET is the standardisation of situations and the control of environmental variables. However, there are also patients who do not sufficiently benefit from this treatment method alone. As a complement to exposure therapy, repetitive transcranial magnetic stimulation (rTMS) is used in this study to investigate whether a combination of both leads to a significantly greater reduction in fear of heights.
46 subjects with fear of heights receive two VRETs. Half of the subjects will receive rTMS (active or placebo, double blind randomized) over the left dorsolateral prefrontal cortex before each of the two exposure sessions. To characterise and assess the severity of the fear of heights, various standardised questionnaires are used before and after the therapy sessions and two behavioural tests are conducted in VR and in reality.
The data collection of the current study will be completed by February 2023 at the latest. The results of the study will be evaluated by the time of the congress.
The study aims to show that a combination of rTMS and subsequent VRET leads to a significantly greater reduction in fear of heights. In addition, the study should generally contribute to further improving the effectiveness of non-invasive brain stimulation procedures in the context of psychotherapy.

barbarabohmeier@web.de

Using VR Technology to Enhance Learning Experiences in Teaching at Universities

Vincent Bontjes van Beek[1], Korbinian von Blanckenburg[1], Julian Lau[1], Robin Meister[1], Michael Minge[1], Patrick Schmidtmeyer[1], Carolin Selbach[1], Zeno Voit[1]

[1]OWL University of Applied Sciences and Arts

Using VR technology to enhance learning experiences in teaching at universities: We present the project “uni.verse” which aims at investigating the possibilities of VR for teaching at universities. After the COVID-19 pandemic and the forced switch to remote teaching, benefits of this style of lectures have become apparent. Ranging from spontaneous student engagement by quickly creating break out sessions to visiting lectures that are held in digitally enhanced environments, virtual classrooms have the potential to provide substantial value to the education system. Taking this idea a step further, enhancing a virtual class with individual avatars for lecturers and students, providing 3D animations to keep students’ attention and using gamification methods to increase students’ involvement are promising scenarios. At the same time, we investigate the potential of live streams to realize virtual classes. The implementation follows a user-centered design approach and considers the needs of students, teachers, and administrators. The project aims to provide a framework how to implement virtual classes as a live stream in a comfortable, ease to use and stimulating way. The talk gives an overview of the current project status and introduces the project to the XR community.

michael.minge@th-owl.de

Virtual Reality EEG Neurofeedback of Partietal Alpha for Increasing Sense of Presence

Loic Botrel[1], Roland Zechner[2], Mathias Müller[2], Andrea Kübler[1]

[1]Department of Psychology I, Intervention Psychology, University of Würzburg, Würzburg, Germany
[2]Department of Research and Development, VTplus GmbH, Würzburg, Germany

Background: Studies has established a relationship between alpha activity in the electroencephalograph (EEG) of the parietal cortex and the sense of presence in highly immersive virtual reality (VR) scenarios. We present here the development and testing of a neurofeedback pipeline for training parietal alpha reduction within a VR environment. In the first study, n=10 participants were trained for 10 sessions to decrease their parietal alpha via neurofeedback via real-time bar feedback displayed on a monitor. It helped determine the training conditions and a subset of electrodes for a follow-up study. This second study included n=15 participants who followed 6 VR training sessions using a portable sponge based EEG system. Sense of presence did not significantly increase as an immediate result of decreasing parietal alpha. Results showed lower alpha training performance. We suspect steep decrease in signal to noise ratio due to software spatial filtering, electrode reduction and signal stability due to bulky VR equipment. Results could be improved offline by using simpler estimates (e.g. parietal average). We also describe the challenges of the concurrent use of head-mounted-display and portable EEG and the tradeoffs that ensue.
Our consortium partners Vtplus (GmBh.) procured and developed a fully interactive VR equipment and environment for training; Brain Products (GmBh) procured and designed a portable EEG system with sponge based electrodes. The study is part of the joint BMBF funded research project VirtualNoPain (13GW0343).

loic.botrel@uni-wuerzburg.de

Selective Attention in Complex Movements

Dan Bürger[1], Stephan Streuber[2], Nicole Wetzel[3], Stefan Pastel[1], Kerstin Witte[1]

[1]Otto-von-Guericke-Universität Magdeburg
[2]Hochschule Coburg
[3]Leibnitz-Institut für Neurobiologie Magdeburg

In sports, athletes need to focus on task-relevant information, otherwise, reduced performance can be expected. Such a distraction effect was shown in several experiments in lab environments (Wetzel & Schröger, 2014). However, in more complex movements, like in sports, there is a lack of research concerning this effect. For this reason, we transferred an experiment including the oddball paradigm into a table tennis setting. Virtual reality was used to have complete control over the presented stimuli and to collect data simultaneously. The subjects saw a ping pong table and balls bouncing toward their left or right side every 3.2 seconds. The task was to return these balls into a specific target region. Before the ball appeared, either a standard or a distractor sound was played. The time between the balls' appearance and the first reaction with the racket ('Time for Response' (TfR)) was measured. In total, 9 blocks with 50 balls were carried out with one minute break between the blocks. An ANOVA with the factors 'sound type' (standard/distractor) and 'block' revealed a significant interaction between these. Post-hoc tests showed significantly shorter TfR when a standard sound was played before the ball appeared in the first ($p < .01$), second ($p = .03$) and fourth block ($p = .01$). The experiment showed that the oddball paradigm could also be found in more complex reactions as well. However, the distraction effect disappears after a certain number of reactions. We assume that habituation to the task requirements led to these results.

dan.buerger@ovgu.de

A Case Study of Movement Data Visualization

Peter Collins[1], Simon Kloiber[2], Volker Settgast[2], Tobias Schreck[2]

[1]Lehrstuhl für Psychologie I, Würzburg University
[2]Institute of Computer Graphics and Knowledge Visualization, Graz University of Technology

Psychology is the science of behaviour. When analysing movement behaviour, the impact of an experimental manipulation is typically only evaluated on aggregated measures, with the result that potentially important behavioural observations are missed.
However, if we record participant's movement behaviour while they navigate and interact with a virtual environment, we can subsequently visualise movement behaviour in the environmental context in which it was recorded. Thus, the detail of movement behaviour can be explored within the context of the environment offering new insights and an alternative to aggregate measures.
In this work, we present a case study of movement data visualised within a virtual environment. The aim is to examining movement behaviour in response to stimuli and the environmental context. To achieve this, we adapt an existing immersive analysis system.
We evaluate the approach with data captured in an independent psychological experiment. In addition, we report exemplary observations and discuss future work necessary to develop a more comprehensive and adaptive system.

peter.collins@uni-wuerzburg.de

Augmented Reality for Chronic Back Pain: Psychoeducational Intervention Design - A Scoping Review

Robin Conen[1], Nicolai Hepke[2], Steffen Müller[3], Ana N. Tibubos[1]

[1]Department of Diagnostics in Healthcare & e-Health, University of Trier, Germany [2]Department of Computer Science, Trier University of Applied Sciences, Germany [3]Department of Computer Science / Therapy Science, Trier University of Applied Sciences, Germany

Background: Chronic low back pain is the most prevalent chronic pain disorder. There is no pathomechanism and psychosocial factors form risk factors for pain chronification. Psychoeducation forms an independent method of education and shows positive effects on psychological components of the disease. At the same time, first virtual reality trainings indicate positive as well as superior results in the treatment of back pain. Whereas Augmented Reality as Mixed Reality complements the real world and can be extended by the own body. The goal was to show the state of research on the treatment of chronic back pain by psychoeducation and by augmented reality. Methods: The literature search was performed according to PRISMA.

