Technologies for well-being

Dr. María Alejandra Quirós Ramírez

Intro

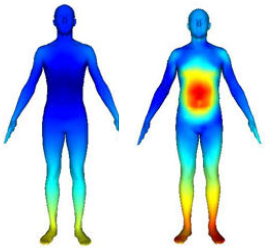
- Guest scientist MPI-IS (2021 ~)
  Technologies for Well-being
- Independent Researcher, Technologies for Well-being U Konstanz. (2020-2021)
- Postdoc in Experimental Psychology & Internet Science, U Konstanz (2019 – 2020)
- Postdoc in Virtual Reality for Collective Behavior U. Konstanz (2018-2019)
- Postdoc in Statistical Body Models & Semantics, Max Planck Institute for Intelligent Systems (2015-2018)

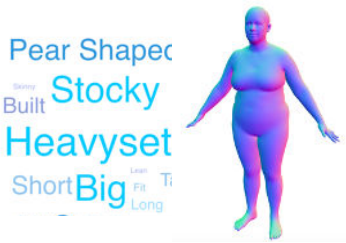
Ph.D. Intelligent Interaction Technologies – 2014
(Affective Computing)
M.Sc. Computer Science – 2011
(Computational Vision)

B.Sc. Computer Engineering – 2008
Instituto Tecnológico de Costa Rica

Research directions

Social & Body Perception

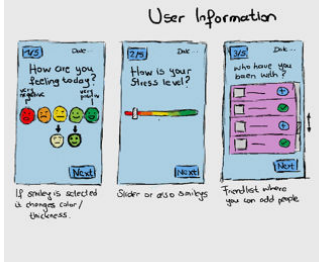




Psychological Assessment


Emotion & Prevention



Individual Factors


Human-Centric Design

Effect of media, engagement, long-term use

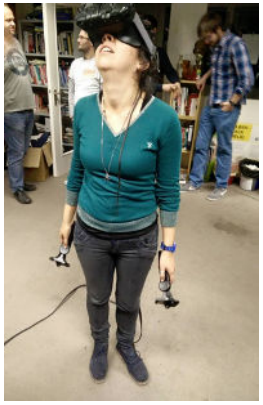
Didactics of empathy & compassion

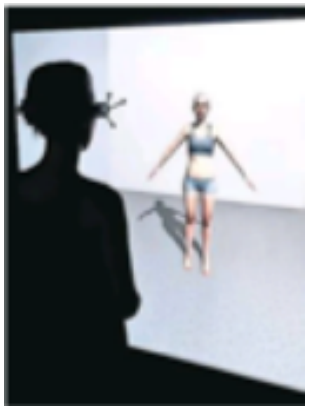
Immersive Virtual Reality

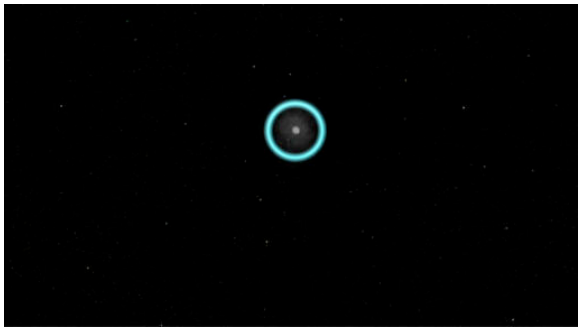
- Artificial 3D environment
- Action | Perception loops
- User Actions: captured by sensors (e.g. controllers)
- User Perception: presented simulated environment through displays (e.g. headset, haptics, etc.)

Why VR?

Virtual reality

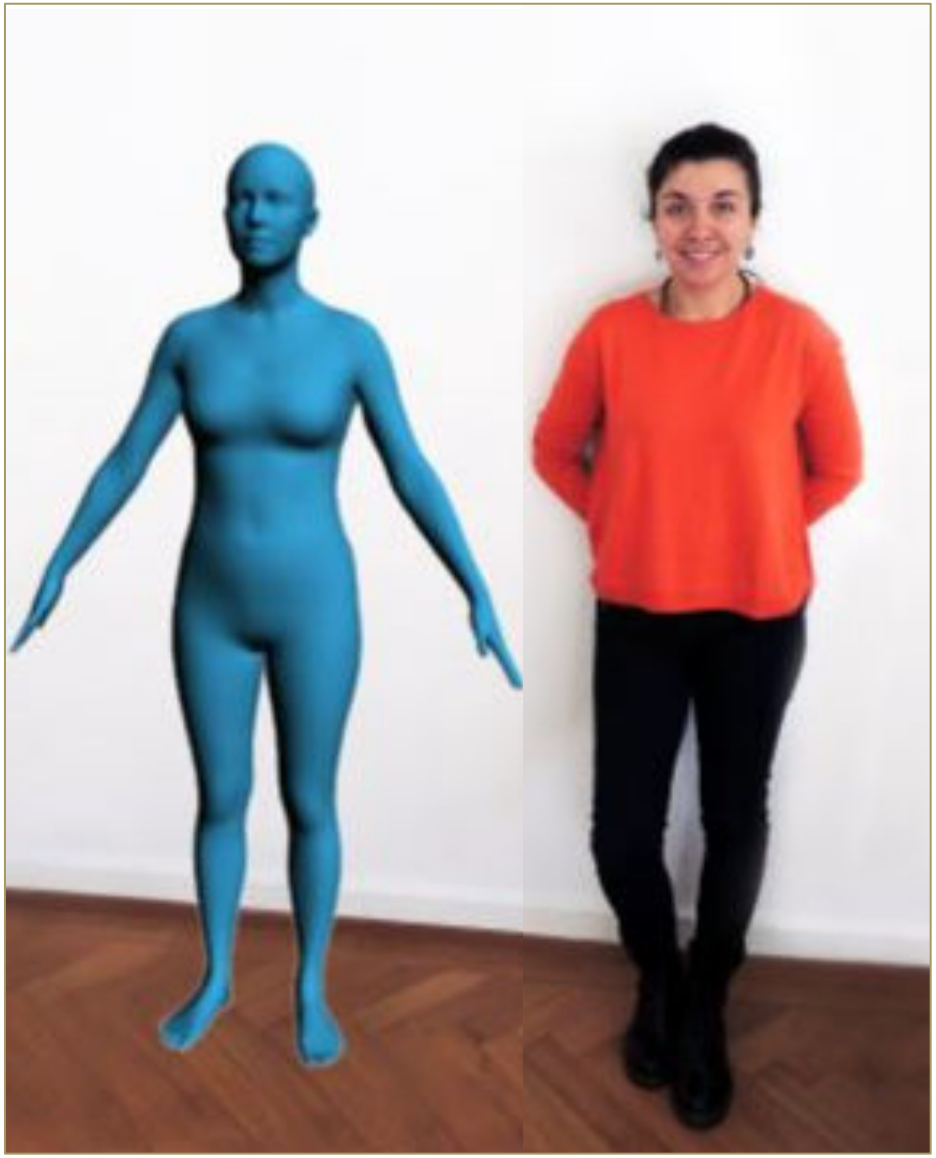






- Naturalistic interactions
- Possible to create or recreate ‘unlikely’ or ‘dangerous’ experiences
- Experimental/Intervention control
- Presence and Immersion
- Portable, scalable, economic
- ‘Imagination’ is the limit

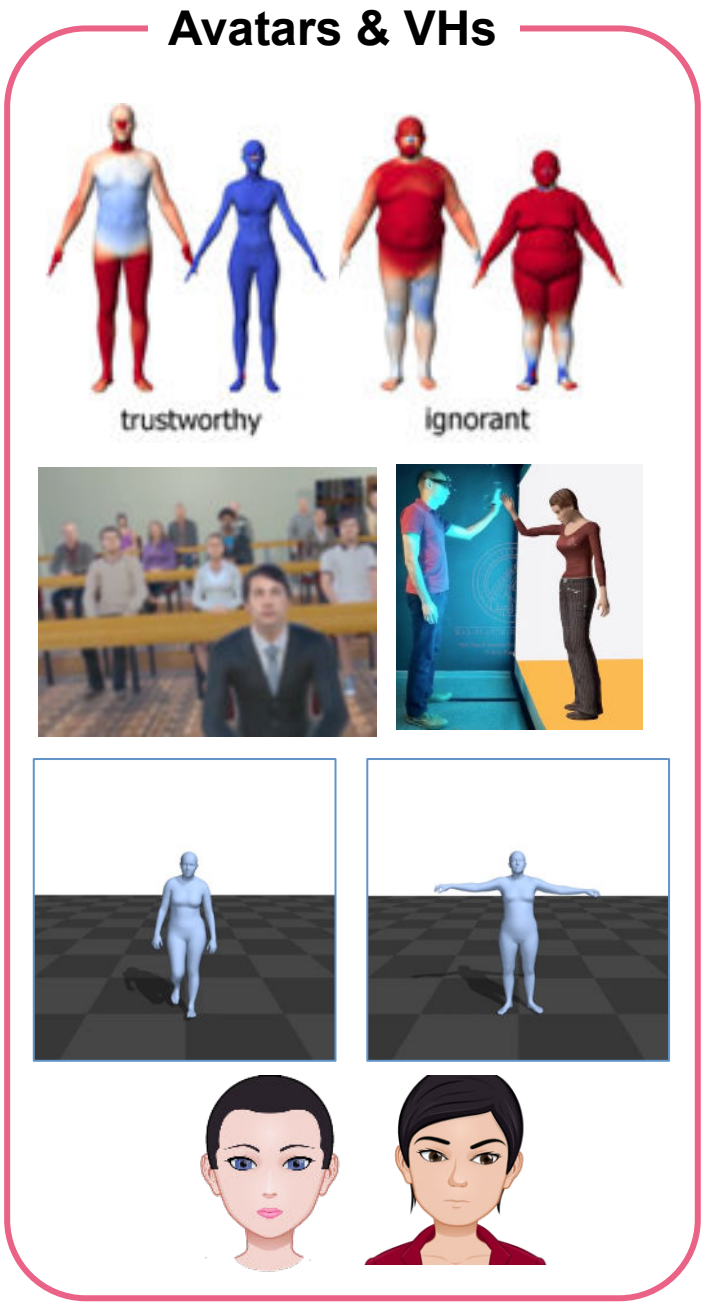
Virtual Humans & Avatars



3D Virtual Humans

- Computer-generated characters or entities that are designed to mimic human appearance, behavior, and/or interaction
- Static images or animations to more advanced and interactive forms
- **As avatars**: Can represent a specific human (or persona)
- **Biometric**: accurate representation

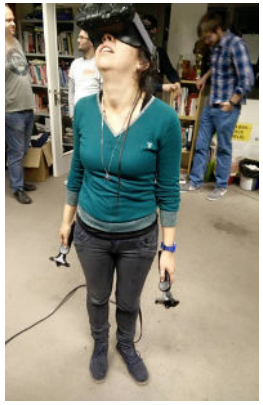
Why Avatars?

