

"A feeling of déjà

vu"

The Effects of Avatar Appearance-Similarity on
Persuasiveness in Social Virtual Reality

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- People tend to be more influenced by others who look like themselves than they are by dissimilar others
- > known as the similarity effect

[1] Image: <https://psychology.iresearchnet.com/social-psychology/interpersonal-relationships/similarity-attraction-effect/>

[2] D.E. Byrne. 1971. The Attraction Paradigm. Academic Press.

- The similarity effect has been studied in the screen-based communications platform. (e.g., 2D monitor)

→ It holds significant influence over factors such as group identification and collaboration performance.

[1] Buisine and Guegan. 2020. Proteus vs. social identity effects on virtual brainstorming. Behaviour & Information Technology

[2] van der Land et al. 2015. Does Avatar Appearance Matter? How Team Visual Similarity and Member-Avatar Similarity Influence Virtual Team Performance. Human Communication Research

- Recently, virtual reality (VR) has been deemed a promising future platform for both socializing and collaboration.



[1] Freeman and Maloney. 2021. Body, Avatar, and Me: The Presentation and Perception of Self in Social Virtual Reality. Proc. ACM Hum.-Comput. Interact., CSCW

[2] Image: DALLE-3

- The VR environment allows people to **create, embody, and control** digital self-representations, known as avatars.
 - > In its subtype known as **social VR**, people use avatars specifically to socialize.



[1] Freeman and Maloney. 2021. Body, Avatar, and Me: The Presentation and Perception of Self in Social Virtual Reality. Proc. ACM Hum.-Comput. Interact., CSCW

[2] Image: Horizon Workrooms and AltspaceVR

- Social VR's affordances of body tracking, and avatar appearance underpin more complex relationships between their self-representations and other users' avatars than screen-based communication platform.