Results: 11 publications were included. Data extraction was performed by qualitative content analysis and categorization into (1) psychoeducation process and content, (2) motivation, (3) intervention duration, and (4) evaluation. The extracted data were discussed by incorporating the existing research on conventional intervention design and the Unified Theory of Acceptance and Use of Technology to conclude psychoeducational intervention design for chronic low back pain with augmented reality technology. Conclusion: Based on these findings, experimental studies are needed on the use of psychoeducation as a treatment component for chronic low back pain in augmented reality. Based on the results of this scoping review, a feasibility study is planned and has already been approved by the Ethics Committee of the University of Trier. The study will be pre-registered with Open Science Framework where further information can be found.

conen@uni-trier.de

Measuring Interpersonal Trust Towards Virtual Humans With a Virtual Maze Paradigm

Johrine Cronjé[1,*], Jinghuai Lin[1,*], Ivo Käthner[2,3], Paul Pauli[2,4] ,Marc Erich Latoschik[1]

[*]shared first author
[1]Human-Computer Interaction (HCI) Group, University of Würzburg, Würzburg, Germany
[2]Department of Psychology I, Biological Psychology, Clinical Psychology and Psychotherapy, University of Würzburg, Würzburg, Germany
[3]Department of Physiological Psychology, University of Bamberg, Bamberg, Germany
[4]Center of Mental Health, Medical Faculty, University of Würzburg, Würzburg, Germany

Virtual humans, including virtual agents and avatars, play an increasingly important role as VR technology advances. For example, virtual humans are used as proxies of users in social VR or as interfaces for AI assistants in online financing. Interpersonal trust is an essential prerequisite in real-life interactions, as well as in the virtual world. However, to date, there are no established interpersonal trust measurement tools specifically for virtual humans in virtual reality. This study fills the gap, by contributing a novel validated behavioural tool to measure interpersonal trust towards a specific virtual social interaction partner in social VR. This validated paradigm is inspired by a previously proposed virtual maze task that measures trust towards virtual characters. In the current study, a variant of this paradigm was implemented. The task of the users (the trustors) is to navigate through a maze in virtual reality, where they can interact with a virtual human (the trustee). They can choose to 1) ask for advice and 2) follow advice from the virtual human if they want to. These measures served as behavioural measures of trust. We conducted a validation study with 70 participants in a between-subject design. The two conditions did not differ in the content of the advice but in the appearance, tone of voice and engagement of the trustees (alleged as avatars controlled by other participants). Results indicate that the experimental manipulation was successful, as participants rated the virtual human as more trustworthy in the trustworthy condition than in the untrustworthy condition. Importantly, this manipulation affected the trust behaviour of our participants, who, in the trustworthy condition, asked for advice more often and followed advice more often, indicating that the paradigm is sensitive to assessing interpersonal trust towards virtual humans. Thus, our paradigm can be used to measure differences in interpersonal trust towards virtual humans and may serve as a valuable research tool to investigate trust in virtual reality.

johrine.cronje@uni-wuerzburg.de

Augmentative Transcranial Magnetic Stimulation for Virtual Reality Exposure Therapy in Acrophobia

Lisa Cybinski[1], Daniel Gromer[2], Tommi Raij[3,4], Florian Gundelach[1], Stefan Unterecker[1], Angelika Erhardt-Lehmann[1,5], Andreas Mühlberger[6], Jürgen Deckert[1], Thomas Polak[1], Paul Pauli[2], Martin J. Herrmann[1]

[1]Center of Mental Health, Dept. of Psychiatry, Psychosomatics, and Psychotherapy, University Hospital of Wuerzburg, Wuerzburg, Germany
[2]Center of Mental Health, Department of Psychology (Biological Psychology, Clinical Psychology, and Psychotherapy), University of Wuerzburg, Wuerzburg, Germany
[3]Athinoula A. Martinos Center for Biomedical Imaging, Department of Radiology, Massachusetts General Hospital, Charlestown, MA, USA
[4]Harvard Medical School, Boston, MA, USA
[5]Department of Translational Research in Psychiatry, Max Planck Institute of Psychiatry, Munich, Germany
[6]Department of Clinical Psychology and Psychotherapy, Institute of Psychology, University of Regensburg, Regensburg, Germany

Specific phobias (SP) are among the most prevalent anxiety disorders. The gold standard for SP treatment is in-vivo or virtual reality exposure therapy (VRET). VRET has the advantage of being more accepted by patients and allowing standardized and controlled exposure exercises. Although exposure therapy is an effective method for reducing phobic symptoms, not all patients benefit sufficiently from this treatment approach. In this double-blind, randomized, placebo-controlled study, we investigated whether the additional application of repetitive transcranial magnetic stimulation (rTMS) enhances VRET in phobic patients. For this, 75 subjects with acrophobia (according to DSM-5) underwent two VRET sessions in a 5-sided cave automatic virtual environment (CAVE). Immediately before each exposure session, participants received either activating or placebo rTMS of the left frontal cortex, which is indirectly coupled to the ventromedial prefrontal cortex (vmPFC) and associated with the underlying learning processes of exposure therapy (according to Raij et al., 2018). For individual stimulation localization, structural MRIs were performed in each participant and integrated into a neuronavigation system. Acrophobic symptoms were assessed before treatment, after treatment, and at 6 months follow-up using questionnaires and two behavioral approach tests, one in virtual reality (using a head-mounted display, HMD) and one in-vivo. Our preliminary analysis showed a significant reduction in phobic symptoms from pre to post treatment, but no significant time x TMS group interaction. These results suggest that VRET is a promising method to reduce phobic anxiety. However, the optimal rTMS localization and stimulation parameters remain open and require further research.

cybinski_L1@ukw.de

Turning up the Stress – Development and Evaluation of a Virtual Reality Stress Kit for Training and Research in the Context of Rescue Operations

Marina Dreisbusch[1], Cornelia Küsel (contributed equally)[1], Armin Leopold[1], Silja Meyer-Nieberg[1], Thomas Gebhardt[1], Patrick Ruckdeschel[1], Karl-Heinz Renner[1], Marko Hofmann[1]

[1]University of the Bundeswehr, Munich, Germany

Rescue operations may provoke high-stress reactions on the part of the rescue forces involved. Despite the potential that virtual reality offers for training and research, there are hardly any virtual environments for the specific target group of rescue forces. Furthermore, previous stress manipulations such as the Trier Social Stress Test do not allow for a gradual increase in stressors.
Within the interdisciplinary project Smart Health Lab funded by the center for research on digitization and technology of the Bundeswehr (dtecbw.de), we (psychologists and computer scientists) are developing a virtual environment that simulates a rescue operation and aims – among other things - at an incremental increase of stressors. Therefore, we present and discuss the basic concept of the VR stress kit as well as the results of a preliminary study that aimed at refining the virtual environment. Further evaluation studies will be conducted to validate stress manipulations.
Our ultimate goal is to allow for adaptive game-playing and personalized stress management, i.e., the presentation of individualized stressors and tailored stress interventions that meet the needs and specifics of the individual rescue worker. Special emphasis is put on the reliable and valid use of sensors to track biological stress parameters that may inform adaptive game-playing. In addition, olfactory stressors shall be incorporated into the virtual stress kit in the future.

marina.dreisbusch@unibw.de

Embodiment and Personalization for Self-Identification With Virtual Humans

Marie Luisa Fiedler[1,2], Erik Wolf[2], Nina Döllinger[1], Mario Botsch[3], Marc Erich Latoschik[2], Carolin Wienrich[1]

[1]Psychology of Intelligent Interactive Systems Group, University of Würzburg
[2]Human-Computer Interaction Group, University of Würzburg
[3]Computer Graphics Group, TU Dortmund University