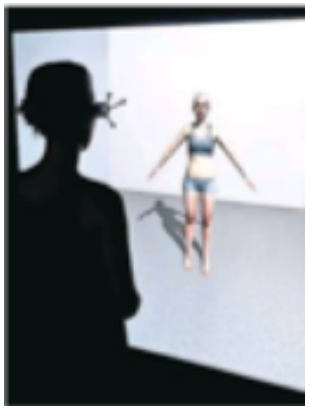


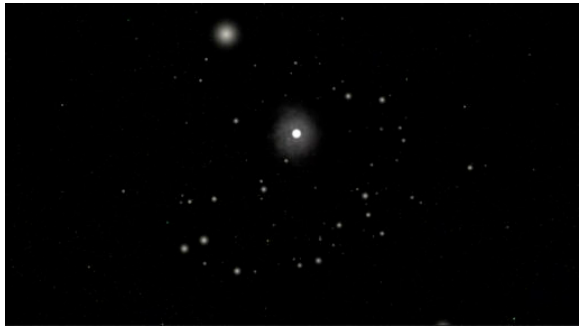
- Embody users in VR
- Highly customizable
  - Identity, style, behavior
  - Possible to change identity and keep behavior constant
- Reduce bias from human-human interaction
  - e.g. mood, appearance
- Personalization

Research methods

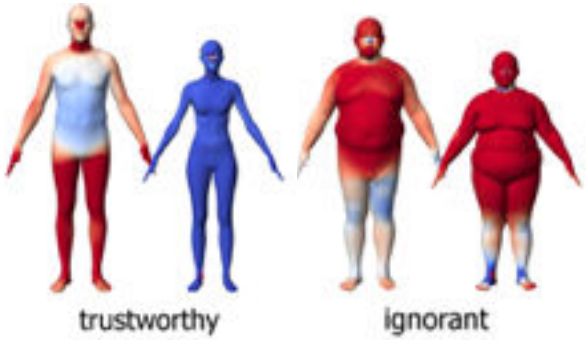
Virtual reality

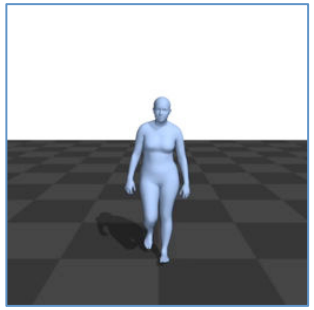


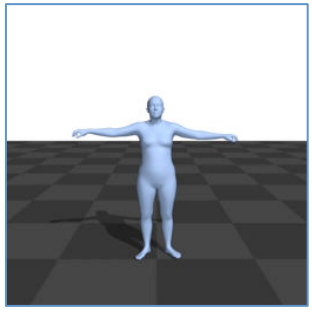




Virtual humans

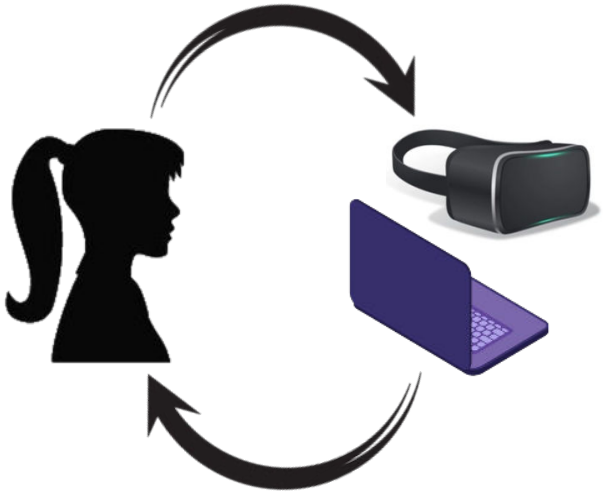






- Mixed-methods (quant+qual)
- Web & Mobile Technologies
- Artificial Intelligence
- User Experience/ Human Centered Design
- Visual Analytics
- Physiological sensing

Research Goals



RG1. Digital assessment & support of mental health

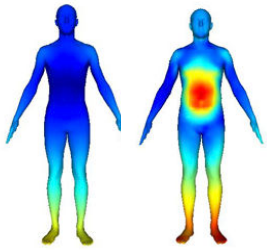
RG2. Simplify development and use of technology for professionals (clinical)

RG3. Move out of the lab/clinic/ (into ‘the wild’)

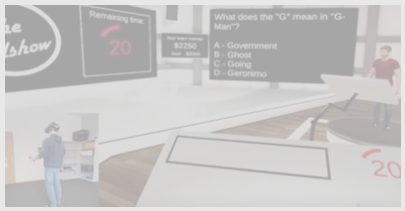
RG4. Develop systems with understanding of the ‘internal world’ of humans

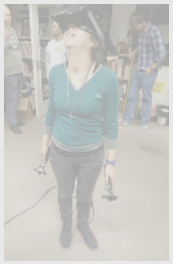
Research directions

Social & Body Perception

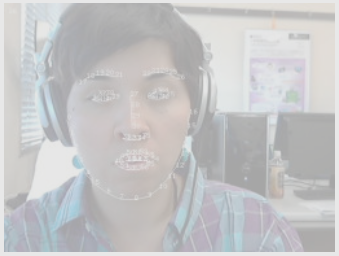


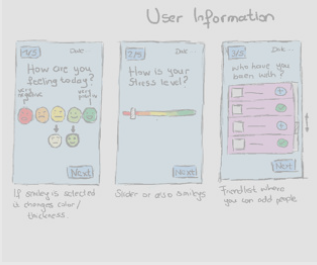

Psychological Assessment






Emotion & Prevention



Individual Factors


Human-Centric Design

Effect of media, engagement, long-term use

Didactics of empathy & compassion

Social Perception

Different mental processes that we use to form impressions of other people

- How are these impressions formed
- Conclusions we make about other people based on our impressions
- Snap judgments and decisions
- Can lead to biased or stereotyped perceptions of other people

Body Perception (Body Image)

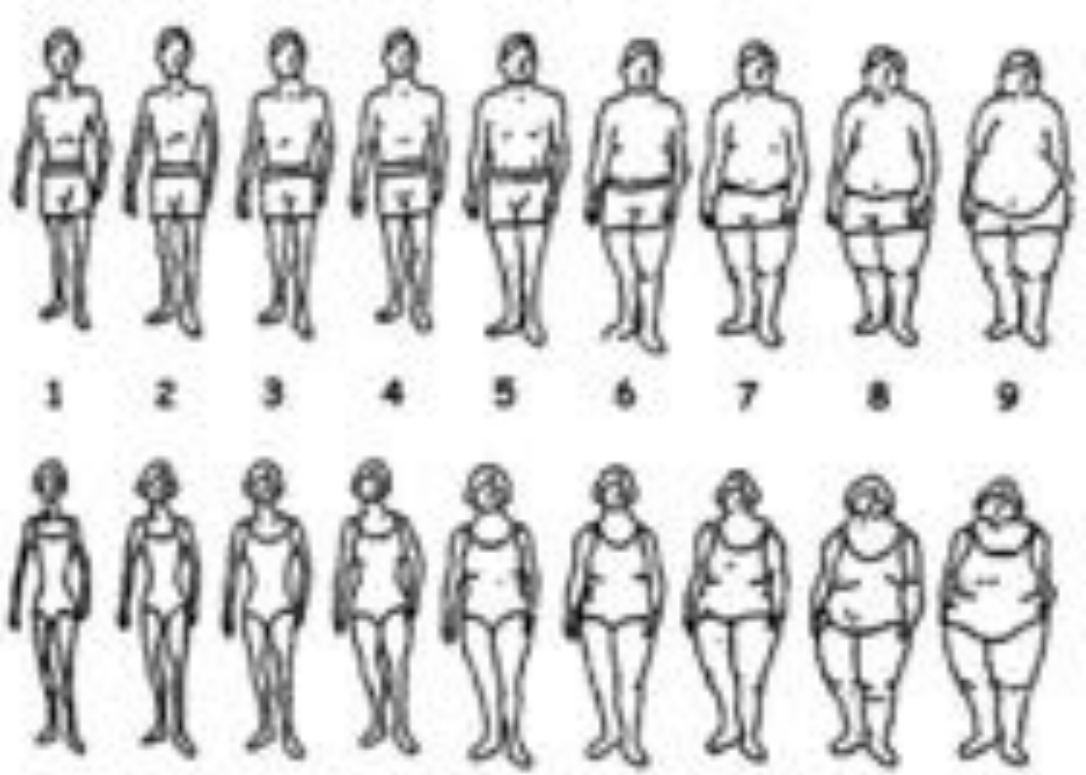
The perception of one's body, as well as *thoughts* and *feelings* that arise as a result of this perception

- Body (dis)satisfaction
- Body image disturbance (eating disorders)

Challenges

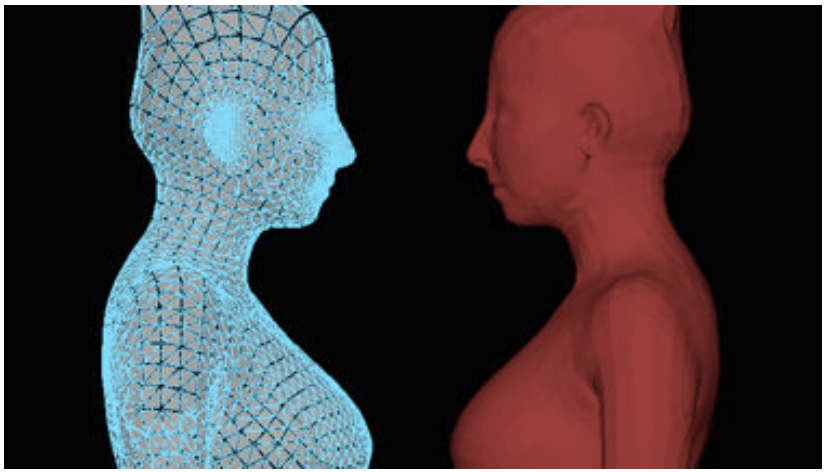
- Human behavior is messy (introspection is hard!)
- Self-report (diverse biases)
- "Rudimentary" tools* = hard to be systematic

Contour Drawing Rating Scale



Thompson MA, Gray JJ. Development and validation of a new body-image assessment scale. J Pers Assess 1995: 64: 258–269.

3D body reconstruction

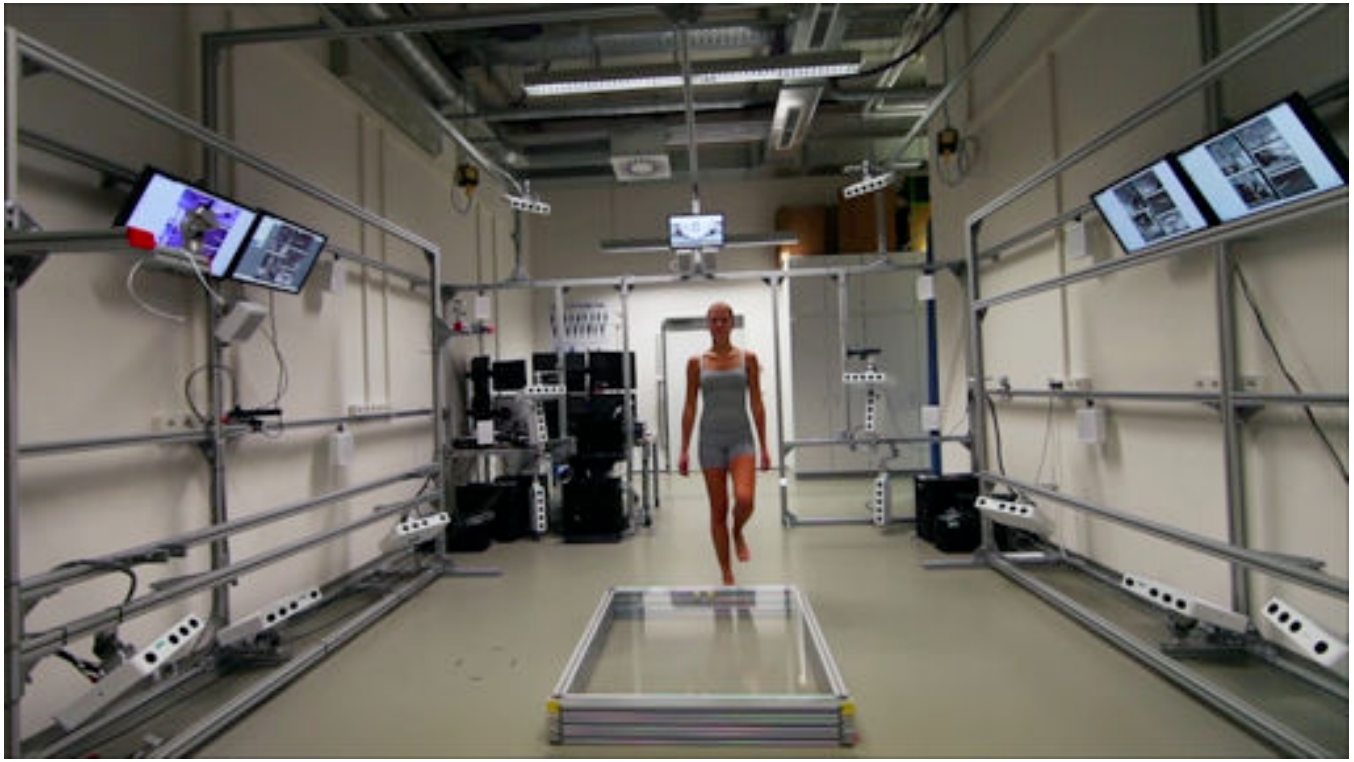


How can we can create **realistic, anatomically accurate avatars** without the need of high-end technology (e.g. scanners) or computation knowledge?