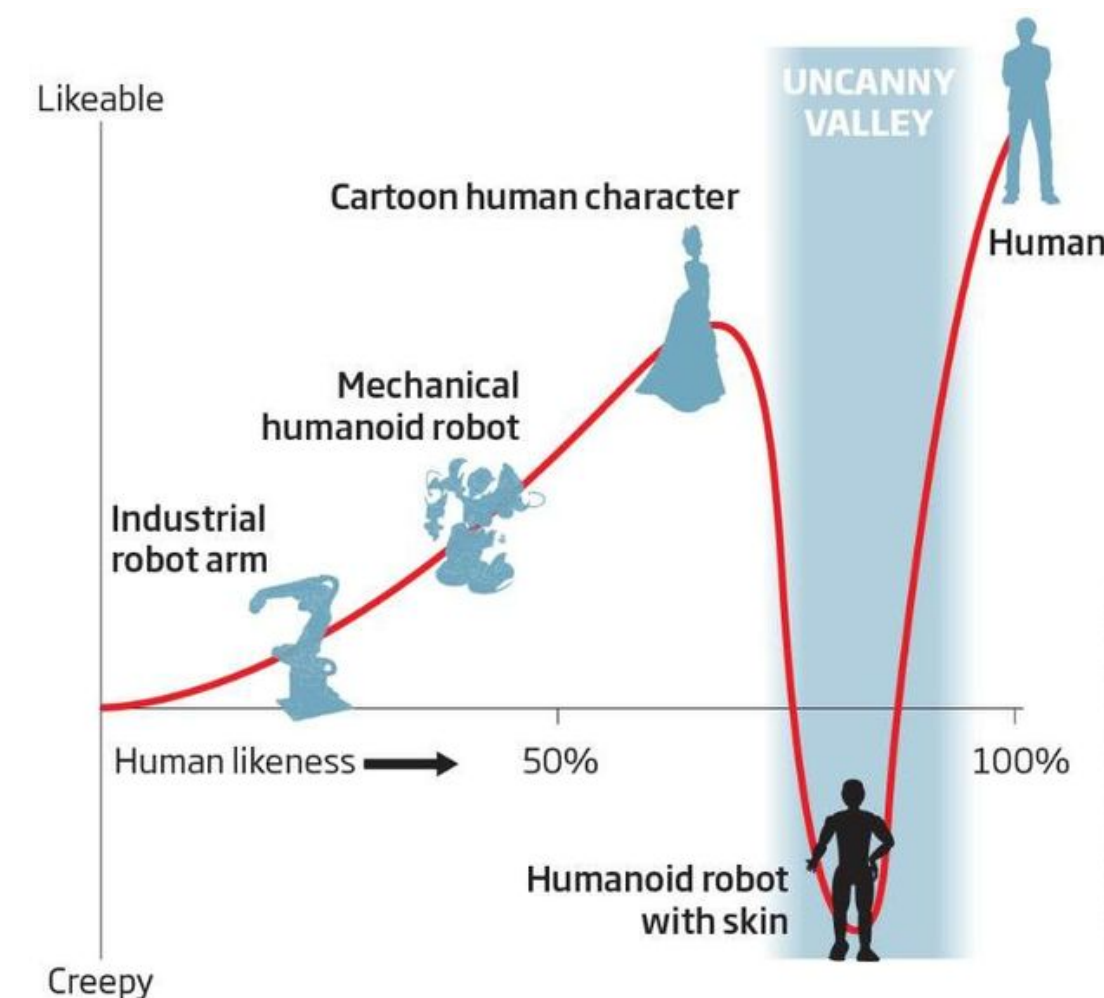


- However, the extent to which similarity effect applies to avatar appearance in VR-based communication platform remains unknown.



-> More specifically, how this phenomenon impacts others' persuasiveness in the social VR.

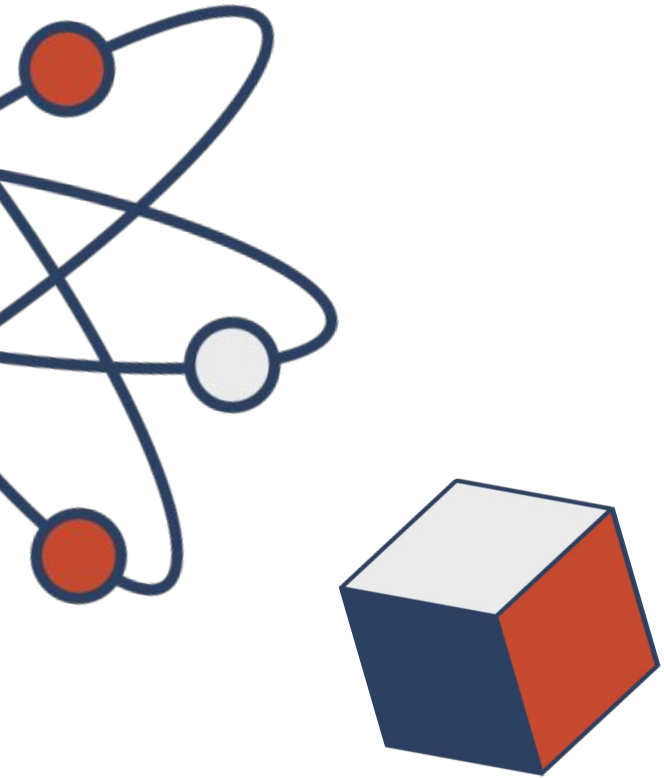
- While VR environment offers more immersive and natural interactions than screen-based, the potential discomfort induced by VR avatars (e.g., uncanny valley) must be taken into account.



[1] Hepperle et al. 2020 "Differences in the Uncanny Valley between Head-Mounted Displays and Monitors," International Conference on Cyberworlds

[2] Hepperle et al. 2022. Aspects of visual avatar appearance: self-representation, display type, and uncanny valley. Vis Comput

[3] Image: The uncanny valley of using CGI humans in consumer research.



Research Question (RQ) 1:

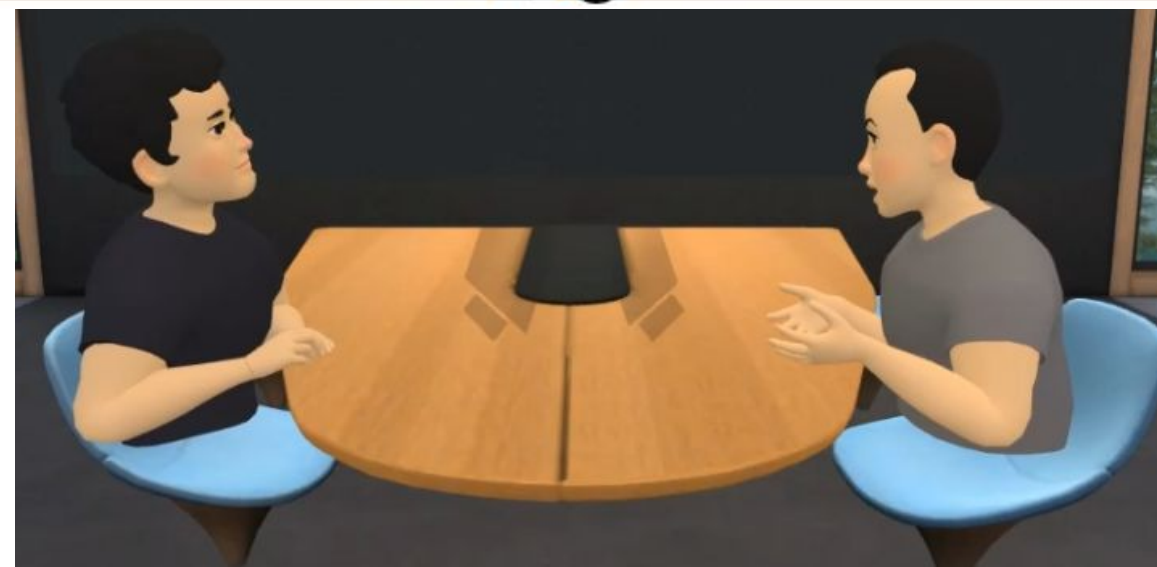
- To what extent does appearance similarity between social VR users' self-representations and other users' avatars affect feelings of (dis)comfort?



Research Question (RQ) 2:

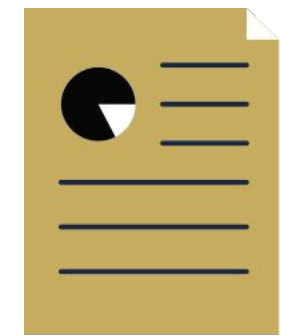
- To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's persuasiveness?

- We conducted a mixed-methods study with 25 participants to investigate the role appearance similarity plays in discussion tasks using a VR-based communication platform.



Contributions:

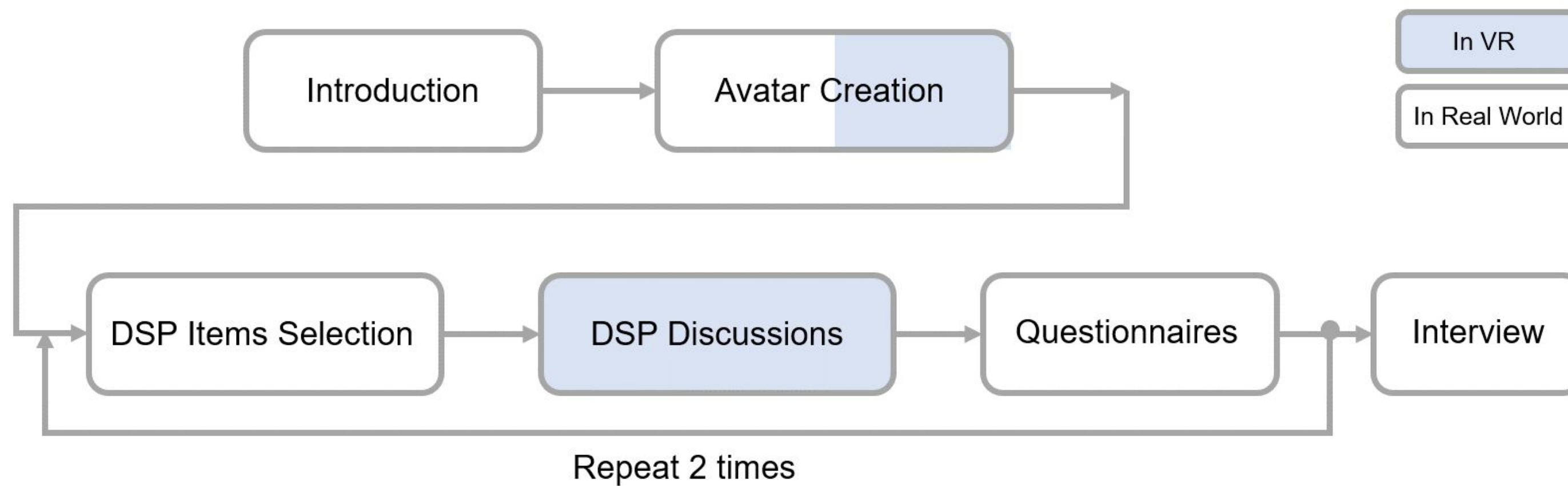
1. The empirical exploration in social VR highlights the nuances of avatar appearance-similarity
2. Moderate similarity made users be persuaded to change their initial choices and feeling that avatar was easier to communicate, more intimate, and less eerie.
3. The interaction of avatar similarity level of users' personality traits would influence persuasiveness.