Our work investigates the impact of virtual human embodiment and personalization on the sense of embodiment (SoE) and self-identification (SI). We introduce preliminary items to query self-similarity (SS) and self-attribution (SA) with virtual humans as dimensions of SI. In our study, 64 participants successively observed personalized and generic-looking virtual humans, either as embodied avatars in a virtual mirror or as agents while performing tasks. They reported significantly higher SoE and SI when facing personalized virtual humans and significantly higher SoE and SA when facing embodied avatars, indicating that both factors have strong separate and complimentary influence on SoE and SI.

marie.fiedler@uni-wuerzburg.de

Digital Teams: Working With 2D vs. 3D Technologies

Yannick Frontzkowski[1], Philip Gubernator[1], Katharina Schübbe[1], Jörg Felfe[1]

[1]Helmut-Schmidt-Universität - Universität der Bundeswehr Hamburg, Germany

As home office increased, so did digital communication (e. g. Zoom, MS Teams). Along with digital communication, employees reported reduced frequency of communication, more communication difficulties, and associated higher social isolation. In addition, frequent digital communication, especially via video conferencing, carries a high risk of Zoom fatigue. Recent studies underscore the possibility that these risks can be improved by more innovative communication technology. In this context, virtual reality (as a 3D communication technology) is compared with previous communication technologies (2D, e. g. Zoom, MS Teams).
Design: To examine the effects of video conferencing on zoom fatigue and performance with different digital communication technologies, an experimental simulation with a 2 (MS Teams vs. Virtual Reality) x 1 (performance task) design is planned.
Results: The results are pending, but it is expected that negative effects of video conferencing on performance and zoom fatigue can be alleviated by 3D technologies.
Limitation: The planned experiment is mainly carried out in a university context, resulting in a one-sided student sample. For generalizable results, further studies must be conducted with other samples.
Implication: The results could provide a foundation for future research in industrial and organizational psychology with virtual reality, which has direct implications for modern work with digital teams.

Frontzky@hsu-hh.de

Driving Simulation: Interactivity and Presentation Setting

Michaela Gabes[1] & Andreas Mühlberger[1]

[1]Department of Psychology, Clinical Psychology and Psychotherapy, University of Regensburg, Regensburg, Germany

Driving simulators are established tools used for different research purposes. Either head-mounted displays (HMDs) or monitors are applied. However, the extent to which the setting (HMD vs. monitor) influences simulator sickness or the experience of presence is not yet entirely clear.
Objectives: We aim to compare different conditions to assess the influence of interactivity and presentation setting on driving parameters, simulator sickness, and the experience of presence.
Methods: This is an experimental study (2 x 2 within-between-subject design) with two interactivity conditions (active behaviour as a driver vs. passive behaviour as a co-driver) as within-subject factor and two settings (HMD vs. monitor) as between-subject factor. For the active condition, we selected four specific driving manoeuvres that we assume would affect driving behaviour differently depending on the setting. Differences in the experience of presence as well as in the development of simulator sickness are to be assessed using standardised questionnaires.
Results: At least 74 participants should be included. We are expecting that presence and simulator sickness are significantly more pronounced in the HMD setting than in the monitor setting in both interactivity conditions. Furthermore, an increased presence, however decreased simulator sickness in the active condition compared to the passive condition is expected. Additionally, we hypothesise that the difference in presence between HMD and monitor setting is smaller in the active condition than in the passive condition.
Conclusion: These results will be relevant for the interpretation of driving simulator studies and the implementation of future studies.

michaela.gabes@ur.de

Social Conditioning in Virtual Reality: A Study Design to Investigate Adaptions of Whole-Body Movement, Gaze and Autonomic Responding After Naturalistic Social Interactions

Sabrina Gado[1] & Matthias Gamer[1]

[1]Julius-Maximilians-Universität Würzburg, Institute of Psychology, Experimental Clinical Psychology, Würzburg, Germany

Adaptive social approach and avoidance behavior is of substantial importance for social functioning. An imbalance in social approach and avoidance tendencies may constitute a risk factor for the etiology and maintenance of mental illness (Struijs et al., 2018) such as social anxiety disorders. Previous studies have shown that trait social anxiety affects people's social approach and avoidance behavior in virtual reality (Kiser et al., 2022; Lange & Pauli, 2019). This immersive virtual reality study will investigate approach and avoidance behavior towards differently conditioned virtual humans on a behavioral level (i.e., whole-body movement, interpersonal distance), as well as active exploration (i.e., gaze behavior) and autonomic responding (pupillary, electrodermal and cardiovascular responses). Therefore, we will combine a naturalistic *social conditioning* procedure (Lissek et al., 2008; Reichenberger et al., 2017; Shiban et al., 2015; Toth et al., 2012) with a *social approach-avoidance test* (Landauer & Balster, 1982; Toth & Neumann, 2013). By means of a pre-screened sample, we will examine how trait social anxiety affects participants' behavior and autonomic responses.

sabrina.gado@uni-wuerzburg.de

Anchored Instruction in Virtual Reality Settings: A Quantitative Study on Cognitive Load and Learning Success

Christian Galgenmüller[1] & Nicholas H. Müller[1]

[1]Faculty of Computer Science and Business Information Systems, Technical University of Applied Sciences Würzburg-Schweinfurt, Germany

A significant number of Educational Virtual Environments (EVEs) use constructivist design principles. However, the method of Anchored Instruction has not yet been examined for its efficacy in EVEs. By using narrative anchors, a learning situation with problems close to everyday life is created that can be solved in an active and self-directed manner with the help of the imparted learning contents. The basis of this form of knowledge transfer is the assumption that knowledge cannot simply be transferred in a passive way, but is constructed by learners in an active involvement in different learning situations. Therefore, a quantitative study will be conducted measuring cognitive load levels of participants via implicit (eye tracking) and explicit measures. Comparing the results from a guided VR tour with a VR escape game, the study wants to find out whether the additional narrative frame of the game leads to cognitive overload, or rather increases learning success. The existing high-resolution 3D model of the historic Ritterkapelle Haßfurt – a photogrammetric reconstruction developed in cooperation with the initiative Smart Green City Haßfurt – is transferred to and edited in Unreal Engine 5 in order to produce both the escape game and the guided tour. A poster outlines the motivation, the relevance, the key questions, the methods, the current state, and the next steps of the research project.

christian.galgenmueller@thws.de

Xtreme Sport-Specific Stress Test: Development of a Virtual Reality Paradigm

Solène Gerwann[1], Alica Mertens[2], Gregor Domes[3], Bernadette von Dawans[3], Marie Ottilie Frenkel[1]

[1]Institute for Sports and Sports Sciences, Heidelberg University, Heidelberg, Germany
[2]School of Social Science, University of Mannheim, Mannheim, Germany
[3]Department of Biological and Clinical Psychology, Trier University, Trier, Germany

High-risk athletes need to take the right decisions under life-threatening conditions, deal with unexpected events (e.g., rockfalls or encounters with wildlife) and stay focused. To investigate high-risk athletes' stress reaction, we designed a new paradigm (Xtreme Sport-Specific Stress Test, XSST) mimicking these demands and built for comparison with the most used paradigm in stress research, the Trier Social Stress Test (Kirschbaum et al., 1993), in its virtual reality adaptation (VR-TSST, von Dawans et al., 2022).
Like the VR-TSST, the XSST consists of a preparation phase, i.e., context-specific learning, and two test phases, i.e., a balance task at high elevation and a recall task. The environment features two natural landscapes in which the participants can move freely. Haptic feedback is provided.
To establish whether the XSST can elicit stress, a within-design pilot study involving six male students was conducted at Heidelberg University. Stress biomarkers salivary cortisol (sCORT) and alpha-amylase (sAA) were measured once before and four times after the VR-TSST and the XSST. Descriptive analyses indicate a comparable elevation of sCORT concentrations after each test (mean increase at peak relative to baseline, MsCORT_TSST = 1.51, SD = 1.08, MsCORT_XSST = .918, SD = 1.05). However, relative to baseline, the VR-TSST induced higher sAA concentrations than the XSST (MsAA_TSST = 7.44, SD = 17.3, MsAA_XSST = .551, SD = .377).
These findings suggest the XSST can elicit a sCORT reaction comparable to the VR-TSST and could be used for context-specific stress research. A validation study with high-risk athletes is ongoing.