Potential applications:
"Digital Twin", contribute to digital phenotype, interaction in the Metaverse, custom-made prosthetics and wearables, etc.

* RG2. Simplify development and use of technology for [clinical] professionals

Typical creation of a high-resolution virtual human/ avatar



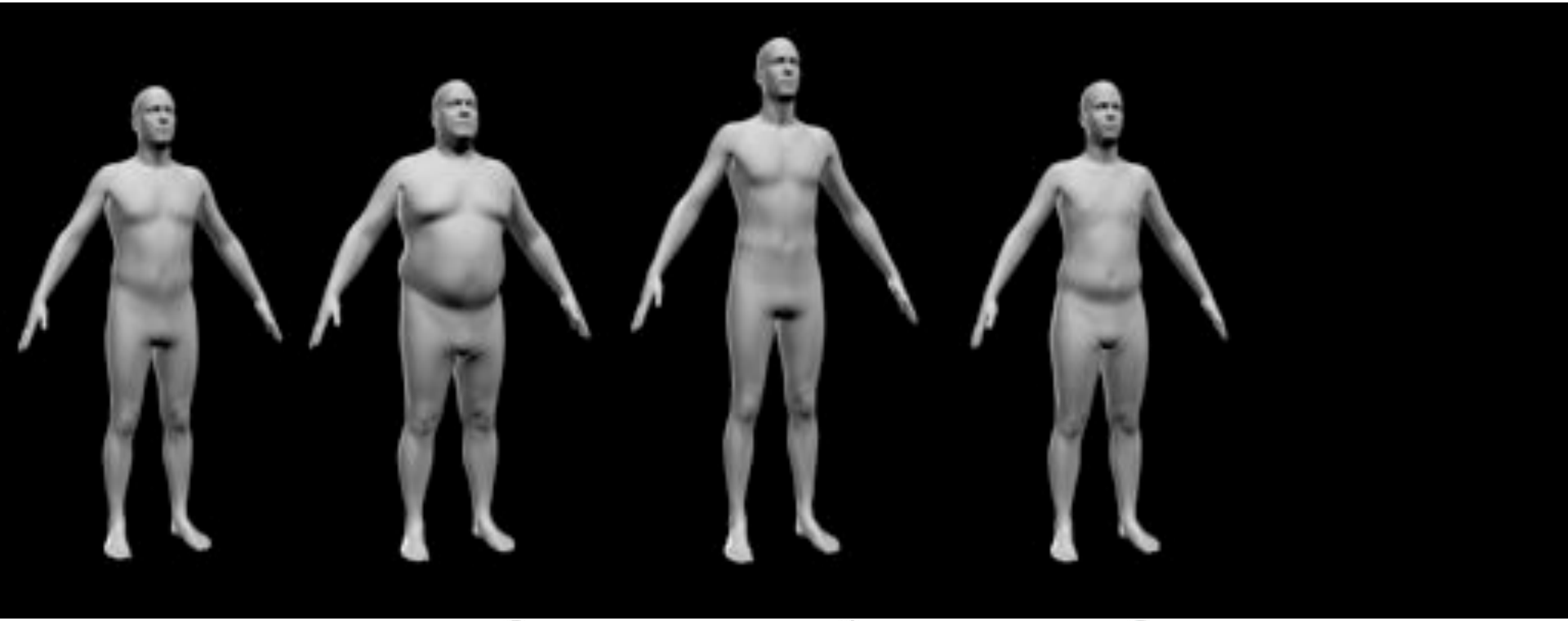
How?

language

bodies

Streuber, S., Quiros-Ramirez, M. A., Hill, M. Q., Hahn, C. A., Zuffi, S., O'Toole, A., & Black, M. J. (2016). Body talk: Crowdshaping realistic 3D avatars with words. ACM Transactions on Graphics (TOG), 35(4), 1-14.

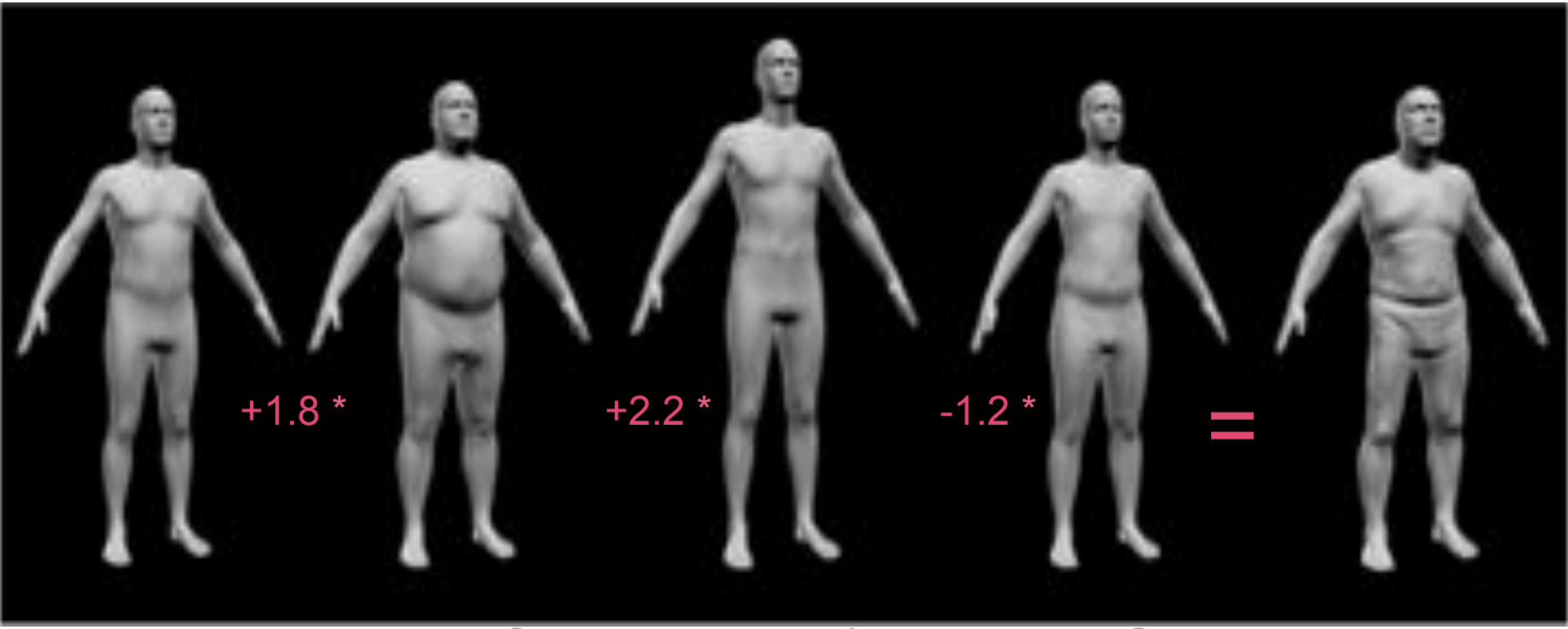
SMPL



Loper, M., Mahmood, N., Romero, J., Pons-Moll, G., & Black, M. J. (2015). SMPL: A skinned multi-person linear model. ACM transactions on graphics (TOG), 34(6), 1-16

SMPL

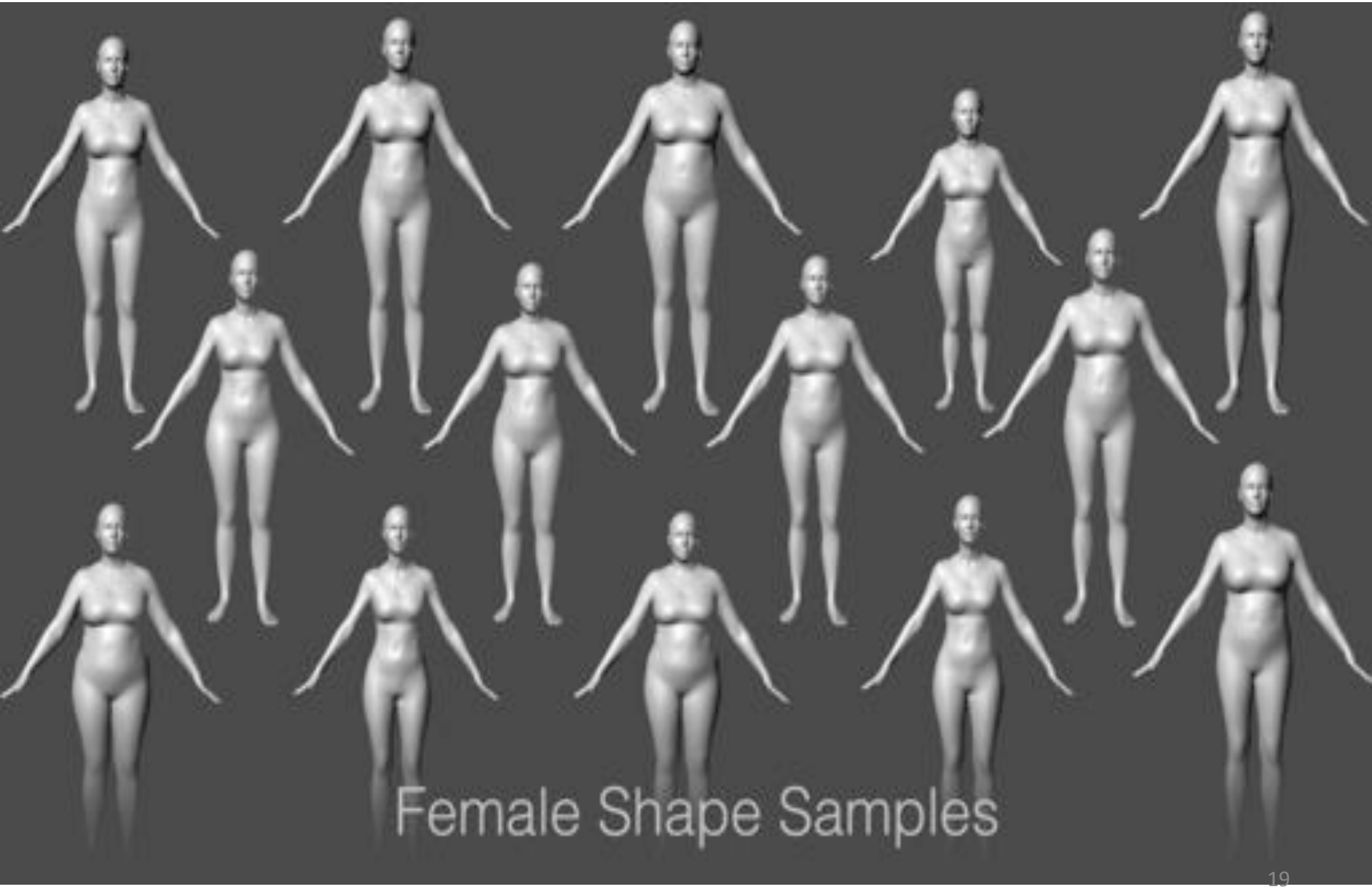
mean body | shape coefficients capture a person's shape | new body



$$\mu_S + \beta_0 P^0 + \beta_1 P^1 + \beta_2 P^2 + \cdots = S^i$$

18

Social & Body Perception



Data collection

average

does not apply at all | completely applies

Round Apple	○ ○ ○ ● ○
Sexy	○ ● ○ ○ ○
Lean	● ○ ○ ○ ○
Big	○ ○ ○ ● ○
Curvy	○ ○ ● ○ ○
Proportioned	○ ○ ● ○ ○
Fit	○ ● ○ ○ ○
Short Torso	○ ○ ○ ● ○
Built	○ ○ ● ○ ○
Short	○ ○ ○ ● ○
Sturdy	○ ○ ○ ● ○
Average	○ ● ○ ○ ○
Muscular	○ ○ ● ○ ○
Long Torso	○ ○ ○ ○ ○
Hourglass	○ ○ ○ ○ ○
Short Legs	○ ○ ○ ○ ○
Feminine	○ ○ ○ ○ ○
Petite	○ ○ ○ ○ ○
Broad Shoulders	○ ○ ○ ○ ○
Skinny	○ ○ ○ ○ ○
Tall	○ ○ ○ ○ ○
Pear Shaped	○ ○ ○ ○ ○
Long Legs	○ ○ ○ ○ ○
Heavyset	○ ○ ○ ○ ○
Attractive	○ ○ ○ ○ ○
Rectangular	○ ○ ○ ○ ○
Small	○ ○ ○ ○ ○
Stocky	○ ○ ○ ○ ○
Masculine	○ ○ ○ ○ ○
Long	○ ○ ○ ○ ○