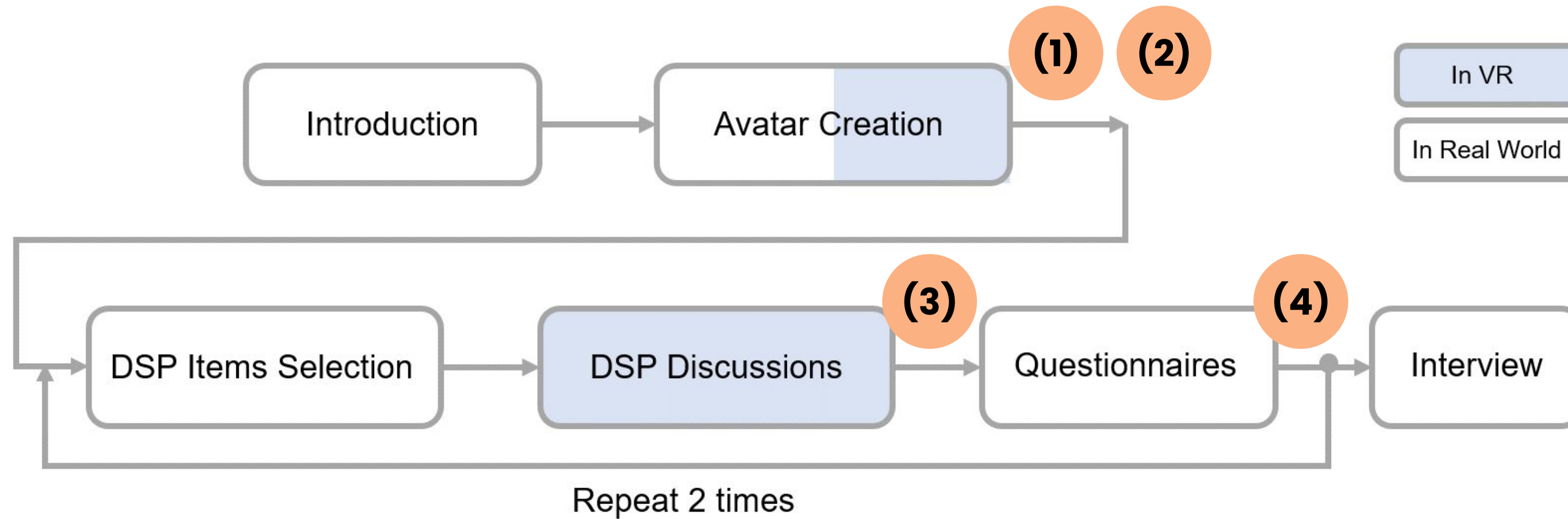
- To identify whether and how the similarity of appearance between self-representations and other users' avatars influenced social VR users',
 - > We designed a within-subjects mixed-methods study in which each participant (n=25) communicated with three researcher-controlled avatars.
 - > (1) **Identicality**, (2) **Moderate Similarity**, and (3) **Dissimilarity**



- The overview of study



- The overview of study



(1) Participants create their self-representation

(2) Study Design

(3) The discussion task in the study

(4) The data collection

(1) Participants create their self-representation

-> To enable participants to create the self-representations based on their physical appearance, we classified the components of various facial features into three categories.

Facial Features	Category			External / Internal Features
	1	2	3	
Face Shape	Oval	Diamond	Round	External
Hair (Male)	Short	Medium	Long	External
Hair (Female)	Short	Long	Other	External
Eye	Downturned	Upturned	Round	Internal
Eyebrow	Arched	Straight	Round	Internal
Nose	Concave	Convex	Straight	Internal
Mouth	Uni	Natural	Pointy Natural	Internal

Table 1. Categories of Facial Features.