solene.gerwann@issw.uni-heidelberg.de

Judging Action Opportunities in Virtual Environments

Milena S. Gölz[1,2], Lisa Finkel[1,2], Rebecca Kehlbeck[3], Anne Herschbach[1,2,4], Isabel Bauer[1,2], Jean P. P. Scheib[1,2], Oliver Deussen[3], Jennifer Randerath[1,2,5]

[1]Department of Psychology, University of Konstanz, Konstanz, Germany
[2]Lurija Institute for Rehabilitation Science and Health Research, Allensbach, Germany
[3]Department of Computer and Information Science, Centre for the Advanced Study of Collective Behavior, University of Konstanz, Konstanz, Germany
[4]Department of Psychosomatic Medicine and Psychotherapy, Medical University Hospital Tuebingen, Tuebingen, Germany
[5]Outpatient Unit for Research, Teaching and Practice, Faculty of Psychology, University of Vienna, Vienna, Austria

The ability to make accurate affordance-based decisions, which involve the correct judgment of action opportunities by estimating environmental properties and our own capabilities, is essential in daily life. While young and healthy adults are able to make quick and adequate affordance-based decisions, impairments were observed in older age or after stroke. The aim of the study was to evaluate whether a Virtual Reality (VR) setting may be feasible for testing and training of affordance judgments. Therefore, we addressed two questions: 1. Do people judge action opportunities similarly in real versus virtual environments? 2. Does visual feedback in VR improve judgment behavior in both the real and the virtual environment?
We assessed how well 24 healthy participants were able to judge whether their hand fits into a given opening that varied in width in a virtual environment (Oculus Rift goggles) and a real environment. For differentiated evaluation, we used detection theory measures.
Results revealed an equivalent level of both conditions in regard to accuracy. Concerning perceptual sensitivity, no clear statement could be made and in regard to judgment tendency no equivalence could be shown. A training effect could be shown within the virtual condition, the improvement appeared transferable to the real condition only on a descriptive level. Implications for future studies are to specify potential conditions that might establish enhanced equivalence and significant transfer effect.

milena.goelz@uni-konstanz.de

VR Glasses or Normal Videoconferencing – How the Choice of a Communication Medium Affects Employee Well-Being

Philip Gubernator[1], Yannick Frontzkowski[1], Sven Hauff[1]

[1]Helmut-Schmidt-Universität - Universität der Bundeswehr Hamburg, Germany

Initial situation: The increasing use of digital communication tools in today's workplace offers different benefits for employees, such as the possibility for remote working. However it can also pose a threat to employee's well-being. For example, traditional videoconferencing can have a negative impact on health-oriented well-being by causing zoom fatigue. Furthermore, the development of social isolation in distributed work teams can be mitigated but not prevented by traditional videoconferencing, which poses a threat to employee's relational well-being.
Research question: While the effects of traditional videoconferencing on employees in distributed settings have already been extensively studied, there has been little research into the effects of communication via VR glasses in three-dimensional space. For example, a higher mediarichness of the VR glasses could lead to a better prevention of social isolation. Further, it is also conceivable that VR glasses could reduce zoom fatigue in online meetings by limiting the ability of employees to multitask. Therefore, we seek to answer the following research question: Are VR-meetings in a three-dimensional space better for employee well-being compared to traditional video conferencing?
Research design: To answer the question, we plan to collect data in an experimental study. The subjects will work on a group task by exchanging information either via a traditional videoconference or through VR glasses.

gubernator@hsu-hh.de

Virtual Reality Exposure Therapy in Real Life: Implementation of VR Therapy in an University Outpatient Clinic

Patrick Halli[1,2], Melanie Bleich[1], Janina Dominik[1], Maja Erkić[1], Simona Maltese[1], Silja Wübbelmann[1], Peter Kirsch[1,2]

[1]Department of Clinical Psychology, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany
[2]Department of Psychology, Heidelberg University, Heidelberg, Germany

Virtual reality exposure therapy (VRET) is a promising treatment option for University outpatient clinics due to its ability to provide exposure-based therapy in a controlled and personalized manner and therefore opening valid and reliable research options. VRET has been shown to be effective for a range of conditions, with studies suggesting comparable efficacy to traditional exposure therapy while offering increased accessibility and acceptability. Here we report on our attempt to implement VRET in our University outpatient clinic at the Central Institute of Mental Health.
To test the feasibility of using a VRET system with multiple therapists we conducted a steps wise implementation plan. In 2019, we started a collaboration with VTplus and their product EVElyn-Demonstrator with a process analysis conducted by VTplus. Followed by the development of an individual study protocol “practical applicability” for psychotherapy research. Initially, six VR scenarios were used and after the revision of the VR system (approval 2020-08) and recommissioning with the CE certified system (2020-11) by VTplus, the system is now in use with 14 different scenarios ranging from fear of heights, arachnophobia, claustrophobia to social phobia. VRET is applied in the outpatient clinic via short-term therapy (KZT 1) by five therapists. At least three individual exposure sessions are conducted with the possibility of performing further sessions in-vivo, in-sensu or in virtual reality.
The main goal of this implementation project is to get hands on experience by the therapists focusing on usability, feasibility and practical use. The first insights and experiences gained during this process will be shared and discussed.

patrick.halli@zi-mannheim.de

The ReliVR Project: Feasibility of a Virtual Reality Intervention in Psychotherapy of Depression

Steffen Holsteg[1], Kyra Kannen[2], Neele Sensmeier[3], Jarek Krajewski[2], Philip Mildner[4], Ruslan David[4], Holger Kürten[4], Tobias Müller[1], Sebastian Freitag[4], Sebastian Schnieder[3], Sonja Dana Roelen[3], Ulrike Dinger[1], Annika Gieselmann[5], André Karger[1]

[1]Clinical Institute of Psychosomatic Medicine and Psychotherapy, Medical Faculty, Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany
[2]Institute of Experimental Psychophysiology GmbH, Düsseldorf, Germany
[3]Hochschule für Medien, Kommunikation und Wirtschaft, Cologne, Germany
[4]Nuromedia GmbH, Cologne, Germany
[5]Department of Experimental Psychology, Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany

In recent years, virtual reality (VR) technologies have played an increasingly important role in the diagnosis and treatment of mental disorders. While, for example, VR exposure therapy in anxiety disorders is already well evaluated and considered effective, potential benefits of VR in the psychotherapy of depression have been sparsely studied so far.
Methods: The current research project ReliVR (funded by the Federal Ministry of Education and Research) investigates the potential use of VR for the psychotherapeutical treatment of depression. By being based on the iterative ReliVR platform development, enhanced with agile strategies we are focusing on psychodynamic methods to develop (1) an interactive VR roleplay for training of maladaptive relationship patterns, and (2) a VR mindfulness intervention for self-application. Using a pre-post-design, we conducted a clinical Proof-of-Concept Study, where depressed patients were immersed into the VR scenarios. In addition, usability interviews with patients and their therapists were evaluated.
Results: 24 patients and 4 therapists reported high usability of the VR modules and a successful immersive experience. Besides finding various aspects for adapting our VR modules, results revealed challenges controlling the virtual hand during the VR-mindfulness task and a general preference for VR scenarios with multiple interaction options.
Conclusions: Our results were used to improve the VR modules for depression therapy and to extend them by further roleplays and features. In a next step, we are developing a web platform that integrates VR and non-VR modules, as well as an emotion and depression detection system.