Social & Body Perception

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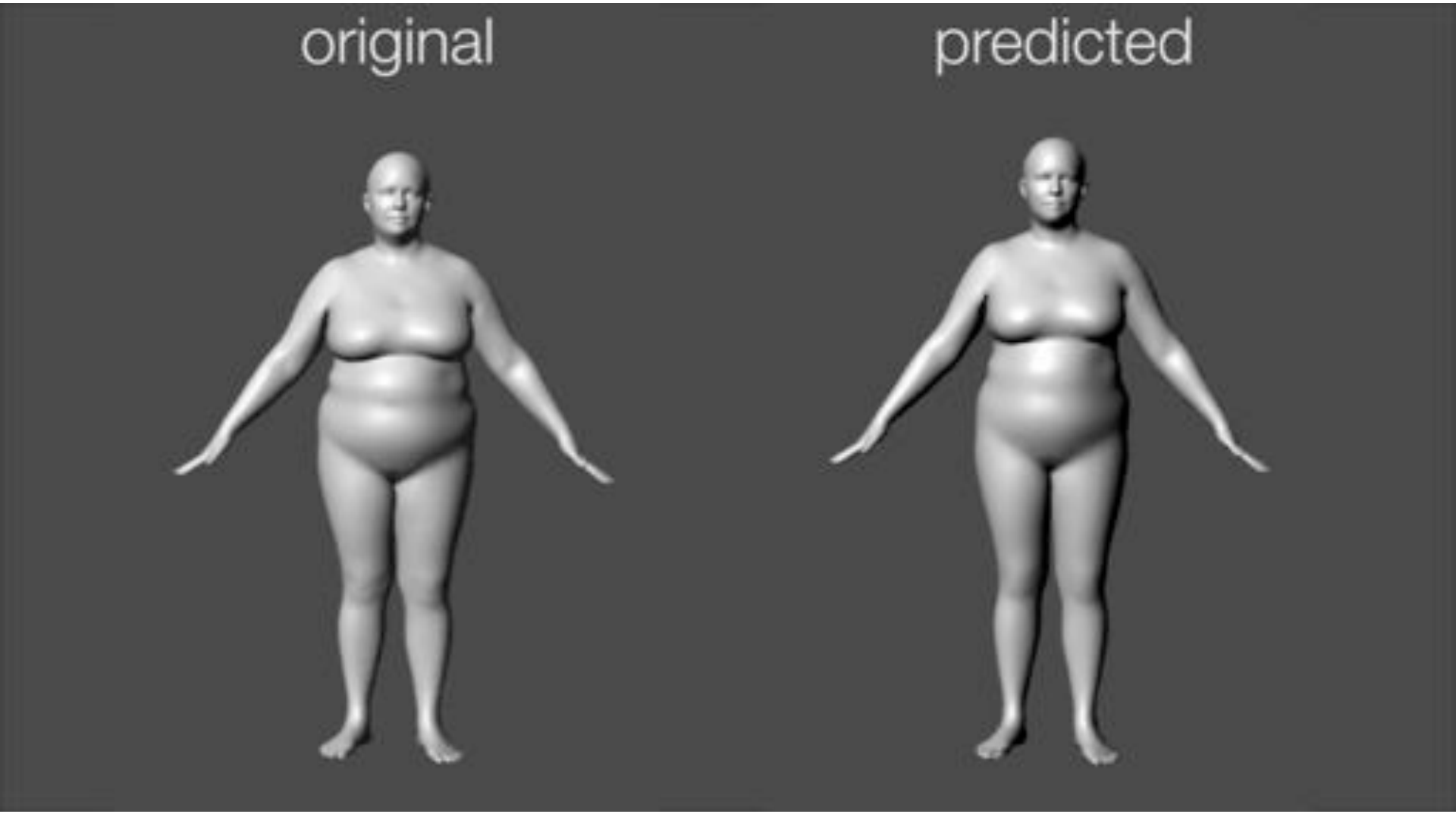
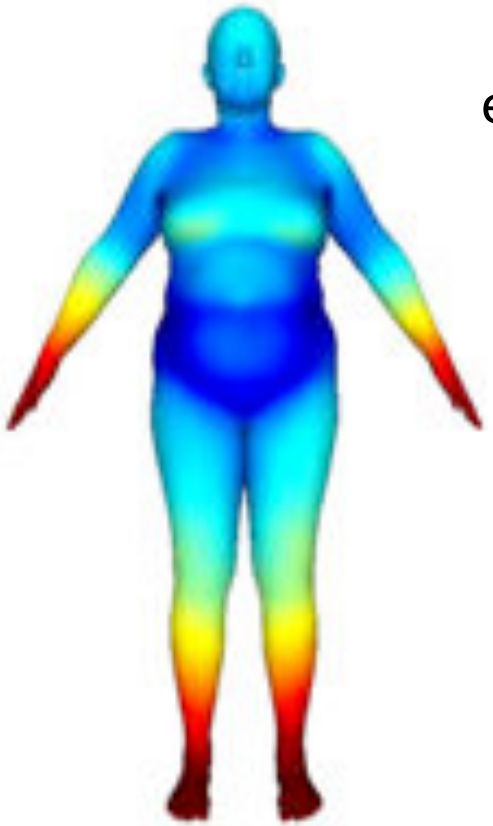
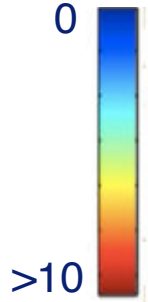


original

predicted

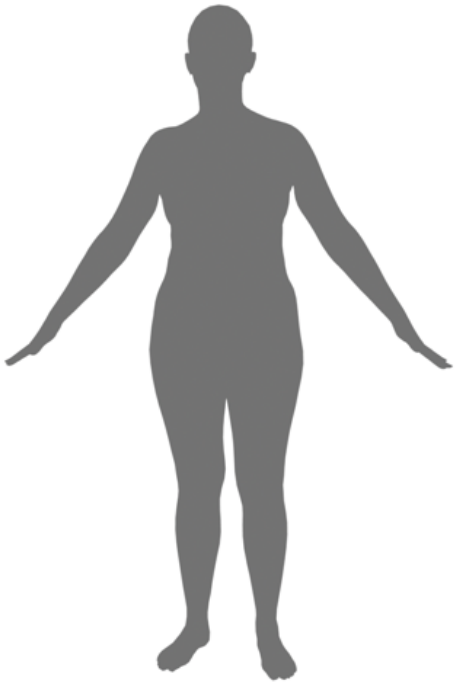


reconstruction error (RE) in mm



Anthropomorphic accuracy

Measurement	Error
height (mm)	26.21
weight (kg)	4.21



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Social & Body Perception

"She was tall and pliantly slender, without angularity anywhere.

Her body was erect and high-breasted, her legs long, her hands and feet narrow."

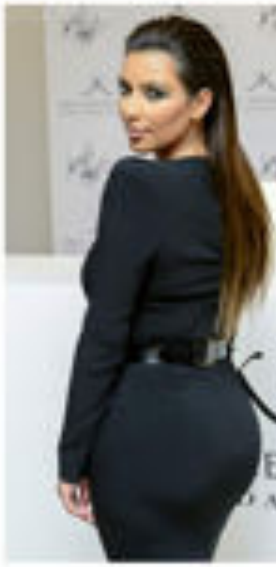
Dashiell Hammett
The Maltese Falcon, 1929. Knopf

Streuber, S., Quiros-Ramirez, M. A., Hill, M. Q., Hahn, C. A., Zuffi, S., O'Toole, A., & Black, M. J. (2016). Body talk: Crowdshaping realistic 3D avatars with words. ACM Transactions on Graphics (TOG), 35(4), 1-14.

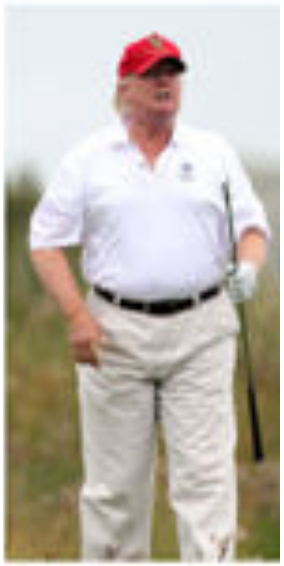
Social & Body Perception

ACMSIGGRAPH

curvy
feminine
attractive
hourglass



big
heavyset
stocky
short torso



lean
petite
skinny
small

short legs
short
short torso
small

*manually posed for illustrative purposes!

Streuber, S., Quiros-Ramirez, M. A., Hill, M. Q., Hahn, C. A., Zuffi, S., O'Toole, A., & Black, M. J. (2016). Body talk: Crowdshaping realistic 3D avatars with words. ACM Transactions on Graphics (TOG), 35(4), 1-14.