steffen.holsteg@med.uni-duesseldorf.de

The Opportunities of Immersive Virtual Reality to Reduce Implicit Gender-Career Bias

Katharina Jahn[1], Oliver Rehren[1], Bastian Kordyaka[2], Alla Machulska[3], Tanja Joan Eiler[3], Armin Gruenewald[3], Rainer Brueck[3], Tim Klucken[3], Bjoern Niehaves[2]

[1]Chemnitz University of Technology
[2]University of Bremen
[3]University of Siegen

Research in immersive virtual reality has already shown that different forms of implicit group-related biases can be changed by embodying an avatar that moves in synchrony with the real body. However, results related to changing gender-related stereotypes are still scarce. To gain more insights into this area, we conducted a within-subjects experiment in IVR using a head-mounted display with hand-tracking and different hand types (female hands, male hands, artificial hands) to investigate whether IVR is effective in reducing work-related gender stereotypes. The results indicate that IVR can reduce stereotyping of women as family-related and men as career-related over time for female but not male participants. Surprisingly, this result occurred regardless of hand type used by the participants. Additionally, only female participants reported higher similarity perceptions and reuse intention to hands of their own gender compared to male or artificial hands. On the other hand, we found no significant differences between the different hand types regarding similarity perceptions and reuse intention in male participants. Our results contribute to existing findings regarding the acceptance of different hand types and interventions for changing group-related biases using IVR.

katharina.jahn@phil.tu-chemnitz.de

Combination of Virtual Reality (VR) and Brain-Computer Interface (BCI) Based Neurofeedback in Chronic Pain Management: Designing a Clinical Trial

Eleni Kakavela[1], Ivo Käthner[2], Markus H. Winkler[2], Loic Botrel[3], Peter Collins[2], Daniel Gromer[2], Carsten Scheller[4], Bastian Lange[4], Roland Zechner[4], Mathias Müller[4], Alex Kreilinger[5], Manfred Jaschke[5], Asarnusch Rashid[6], Paul Pauli[2], Andrea Kübler[3], Claudia Sommer[1]

[1]Department of Neurology, University Hospital Würzburg, Würzburg, Germany
[2]Department of Psychology I, Biological Psychology, Clinical Psychology, and Psychotherapy, University of Würzburg, Würzburg, Germany
[3]Department of Psychology I, Intervention Psychology, University of Würzburg, Würzburg, Germany
[4]Department of Research and Development, VTplus GmbH, Würzburg, Germany
[5]Brain Products GmbH, Gilching, Germany, [6]ZTM Bad Kissingen GmbH, Bad Kissingen, Germany

Chronic pain causes enormous suffering for those affected and very high costs for the health system. Treatment with analgesic drugs is often not effective in the long term and may be associated with side- effects. Therefore, there is a big need for alternative therapeutic options. Data from the literature suggest that pain reduction may be possible through the induction of mental and physical states incompatible with the experience of pain. This may be achieved by means of virtual reality combined with neurofeedback, e.g., by modulation of parietal alpha activity, which can be trained using a brain- computer interface (BCI). The joint BMBF-funded research project "VirtualNoPain" (13GW0343) is intended to investigate the therapeutic applicability of these effects and their combination, using an especially developed demonstrator in pain management.

In this project, we will conduct a preparatory study with pain modulation in healthy participants, followed by a study with patients with chronic pain, who will be immersed in virtual environments and introduced to neurofeedback-training. Patients will undergo a two-week long VR-BCI therapy with daily sessions. After each session, the pain intensity on the numerical rating scale and the virtual scenarios in terms of presence, valence and arousal will be rated.

We expect lower pain ratings and lower duration and intensity of pain exacerbations as an effect of treatment. This pilot study will yield important data needed to set up a larger controlled trial.

kakavela.eleni@gmail.com

Navigating the Approach-Avoidance Matrix: Exploring Individual Differences in a Novel Virtual Reality Foraging Task

Alexandros Kastrinogiannis[1] & Tina B. Lonsdorf[1]

[1]University Medical Center Hamburg-Eppendorf

A key characteristic of adaptive fear is avoiding genuinely threatening situations or stimuli. However, excessive avoidance of hazardous stimuli or circumstances can have negative long-term consequences on preventing the acquisition of safety information, leading to the maintenance of anxiety. Recent research has concentrated on investigating approach-avoidance (AA) conflicts in foraging tasks under predation threat, with a focus on decision-making strategies. However, the influence of inter-individual variations on AA tactics within a threatening context remains unclear. We present an approach-avoidance paradigm in a virtual foraging task that is based on a matrix-designed environment that facilitates the tracking and visualisation of AA behaviour as a function of spatial movement. Participants have to gather an adequate number of food tokens in three simulated environments (forest, water, desert) over 24 trials to attain virtual survival. An AA conflict is induced by proportionally linking the potential reward to the probability of encountering an aversive (electrical) stimulus. To achieve this goal, each individual is required to perform a specific AA behaviour in terms of time spent in each context and spatial movement along the field. We present preliminary data demonstrating the validity of our task and highlighting the utility of using reward and punishment in a gamified design within virtual reality to elicit AA behavior as a novel method for investigating this phenomenon in a continuous manner. Additionally, we demonstrate some first findings towards our goal of identifying subgroups based on behavioral task performance and physiological activity (skin conductance level).

a.kastrinogiannis@uke.de

Stereoscopic Vision and Emotional Face Processing: Insights From a Combined EEG and Virtual Reality Study

Felix Klotzsche[1,2,3], Ammara Nasim[1,4], Simon M. Hofmann[1,5], Arno Villringer[1,2], Vadim Nikulin[1], Werner Sommer[2,3,6], Michael Gaebler[1,2]

[1]Max Planck Institute for Human Cognitive and Brain Sciences, Department of Neurology, Leipzig, Germany
[2]Humboldt-Universität zu Berlin, Berlin School of Mind and Brain, Germany
[3]Humboldt-Universität zu Berlin, Department of Psychology, Germany
[4]Carl von Ossietzky Universität Oldenburg, Germany
[5]Fraunhofer Institute Heinrich Hertz, Department of Artificial Intelligence, Berlin, Germany
[6]Zhejiang Normal University, Department of Psychology, Jinhua, China

Stereopsis is a powerful mechanism of the visual system for perceiving spatial depth and therefore might influence how human observers process facial expressions. We combined VR with EEG and multivariate decoding to compare the neurophysiological responses to stereoscopic and monoscopic presentations of emotional facial expressions.
Three computer-generated faces with four different expressions were displayed as frontal portraits using an HTC Vive Pro Eye. N = 34 healthy, young participants indicated in 720 trials the expressions of the faces. To investigate the role of stereopsis, the face stimuli were rendered either as 2D planes (monoscopic viewing condition) or as stereoscopic 3D model. We cross-validated time-resolved linear classifiers to predict the expression as well as the viewing condition from the EEG.
Participants recognized all emotions with high accuracy. Starting around 150 ms after stimulus onset, the expressions could be decoded from the EEG. However, there was no significant difference in decoding performance between mono- and stereoscopic trials although the viewing condition itself, could also be decoded from the EEG with a similar time-course as decoding the (task-irrelevant) identity of the displayed face.
Our findings indicate that although there are differences in EEG responses to stereo- and monoscopically presented faces, this does not interact with the ability to decode the faces' expressions from neural activity. Therefore, the representation of facial expressions—at least when viewed from a fixed perspective—does not seem to rely strongly on stereoscopic information.

klotzsche@cbs.mpg.de

Training Surgical Knot Tying in Extended Reality – First Results of the Project "GreifbAR"

Robert Luzsa[1], Susanne Mayr[1], Moritz Queisner[2], Christopher Remde[2], Igor M. Sauer [2]

[1] Universität Passau
[2] Charité - Universitätsmedizin Berlin

Background: Tying surgical knots is a basic but critical skill that surgeons must master. Currently, knot tying is typically taught through instructor observation or instructional videos. These methods are either very resource consuming or offer little interactivity and customizability. Knot tying training in extended reality (XR) could address these weaknesses and improve the linking of observation and application: For example, spatial awareness and the ability to mentally rotate, i.e. imagine knots from different perspectives, affects learning performance (Brandt & Davies, 2006). XR may support spatial awareness by allowing knot tying from different perspectives superimposed on the real world.
Method: The project GreifbAR develops an XR-based interactive knot tying training application. This application teaches the process of knot tying and provides individualized feedback based on hand pose and scene recognition. To achieve a learning-friendly design and user acceptance, the requirements of learners and experts must be considered. Therefore, based on a literature review, an online survey with 70 medical students and four interviews with experienced surgeons at Charité - Universitätsmedizin Berlin were conducted.
Initial results: The respondents show openness towards knot tying training with XR, yet emphasize the importance of a realistic learning situations and personal guidance. They also report little prior experience with XR. The talk integrates the survey results with findings from technology acceptance research and derives implications for the design of XR-based training systems for knot tying and similar procedural tasks.

robert.luzsa@uni-passau.de

Approaches to Transfer Cartographic Elements Into VR to Improve Information Transfer

Helge Olberding[1]

[1]Department of Geovisualization, Technical University of Applied Sciences Würzburg-Schweinfurt

Most VR applications do not view the scene from a top-down perspective, but from a first-person perspective. This means that from the viewing perspective with a VR headset, the buildings are displayed 1:1 in size as they are perceived in reality. For a more targeted information transfer in such a visualization, an information reduction, a filtering of the 3D scene is necessary, as in the thematic cartography. For a non-specialist user, however, orientation in a realistic visualization is particularly helpful. This means that a combination of non-realistic visualizations or cartographic elements and realistic visualizations is potentially reasonable.

Cartographic symbols and map-like filtering methods are in development to combine realistic and cartographic geovisualization in VR. We designed different 2D and 3D map symbols. The symbols vary in size, shape, color, and pattern. In addition, we created concepts with the help of alternative or abstract visualization approaches. The opposite of photorealistic visualization is non-photorealistic rendering (NPR), which can be generated using filters from image processing.

For the combined visual approaches, we designed different application scenarios in 3-D city models, in which the cartographic stylistic elements should enable easier information transfer for the users. It was possible to implement user interactions, using motion sensors, that impact and change the visualization in real-time.

helge.olberding@thws.de

Learning From VR Compared to Videos: A Comparison Using Practical Laboratory Class Materials

Laura Pasqualette[1] & Louisa Kulke[2]

[1]Neurokognitive Entwicklungspsychologie, Friedrich-Alexander-Universität Erlangen-Nürnberg
[2]Department of Developmental and Educational Psychology, University of Bremen

Virtual Reality (VR) has been a hot topic and effort has been made to investigate its applicability during teaching and effectiveness during learning. During the pandemic, teaching was moved online, making it challenging to teach practical classes. As an alternative to in-lab training sessions, we recorded a 360-degree video teaching material as a practical introduction to Electroencephalography (EEG) to provide students with an opportunity to visit virtually the EEG lab.

The current pre-registered study (https://doi.org/10.17605/OSF.IO/JGRUP) used this material to compare whether participants learned more effectively when watching the teaching material on a VR headset (360-degree video) or on a computer screen (2D video). In a mixed design, we measured 46 participants' (42 female, mean age: 21.3) knowledge about EEG before and after (within participants variable) watching the video in VR or 2D (between participants variable) by recording their answers on a knowledge questionnaire. Overall, participants significantly increased their knowledge about the topic, independent of the material they watched (VR or 2D). Furthermore, 31 out of 46 participants declared they would have preferred to watch the video on the VR headset. Our study demonstrates that learning is comparably effective in VR and 2D. However, VR is subjectively preferred by participants as a learning tool. In conclusion, the current study provides further insight into the usability of VR for learning of practical academic topics in psychology.

pasqualette@gmail.com

Temperature Perception in Virtual Realities - Can Level Design Change Temperature Perception?

Kevin Pfeffel[1] & Nicholas H. Müller[1]

[1]Technical University of Applied Sciences Würzburg-Schweinfurt

My contribution is about an upcoming research experiment that deals with temperature perception in virtual environments. Initial studies on this topic such as Cooper E. A., et al. (2014) could provide evidence for temperature contagion. Subjects were shown videos in which a human hand was immersed in cold or hot water. The temperature of the hand was measured using a thermistor. It was shown that the hands of the test subjects also became significantly colder in the videos with cold water. For our own experiment, two identical virtual environments were built in which a labyrinth can be walked. The difference is that one world is an ice desert and the other is a hot landscape similar to the Grand Canyon. Under laboratory conditions, the room temperature should be kept identical for both worlds. For the measurement, a subjective assessment and a bio physiological measurement should be made. Because these physiological processes are continuously active in the body, these measurements have the advantage of being able to provide continuous data, which are available even in the absence of overt behavior on the part of the subject (Wickens & Hollands, 2000; Wilson & Eggemeier, 1991). The research question is whether the visual stimuli of the VR environment alone can induce a temperature change in the subjects. Hypothesis 1 states that the perceived and measured temperature will be lower in the cold world. Hypothesis 2 states that the perceived and measured temperature will be higher in the hot world.

kevin.pfeffel@thws.de

Designing a Perceptive and Interactive Social Robot to Enhance Elderly Care in Assisted Living Facilities

Christian Felix Purps[1] & Matthias Wölfel[1,2]

[1]Karlsruhe University of Applied Sciences
[2]University of Hohenheim

We present a prototype social robot that is being developed for use with elderly residents in assisted living facilities. The prototype combines a mobile device screen for displaying emotional facial expressions with a one-arm robot with six degrees-of-freedom for bodily communication. It includes perceptual units to track and respond to non-verbal behaviors such as proximity, posture, gestures and facial expressions, creating human-like interaction and reducing the gap between the physical and digital worlds to provide an immersive and interactive experience.
The main application of the robot is to assist older individuals with task management and reminders, reducing stress, and promoting autonomy. Regular non-task-oriented interactions with the robot aim to foster social bonds and create acceptance of its presence and activities. The robot uses calm technology to subtly influence interlocutors before becoming explicit, which can be achieved through various applications of the screen combined with robotic arm movements. If it is unable to provide sufficient support autonomously, it can either offer telepresence communication via its screen, extending the presence of the interlocutor to the user's location via video streaming, or send notifications to caregivers who can then provide on-site assistance.
The combination of a screen face to access virtual space and a physical embodiment distinguishes the prototype from purely virtual embodied conversation partners. By developing, testing and evaluating our prototype, we want to contribute to improving the well-being of older people and reduce the workload of caregivers in order to meet the demographic challenges of an ageing society.

christian_felix.purps@hs-karlsruhe.de

The Model is Bend, but Never Broken: A Quadratic Extension to the Capability Model of Frontal Asymmetry Based on Situational Induction Strength

Johannes Rodrigues[1], John J. B. Allen[2], Mathias Müller[1], Johannes Hewig[1]

[1]Julius-Maximilians-Universität Würzburg, Germany
[2]University of Arizona, USA