Social & Body Perception

Visualization of personality and political trait biases

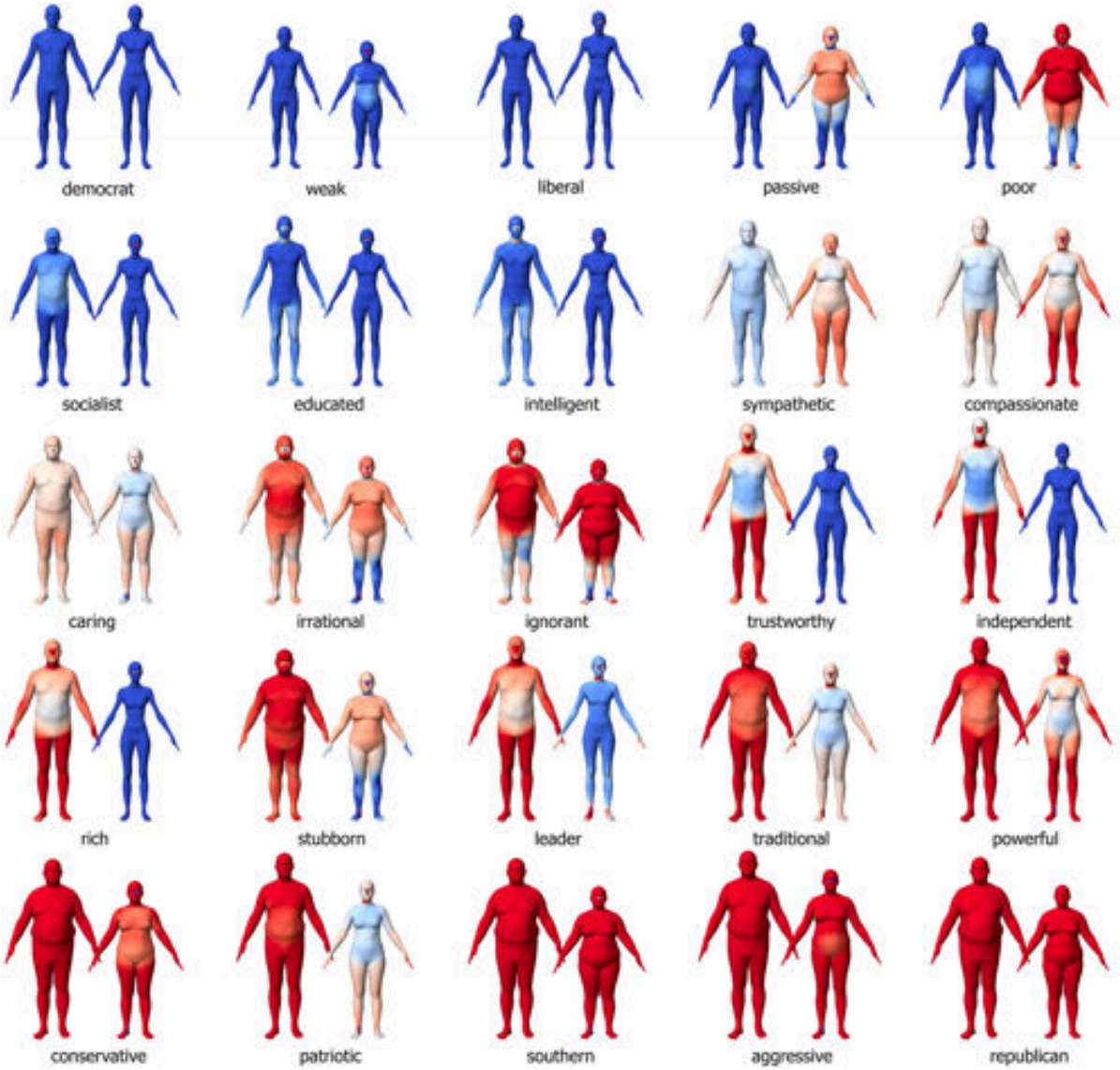
Can we visualize the meaning of concepts beyond body shape descriptors?

Potential applications:
Implicit biases, bias and stereotype awareness, population comparison

* RG4. Develop systems with understanding of the ‘internal world’ of humans

nature
Humanities & Social Sciences
Communications

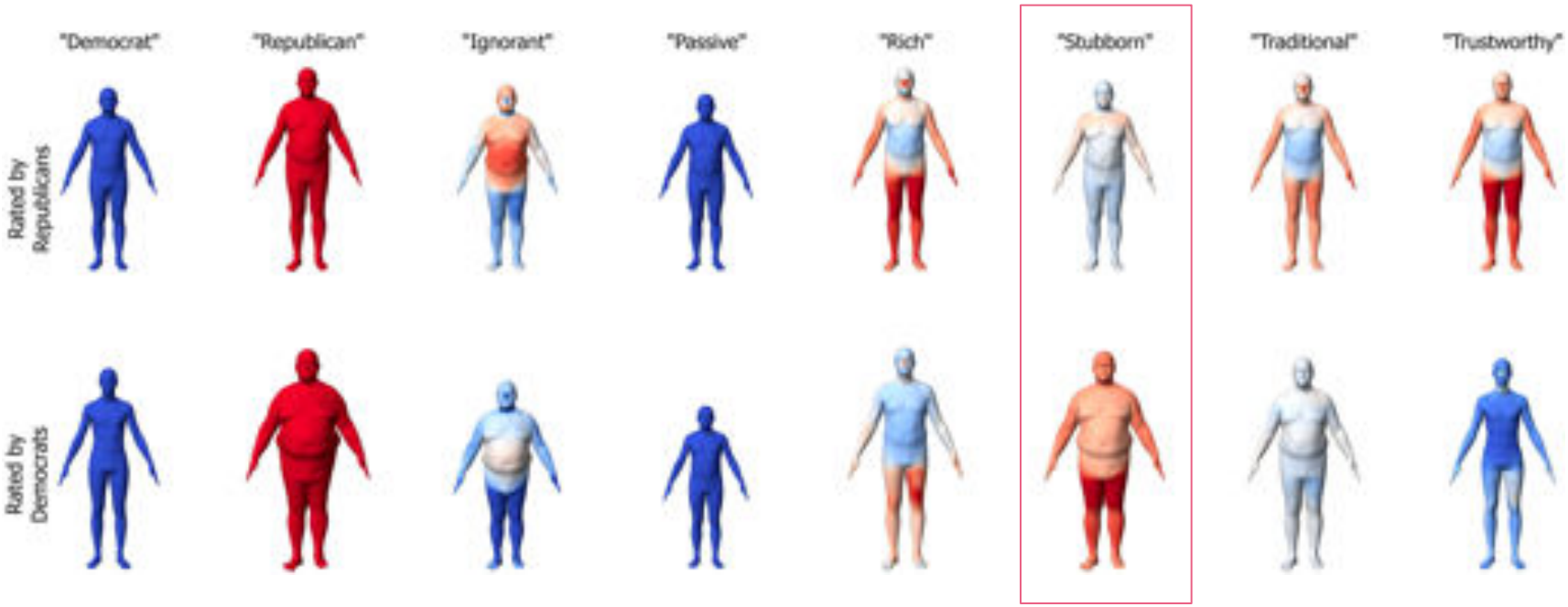
Modeling and visualization of bodily biases & stereotypes



Quirós-Ramírez, M. A., Streuber, S., & Black, M. J. (2021). Red shape, blue shape: political ideology influences the social perception of body shape. Humanities and Social Sciences Communications, 8(1), 1-10.

nature
Humanities & Social Sciences
Communications

Modeling and visualization of bodily biases & stereotypes
– Individual differences –



Quirós-Ramírez, M. A., Streuber, S., & Black, M. J. (2021). Red shape, blue shape: political ideology influences the social perception of body shape. Humanities and Social Sciences Communications, 8(1), 1-10.

Visualization of gender stereotypes

Can we visualize and quantify gender stereotypes in professional contexts?

Potential applications:

Evaluation/diagnostic of biases, bias and stereotype awareness, population comparison

- RG1. Digital assessment & support of mental health
- RG4. Develop systems with understanding of the 'internal world' of humans

Implicit automatic identification gender biases in STEM and other fields

(from a **gender Neutral** model)

Potential applications:
Implicit bias assessment in institutions and companies

visual analytics!

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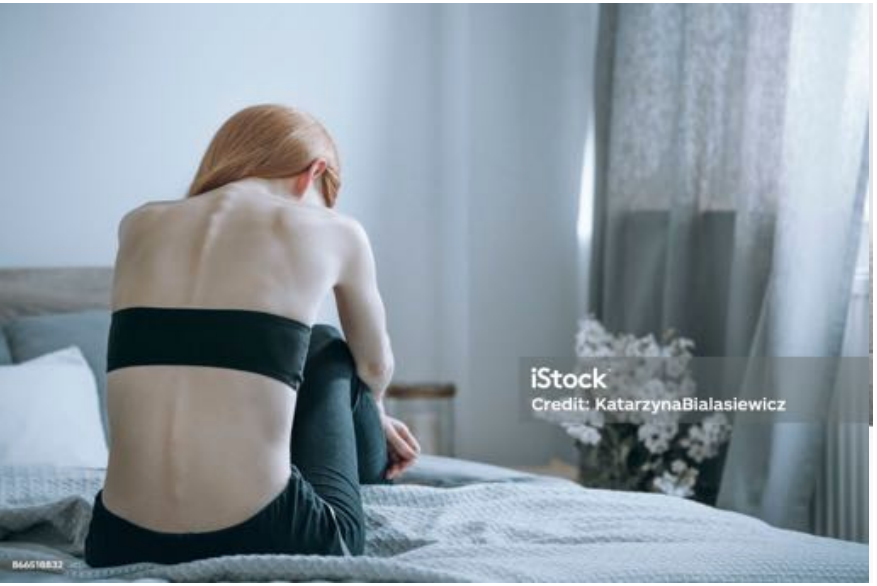
Clinical body perception



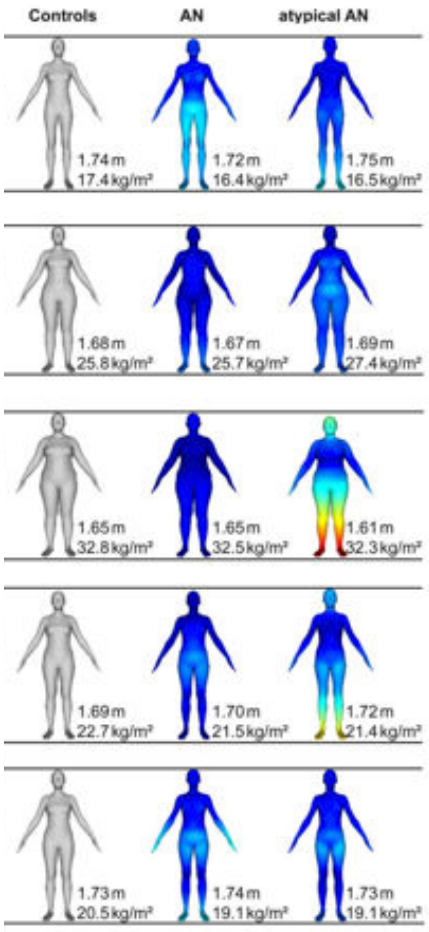
Can we shed new light on the underpinnings of self-body perception and satisfaction?

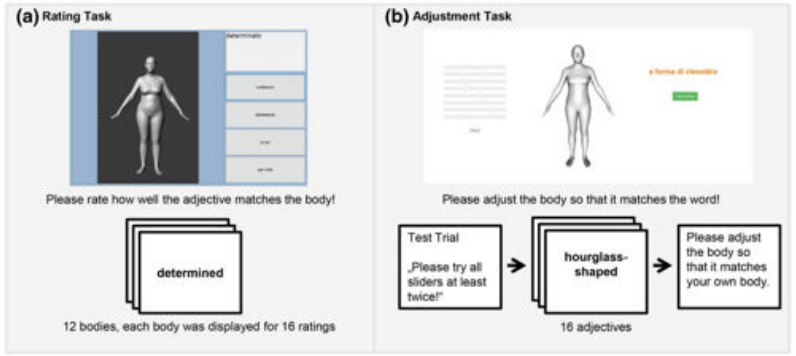
Potential applications:

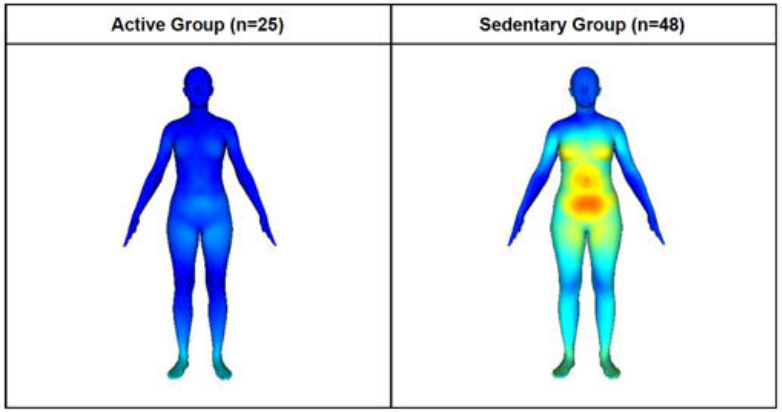
Further understanding on the underpinnings of eating disorders, beauty standards, and body satisfaction

* RG1. Digital assessment & support of mental health
* RG4. Develop systems with understanding of the 'internal world' of humans

Eating disorders clinical research







Discrepancies in body satisfaction between current body shape and **ideal body shape** for active and sedentary groups

UNIVERSITÄTS KLINIKUM TÜBINGEN

UNIVERSITÀ DEGLI STUDI DI PADOVA

Behrens, Simone Claire, et al. "Weight bias and linguistic body representation in anorexia nervosa: Findings from the BodyTalk project." European Eating Disorders Review 29.2 (2021): 204-215.
Meneguzzo, Paolo, et al. "Body image disturbances and weight bias after obesity surgery: Semantic and visual evaluation in a controlled study, findings from the BodyTalk Project." Obesity Surgery 31 (2021): 1625-1634.