Frontal asymmetry has shown to be related to approach and avoidance patterns in a virtual T-maze without further differential relations to the type of avoidance behavior or traits, leading to a quadratic extension of the capability model of anterior asymmetry. Looking for other markers to disentangle the behavioral choices of avoidance on psychophysiological level, heart rate responses were investigated. While trait or stimulus valence related differences in heart rate change are well known, a distinction of the cardiac response pattern related to different behavioral responses during identical motivational context has been neglected so far. We investigated heart rate change during movement via joystick in the negatively valent motivational condition of a virtual T-maze in two studies. Concerning the behavior, two specific avoidance response types could be identified in previous studies: a backwards withdrawal and a forward approach to safety. The short-term heart rate change was differentially related to the avoidance behavior pattern in a virtual T-maze, showing either a defensive response when facing the zone of safety or an orienting reaction if they faced the negative entity while withdrawing backwards. Interestingly, these differences were found independently of the stimuli used in the two paradigms (monster vs. man). Furthermore, the choice of avoidance behavior was linked to gender. These findings stress the importance of the behavioral responses concerning the investigation of psychophysiological measurements and reveal as possible reasons for variance in heart rate pattern across gender. Additionally, the different sensitivity and specificity of different psychophysiological measurements is emphasized.

johannes.rodrigues@uni-wuerzburg.de

360° Videos are Suitable to Trigger Social Anxiety

Anna Rohde[1], Niklas Siminski[1], Grit Hein[1], Jürgen Deckert[1], Paul Pauli[2], Angelika Erhardt-Lehmann[1,3], Martin J. Herrmann[1]

[1]Center of Mental Health, Department of Psychiatry, Psychosomatics and Psychotherapy, University Hospital of Wuerzburg, Wuerzburg, Germany
[2]Center of Mental Health, Department of Psychology (Biological Psychology, Clinical Psychology and Psychotherapy), University of Wuerzburg, Wuerzburg, Germany
[3]Department of Translational Research in Psychiatry, Max Planck Institute of Psychiatry, Munich, Germany.

The ongoing pandemic has changed our requirements for anxiety therapy. The demand for appropriate treatment options under "social distancing" has brought telemedicine procedures into focus. One of these is virtual exposure therapy. While there are already established therapy approaches for social phobia using computer-generated virtual reality, the use of 360° videos as exposure material has not yet been sufficiently investigated even though they offer a cost-effective alternative.
Therefore, the aim of the present study was to create a selection of 360°videos fitting for social anxiety patients and to investigate the effectiveness of these videos in eliciting a fear response, as a relevant factor for potential exposure therapy.
We have created 360° videos depicting situations from the areas of social interaction, observation anxiety, performance anxiety, and fear of intimacy. Within these videos, the participant is part of a complex social interaction. To evaluate anxiety response during the videos we assessed the subjects' anxiety levels using subjective (SUDS), physiological (EDA; HR; HRV) and hormonal parameters (cortisol). For analysis we compared high (HSA; N=32) versus low (LSA; N=32) social anxious subjects (based on the questionnaire SPAI) in their anxiety response.
We found a significant higher increase in the subjective fear response of the HSA compared to the LSA group. We have also found similar results for the physiological parameters as e.g. HRV.
We conclude results that the videos used are suitable to trigger social anxiety and thus can be applied as a component in the therapy of patients with Social Anxiety disorders.

anna.rohde@stud-mail.uni-wuerzburg.de

Hey AI: Can Virtual Agents Induce Social Stress? On the Application of Text-to-Speech Synthesis in Clinical Virtual Reality Research

Sarah Roßkopf[1], Franziska Woltz[1], Leon O.H. Kroczek[1], Theresa F. Wechsler[1], Andreas Mühlberger[1]

[1]Department of Clinical Psychology and Psychotherapy, University of Regensburg

Nowadays, most people are familiar with text-to-speech (TTS) synthesis in everyday life for example when using navigation systems or digital assistants. The advantage of implementing modern TTS synthesis for use in virtual reality (VR) applications including social interactions as e.g. in clinical virtual research paradigms is obvious. Higher levels of standardization can be guaranteed and at the same time flexibility of virtual agents to react can be increased. Nonetheless, evidence is scarce concerning systematic examination of the effects of TTS use in VR on psychological variables like stress presence, and anxiety. In the present study, we conducted a randomized-controlled experiment and investigated whether the use of TTS stimuli compared to prerecorded human speech within a Virtual Trier Social Stress Test (VR-TSST) evoked equivalent reactions. Within the VR-TSST, participants had to perform a talk and a challenging mental arithmetic task embedded in a virtual job interview scenario while three agents in the committee reacted in an unsettling manner. Participants' heart rate, gaze behavior, and trapezius muscle activity during baseline, talk preparation, and performance phases were recorded. Furthermore, self-reports on stress, presence, and anxiety were surveyed. We found profound subjective and physiological stress reactions in both audio conditions. The results indicate that TTS synthesis does not impair the induction of acute psychosocial stress, and thus can be used for standardized social stress tests as well as perspectively for VR exposure therapy in social anxiety.

sarah.rosskopf@ur.de

Could a VR-Based Treatment Serve as Useful Enhancement to Common Conflict Resolution Techniques?

Annette Schlien[1] & Veronika Lerche[1]

[1]Psychological Methodology, Department of Psychology, Christian-Albrechts-Universität zu Kiel, Kiel, Germany

Virtual Reality (VR) interventions are deemed to be interesting tools to elicit empathy or prosocial behavior. The purpose for the currently planned study is to examine whether a VR paradigm is helpful to enhance empathy of individuals involved in dyadic conflicts and whether such a paradigm would thus be a useful endorsement to common mediation processes. Common mediation processes contain specialized communication and negotiation techniques, such as having each conflict party constitute their perspective on the conflict orally from a first person perspective. These statements are supposed to involve the individuals' occurring affects and their underlying interests and needs. In our study, first the statement of each participant will be recorded. Then, participants will take part in the VR-based part of the study–one counterpart at a time. Each participant will be asked to customize one avatar for each conflict party, respectively. Subsequently, for a standardized amount of time each participant will embody the self-customized avatar of the respective counterpart while listening to the recorded statement of the counterpart. In the control group, on the contrary, participants will listen to the counterparts' recorded statement without embodying an avatar. For both groups, a pre-post empathy rating and specific ratings regarding the success of the mediation process will be compared.

schlien@psychologie.uni-kiel.de

Virtual Reality in Mental Health Research

Sebastian Siehl[1], Frauke Nees[1], Stephan Lehmler[1]

[1]Institute of Medical Psychology and Medical Sociology, University Medical Center Schleswig-Holstein, Kiel University, Kiel, Germany

Virtual reality (VR) is a powerful tool with benefits in terms of ecological validity that can be used to enhance both assessments and screening of mental health and for prevention and intervention mental disorders. We have started to develop and implement VR scenarios to address basic neuropsychological research questions as well as to use VR along a psychotherapeutic approach. In our poster, we present and discuss three ongoing projects:

1. An experimental design employing virtual humanoid avatars and environmental solutions together with neuroimaging pe- and post-testing to target social and spatial-temporal learning and memory processes.
2. Using VR to develop reinforcement learning-based adaptive coping scenarios to environmental adversity while monitoring brain and behavioural responses. Information will be linked to a smartphone-based digital health app and used to inform respective environmental-based interventions.
3. A psychotherapy-informed VR application, based on the principles of the acceptance and commitment therapy by implementing thought (de)fusion techniques in a gamification-like virtual environment. This is tested for its feasibility to more effectively enable patients to work with and adapt (negative) thoughts.

lehmler@med-psych.uni-kiel.de

Investigating Spatial Navigation Using a Graph Theoretical Analysis of Eye Tracking Data Recorded in Virtual Reality

Jasmin L. Walter[1], Vincent Schmidt[1], Lucas Essmann[1], Sabine König[1], Peter König[1,2]

[1]Institute of Cognitive Science, University of Osnabrück, Germany
[2]Department of Neurophysiology and Pathophysiology, University Medical Center Hamburg-Eppendorf, Germany

Eye tracking experiments in immersive virtual reality environments offer new ways to investigate visual attention during spatial navigation. However, eye tracking data that is recorded in 3D environments with freedom of movement also requires new analysis approaches. Here, we propose a new method to quantify characteristics of visual behavior by applying a graph-theoretical analysis to eye tracking data.
We first apply the new analysis approach to eye tracking data of 20 participants recorded while exploring a virtual city and subsequently conduct the same analysis with data of 26 other participants who explored a different virtual city. In both experiments, we pre-process the data and define "gaze" events, from which we created gaze graphs. On these, we apply graph-theoretical measures to reveal the underlying structure of visual attention.
To investigate the importance of houses in the city, we use the node degree centrality measure. Our results reveal that 10 houses in the first city and 5 houses in the second city have a node degree consistently exceeding a two-sigma distance from the mean node degree of all other houses. In both experiments all gaze graphs showed a clear hierarchical structure, thus supporting the importance of these houses. As these outstanding houses fulfilled several characteristics of landmarks, we named them "gaze-graph-defined landmarks".
Overall, our findings provide new experimental evidence on visual attention during spatial navigation, which we were able to replicate in a second experiment. Moreover, our proposed method establishes a new approach to analyze eye tracking data recorded in virtual reality.

jawalter@uos.de

Modulation of Experimental Pain by Guided Relaxation in Virtual Reality

Markus H. Winkler[1], Peter Collins[1], Ivo Käthner[1], Daniel Gromer[1], Ole Bechheim[1], Carsten Scheller[3], Bastian Lange[3], Mathias Müller[3], Paul Pauli[1,2]

[1]Department of Psychology I, Biological Psychology, Clinical Psychology, and Psychotherapy, University of Würzburg, Würzburg, Germany
[2]Center for Mental Health, Medical Faculty, University of Würzburg, Germany
[3]Department of Research and Development, VTplus GmbH, Würzburg, Germany

Virtual reality (VR) has been shown to be effective in the treatment of acute and chronic pain. Previous research on the psychological mechanisms mediating the analgesic effects point to the importance of distraction from pain, the induction of positive emotions, and the experience of high presence in VR. Considering these mechanisms, we have developed a highly immersive, positive nature environment with dynamic features, combined with an oral relaxation script guiding the attention of the user to virtual events. The current experiment investigates the effects of this manipulation on subjective, physiological, and behavioral indicators of experimentally induced pain.
Healthy participants were immersed in the guided relaxation environment and a neutral control environment, respectively. During each scenario a thermode delivered three heat stimuli of rising temperature and participants indicated their pain threshold via button press. At the end of each session three heat stimuli above the individual pain threshold were presented and rated in terms of pain intensity and unpleasantness. Skin conductance responses (SCRs) evoked by the fixed pain stimuli were assessed as physiological indicators of pain. After each session, the virtual scenarios were rated in terms of presence, valence, arousal, and attentional capture.
Data collection has started, and first results will be reported.
We expect lower pain ratings, pain evoked SCRs and pain thresholds in the guided relaxation scenario. We hope the results may be promising for the treatment of acute and chronic pain.
The study is part of the joint BMBF funded research project VirtualNoPain (13GW0343).

markus.winkler@uni-wuerzburg.de

WORKSHOPS

Integration of VR into Medical Education

Thursday, 09:00 – 12:00 I Marcusstr. 9-11, Room 113

Ole Hätscher[1], Anna Junga[2], Henriette Schulze[2], Pascal Kockwelp[3], Benjamin Risse[3], Mitja D. Back[1], Bernhard Marschall[2]

[1]Departmentt of Psychology, University of Münster, Münster, Germany
[2]Department of Medicine, University of Münster, Münster, Germany
[3]Departmentt of Computer Science, University of Münster, Münster, Germany

Medical education is of crucial importance for preparing future physicians for medical practice. In this domain, the use of virtual reality (VR) is becoming increasingly important because it enables the simulation of borderline cases of medical encounters that are hard to train with traditional methods. At the medical faculty in Münster, the workgroup CITRUS (Computer-based Immersive Trainings Using Simulations) fosters medical VR-based projects: since 2021, medical students conduct a brain death diagnosis in an immersive virtual reality simulation as part of a curricular course block on organ transplantation. Furthermore, a DFG-promoted national project named “medical tr.AI.ning” was initiated and is now coordinated in Münster. The project aims to develop an artificial intelligence (AI)- and VR-based training platform where medical students train core competencies by interacting with intelligent (AI-driven) agents. The first medical tr.AI.ning scenario, which allows students to perform a full-body dermatological examination in the context of a skin cancer checkup, launches in summer 2023. This half-day workshop serves to give an overview of our current projects as well as enabling hands-on experience with our scenarios and technical set-up. We will also discuss challenges for the deployment and implementation of virtual reality in university teaching as well as psychological and didactical research directions based on the use of virtual reality in medical education.

ole.haetscher@wwu.de

Hands-on Hololens
An Introduction to Augmented Reality for Microsoft Hololens 2 with Unity 3

Thursday, 09:00 – 16:00 I HS 224

Emma Schüpfer[1] & Susanna Götz[1z]

[1]Institut für Design und Informationssysteme, Technische Hochschule Würzburg-Schweinfurt

Objective and Expected Outcomes: This workshop aims to provide an introduction to the basics of AR technology, specifically the Microsoft Hololens 2, and its potential applications in different industries. Participants will learn about key concepts and have the opportunity to create simple AR experiences for Hololens 2 themselves, gaining hands-on experience with AR development in Unity 3D. By the end of the workshop, participants will be equipped with the knowledge and resources to continue exploring Hololens application development on their own.
Target Audience: The workshop is suitable for anyone with an interest in technology, particularly those in the fields of design, science, education, marketing and entertainment. While programming expertise is not a requirement for participation, having a basic understanding of programming concepts will be beneficial. Participants without prior programming experience will still be able to create simple AR experiences and learn about the potential of AR technology. No prior knowledge of AR is required.

emma.schuepfer@thws.de

Insights into the Virtual Reality Scientific Toolkit (VRSTK)

Thursday, 09:00 – 12:30 I Audimax

Matthias Wölfel[1], Jonas Deuchler[1], Wladimir Hettmann[1], Daniel Hepperle[1]

[1]University of Applied Science Karlsruhe

The Virtual Reality Scientific Toolkit (VRSTK) facilitates the creation and execution of user studies in immersive virtual reality (VR) environments within the Unity 3D real-time development platform. As an open-source project released under the MIT license, VRSTK extends the capabilities of Unity. It can be downloaded, used, and extended free of charge.

In this workshop, we aim to introduce the VRSTK and its core features by walking the audience through a hypothetical user study that uses some of the VRSTK's core features. In addition to describing the toolkit, we hope to inspire other scientists and interested developers to use and contribute to the VRSTK.

matthias.woelfel@h-ka.de

Excursion to the MAVEL Lab

Thursday, 10:30 – 11:30 I MAVEL Lab Schweinfurt

Dominik Fritsch[1] & Florian Schuster[1]

[1]Technical University of Applied Sciences Würzburg-Schweinfurt

Excursion to the MAVEL (*Mixed Augmented Virtual Experience Learning*) lab of THWS. On a total of 130 m² the so-called *Stimulusmachine* is created. It is defined as the entirety of hardware and software necessary to provide reality-independent and multisensory information. The innovative approach of combining different technologies and core disciplines in one system can set new standards in Extended Reality (XR) research.

Due to the ongoing construction phase, a full presentation of all possibilities is not possible. We would like to introduce you to the building and the currently available hardware (a 40m² Projection Screen).

dominik.fritsch@thws.de

SOCIAL EVENT

Wednesday, 19:00 I Hoch3

Panel Discussion: Quo vadis, Metaverse?

Moderation: Ivo Käthner

Panelists: Marc Erich Latoschik, Anna Felnhofer, Fabian Rücker