Social context in Body (dis)Satisfaction

Virtual reality!

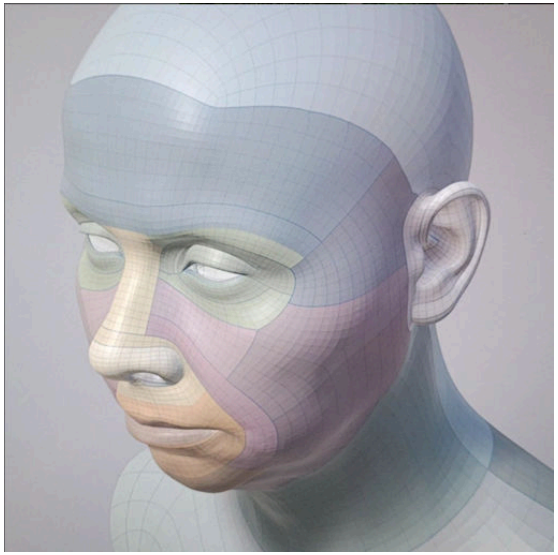
Effect of context on body perception and satisfaction

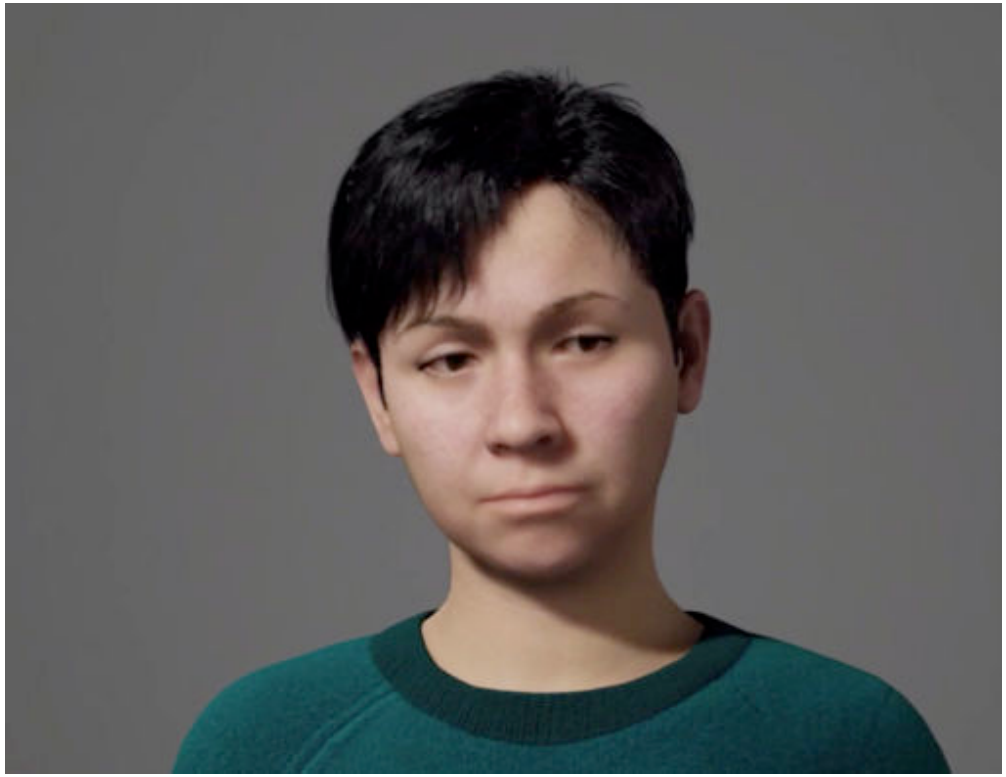
- Crowd BMI (high/low/avg)
- “Apple collection” in a maze surrounded by a crowd of virtual humans
- Own body modeling task (pre/post)
- Ideal body modeling task (pre/post)
- Body satisfaction questionnaire (pre/post)

Other upcoming projects in Social Perception

Charisma perception

Identity





Behavior

METAHUMAN CREATOR

UNREAL ENGINE

Cross-cultural beauty standards

https://onlinedoctor.superdrug.com/perceptions-of-perfection/

Tools for Body Perception studies

DGESS
Deutsche Gesellschaft für Essstörungen e.V.

PARTICIPATORY DESIGN PROCESS

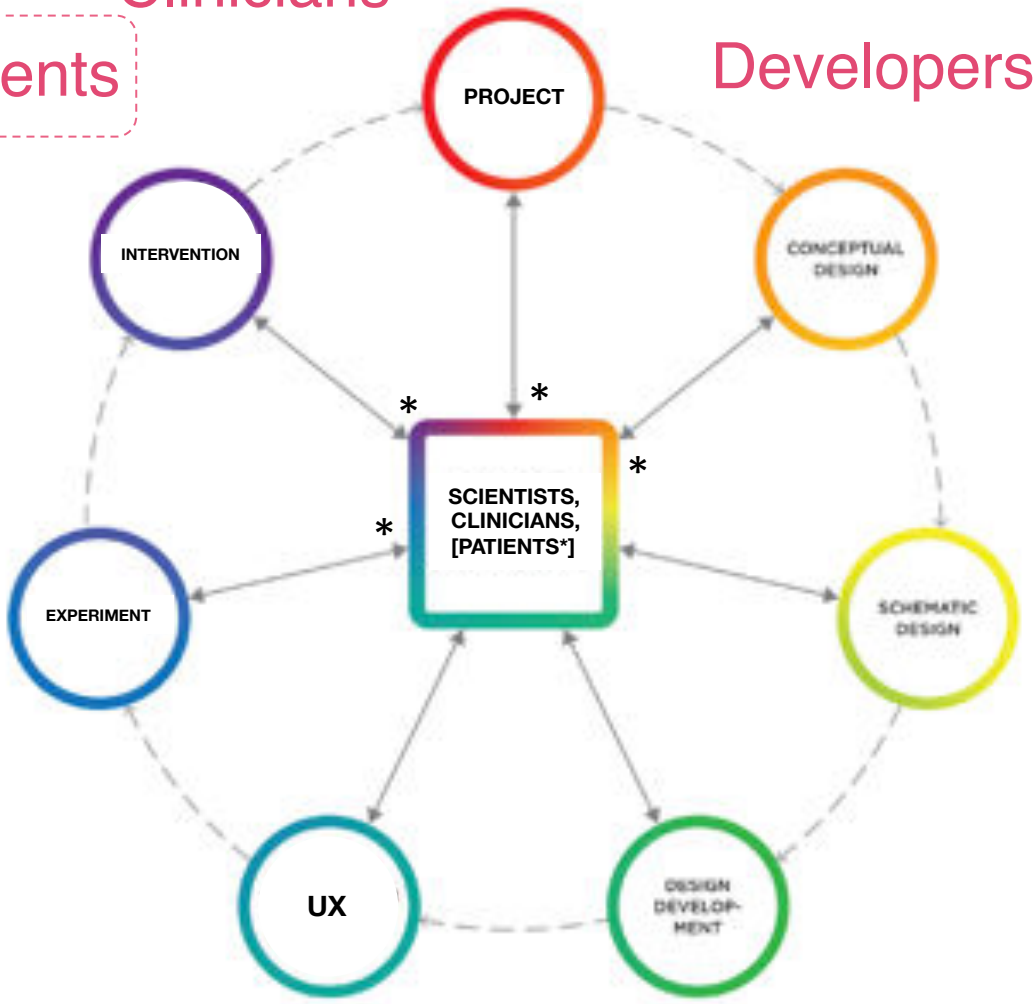
THE PARTICIPATORY DESIGN PROCESS IS COMMUNITY DRIVEN.

Scientists

Clinicians

Patients

Developers



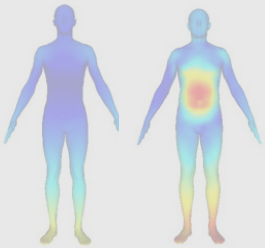
adapted from Enterprise Community Partners, Inc.

Why?

- Decrease aversion or triggering patients
- Reduce power imbalance
- Improve design
- Get to know more about the patients?
- Increase impact?
- Foster community feeling

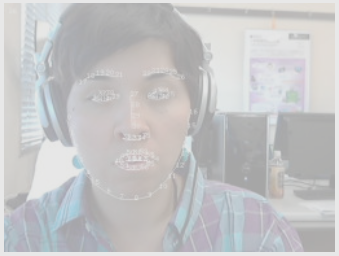
Research directions

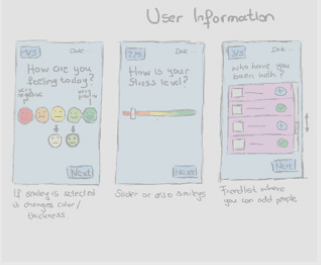
Social & Body Perception



Psychological Assessment


Emotion & Prevention



Individual Factors


Human-Centric Design

Effect of media, engagement, long-term use

Didactics of empathy & compassion

Challenges

- Human behavior is messy (introspection is hard!)
- Self-report (diverse biases)
  - pencil & paper questionnaires
- Evaluation happens in the laboratory
  - behavior may be different “in real life”
- Lack of **interaction** for evaluation purposes

Assessment of Stress/Anxiety

Challenge

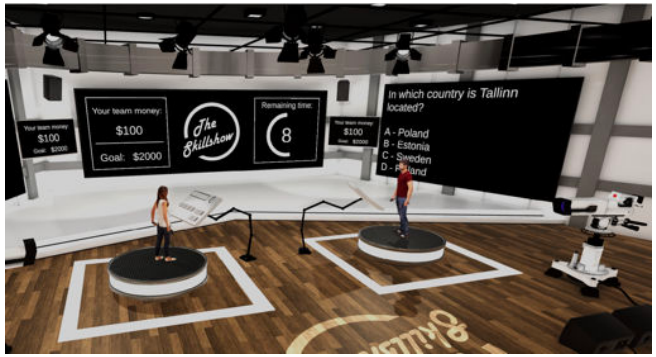
Expensive and complicated to hold a behavioral experiment in the lab (confederates, keep variables constant across trials, etc.)

RQ1: Is the paradigm effective in inducing stress? **(Yes)**
RQ2: Does stress decrease when playing with an avatar companion (cooperation)? **(more participants needed!)**

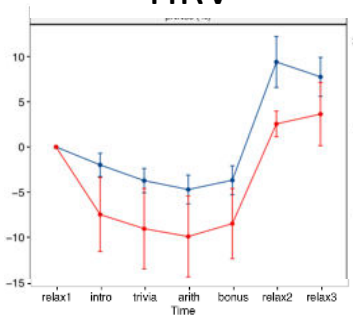
Experiment:

- Participant plays a game show
- Different stress induction phases:
  - Self introduction (social evaluation)
  - Game: Trivia Questions
  - Game: Math Question
  - Game: Final Round

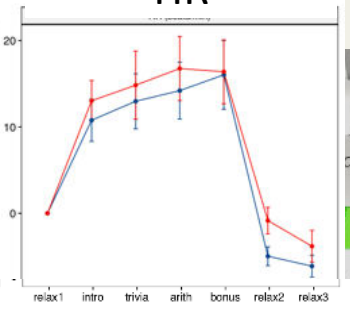
Participants: 20 (between subject design)



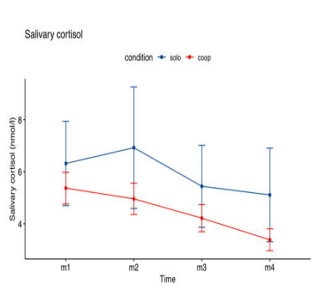
HRV



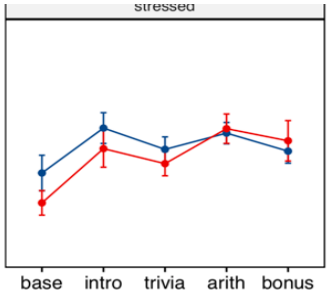
HR



Cortisol



Self Report



zfp Reichenau
Akademisches Lehrkrankenhaus der Universität Konstanz

Assessment of Fear of Public Speaking

VR ‘in-the-wild’

Can we bring our VR experiences into “the wild”?

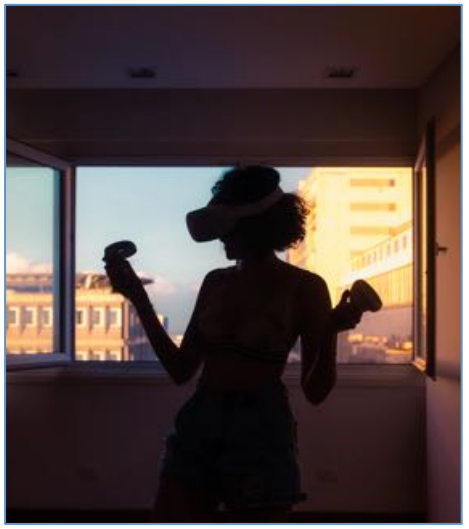
Potential applications:

Evaluation at home (different triggers as in the lab)

Further treatment & monitoring at home (patients could be discharged and continue their therapy)

* RG2. Simplify development and use of technology for professionals
* RG4. Develop systems with understanding of the ‘internal world’ of humans

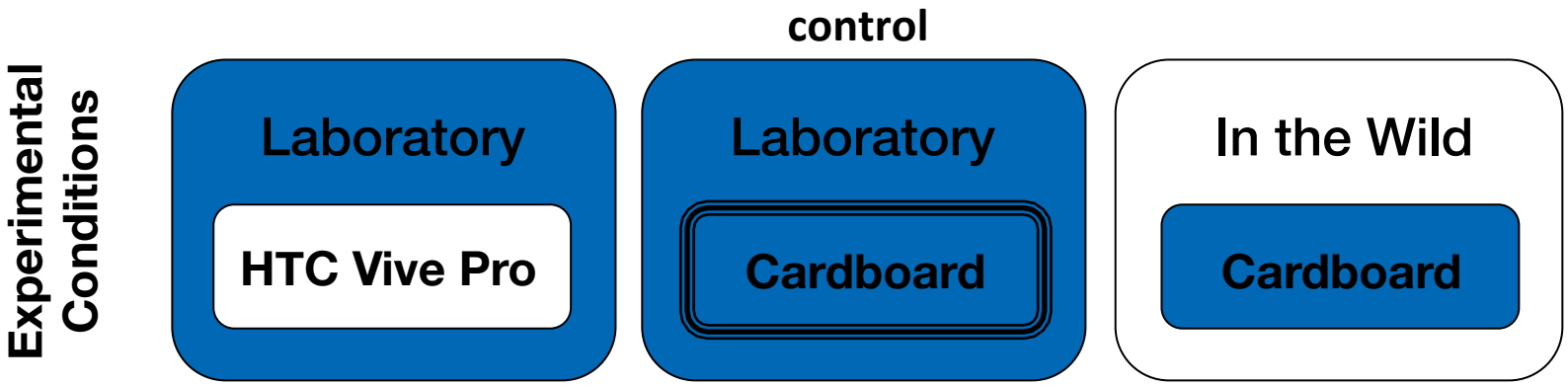
VR ‘in-the-wild’



Do VR experiences outside of the lab hold the same effects as in the lab?

+ Remotely access patients / participants
+ Access more people (remotely – larges sample sizes)
+ Patients can train / practice on their own
+ More heterogeneous samples
+ Cost reduction (mobile VR with e.g. cardboard)

Experimental design



VR ‘in-the-wild’

Public speaking task

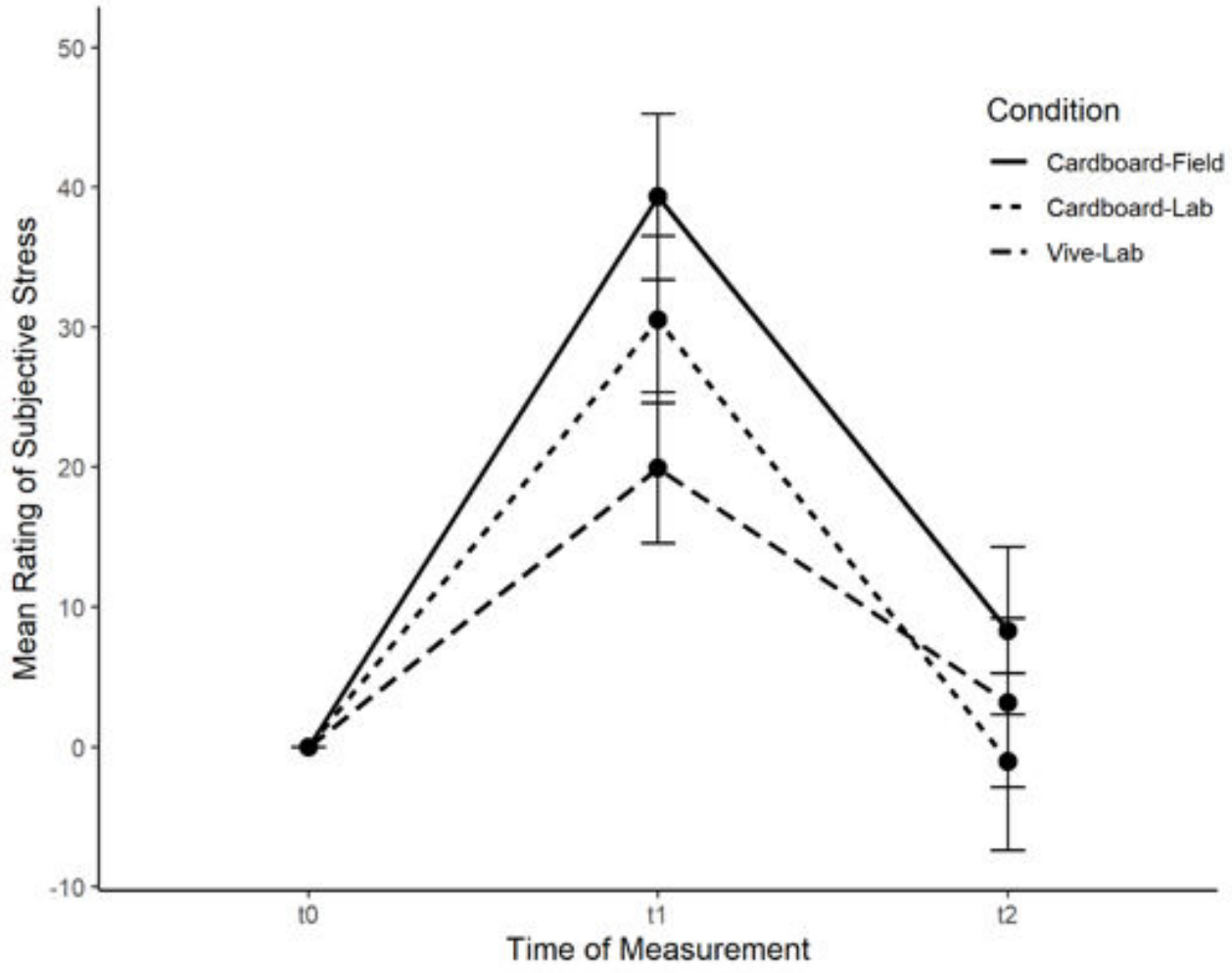
Interaction
Stress inductive
Computer Graphics

Nature task

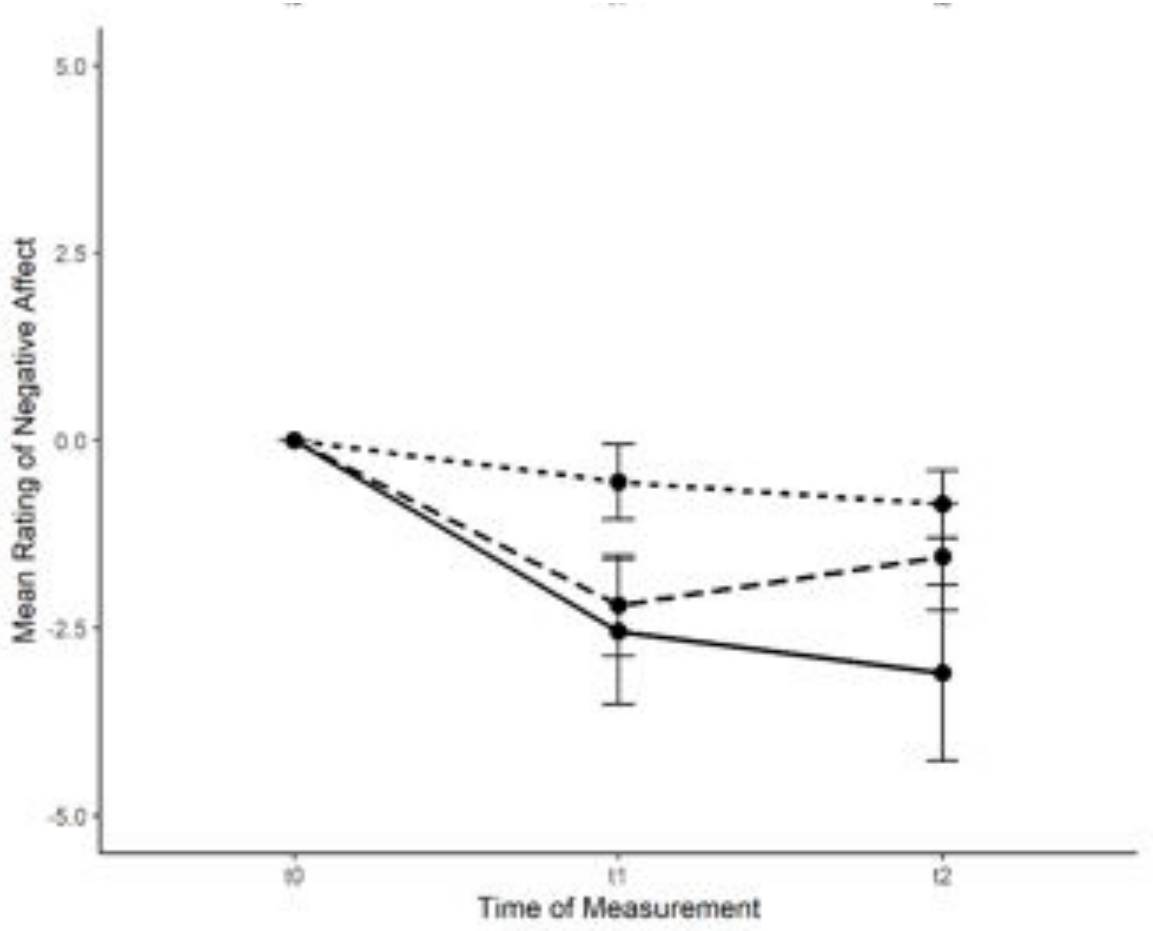
Observation
Mood improvement
360° video

Stress/Mood, Presence, Sickness, Usability

Results – Perceived Stress



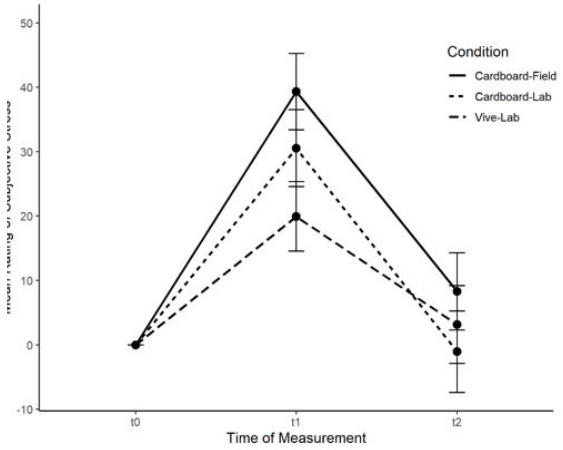
Results – Decrease of negative affect



Evidence that mobile VR is a valid method for psychological studies in the wild

(e) Finished Cardboard Device with Smartphone

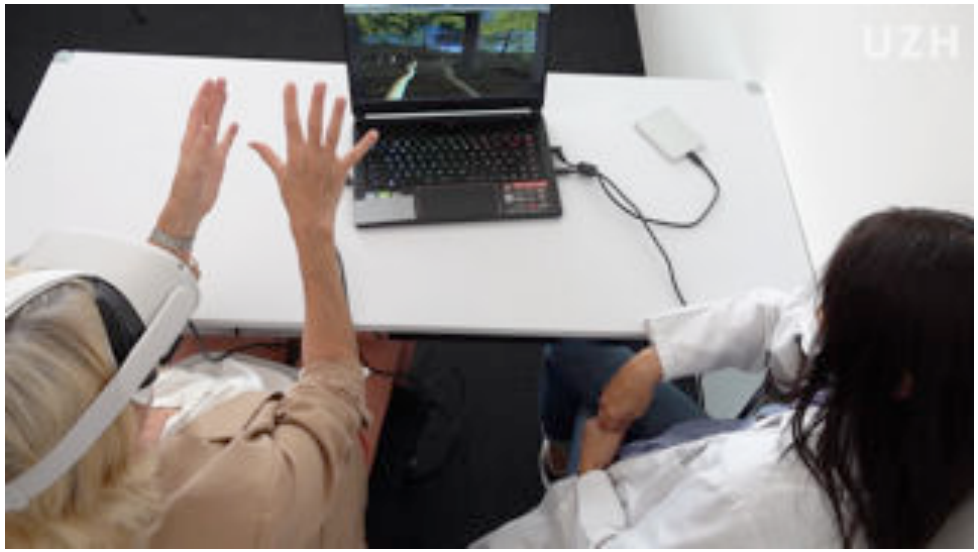
(f) Cardboard Device with closed lid



- ✓ Similar responses in cardboard as in HTC Vive
- ✓ These responses are similar outside of the lab

Representative VR sample?

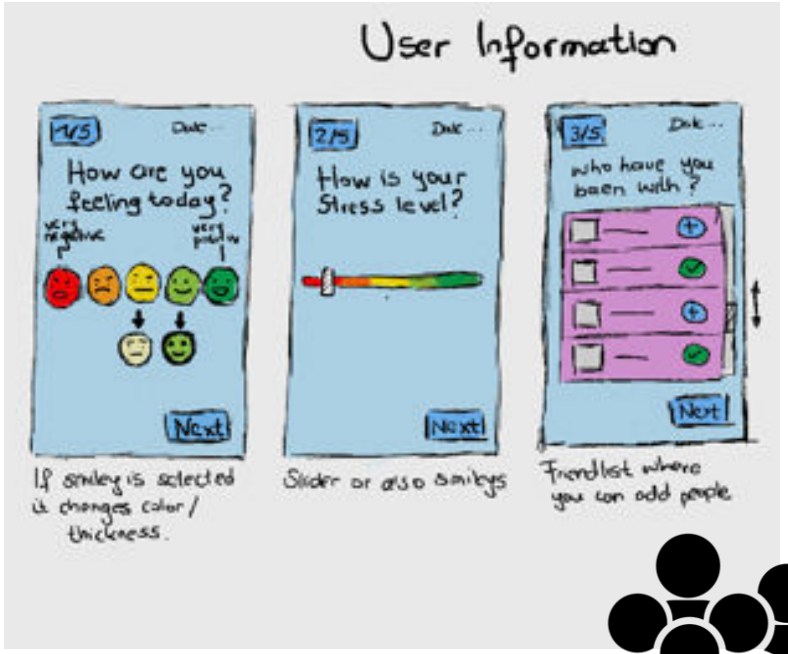
Pain management at home



Universität Konstanz

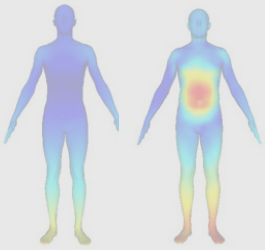
Assessment of Stress/Mood Contagion ‘in-the-wild’

How does mood & stress transmits between people?

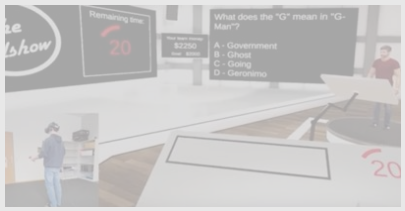


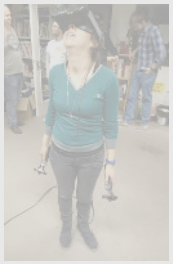
Research directions

Social & Body Perception



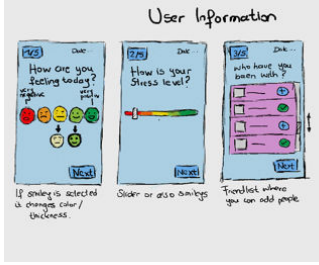
Psychological Assessment






Emotion & Prevention



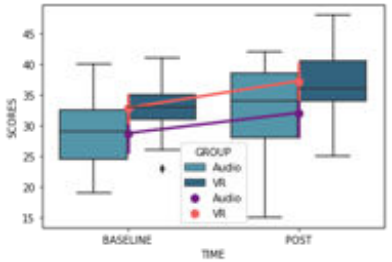
Individual Factors


Human-Centric Design

Effect of media, engagement, long-term use

Didactics of empathy & compassion

VR Mindfulness Meditation (Loving Kindness Meditation)



mindfulness

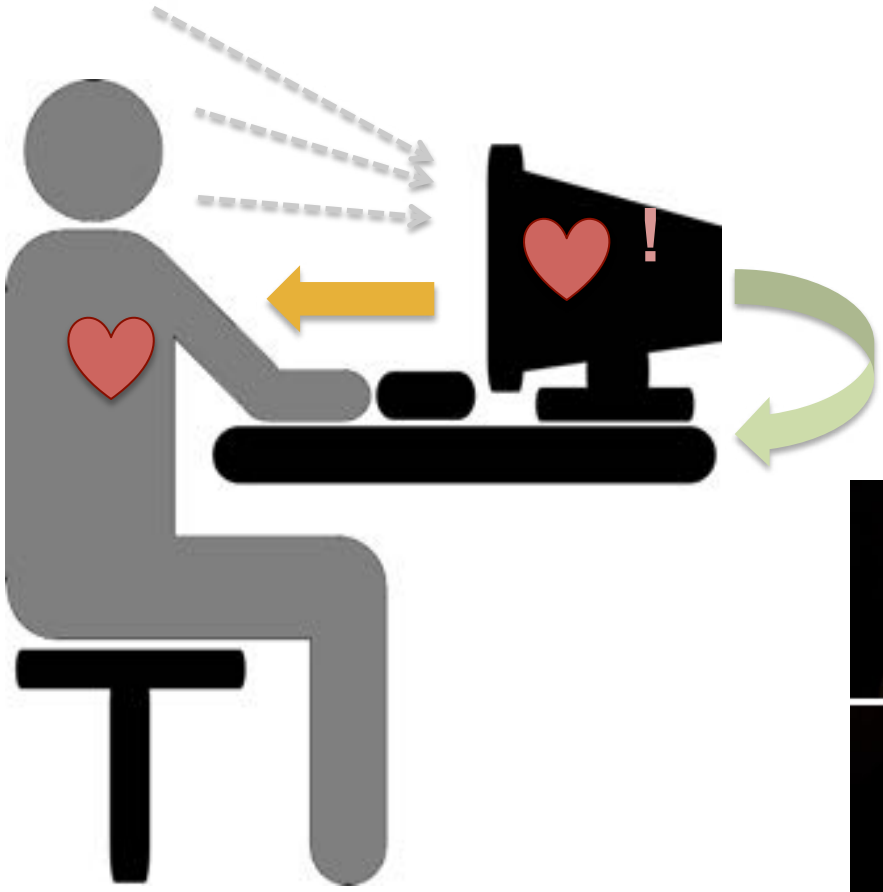
Why VR/VH Unknown neutral location
Metaphors to represent other people

VR Experience developed following the Design Thinking Process with experienced and novice meditators

TEDx Konstanz
x = independently organized TED event

2022

Culture-aware emotion recognition

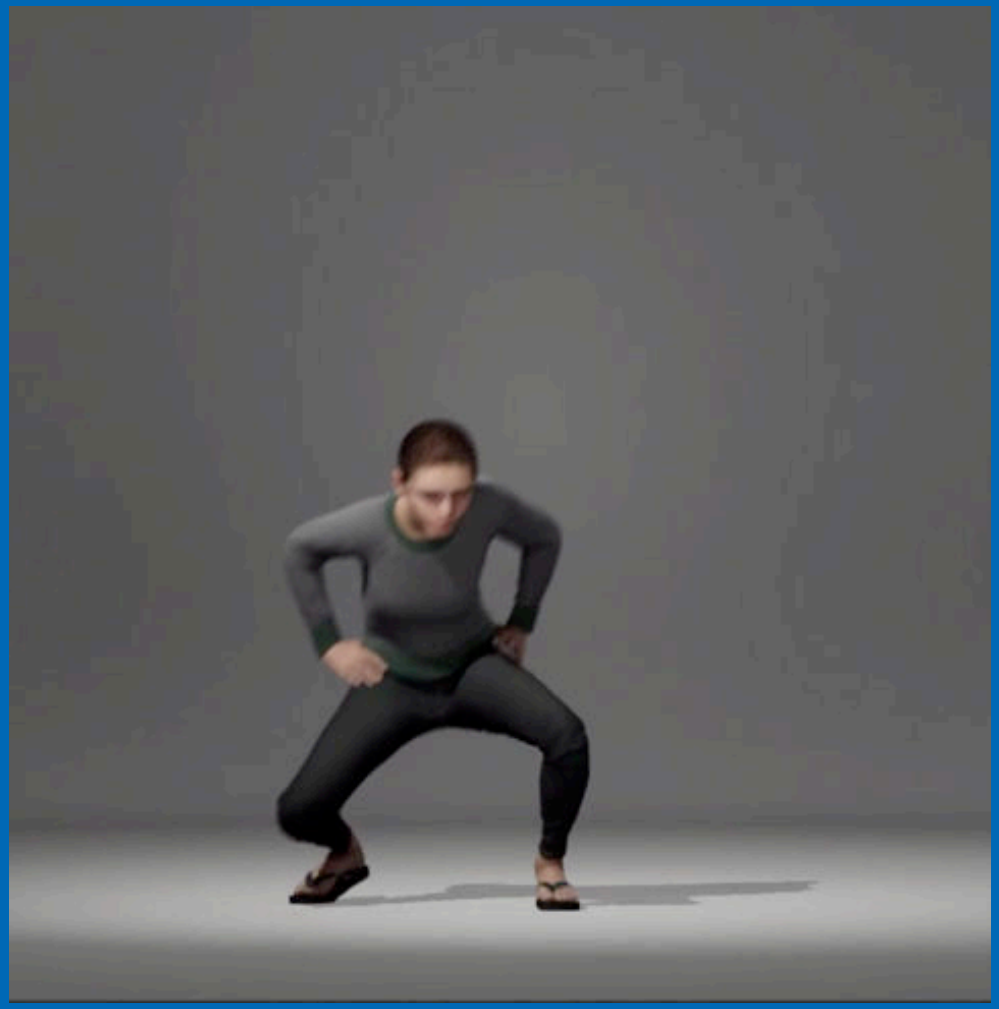


TEDx PuraVida
x = independently organized TED event

2016

Theater aided emotion induction in VR

Take home message



Thank you!

Dr. María Alejandra Quirós-Ramírez

http://www.alejandraquiros.info

https://bodytalk.is.tue.mpg.de/ (visualizer)