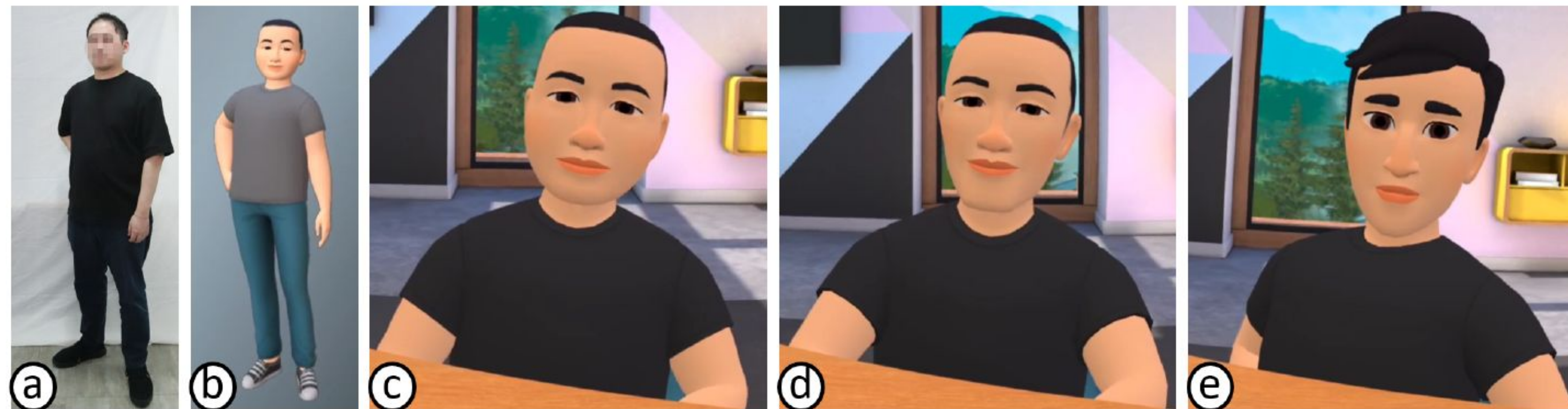
(1) Participants create their self-representation

-> They would use the tablet and mirror to create the self-representations, and then double-check in the VR environment.



(2) Study Design

-> The experiment had a 1 x 3 within-subjects design, specifically **Identicality, Moderate similarity, and Dissimilarity.**



(2) Study Design

-> The manipulation of external and/or internal facial features in the three conditions built upon previous studies of face recognition and discrimination.

-> The external features will follow the order in Table 2 to ensure the magnitude between each condition was similar.

External Facial Features	Conditions	Identically (participants initial selection)	Moderate Similarity	Dissimilarity
	Face Shape		Oval	Diamond
		Round	Oval	Diamond
		Diamond	Oval	Round
Hair (Male)		Short	Short	Medium
		Medium	Medium	Long
		Long	Long	Medium
Hair (Female)		Short	Short	Long
		Long	Long	Short
		Other	Other	Long

Table 2. Manipulation order among conditions (External Facial Features)

(2) Study Design

-> The manipulation of external and/or internal facial features in the three conditions built upon previous studies of face recognition and discrimination.

-> The internal features will follow the order in Table 3 to ensure the magnitude between each condition was similar.

Internal Facial Features	Conditions	Identically (participants initial selection)	Moderate Similarity	Dissimilarity
Eye	Round	Round	Round	Upturned
	Upturned	Upturned	Upturned	Round
	Downturned	Downturned	Downturned	Round
Eye Brow	Arched	Arched	Arched	Straight
	Round	Round	Round	Straight
	Straight	Straight	Straight	Round
Nose	Straight	Straight	Straight	Concave
	Concave	Concave	Concave	Straight
	Convex	Convex	Convex	Straight
Mouth	Uni	Uni	Uni	Natural
	Natural	Natural	Natural	Uni
	Pointy Natural	Pointy Natural	Pointy Natural	Uni

Table 3. Manipulation order among conditions (Internal Facial Features)

(3) The discussion task in the study

- > We selected the modified desert-survival problem (DSP) to evaluate the influence of appearance similarity.
- > It was used to measure persuasiveness in conversation.



Experimenter view of a conversation in the dissimilarity condition



(3) The discussion task in the study

-> Participants could see their self-representations in a mirror.

-> During discussions, they could compare the appearance-similarity between self-representations and interlocutors' avatars through the mirror.



(a) The VR discussion room from the participants' first-person view.



(b) First person view of a conversation in the Moderate Similarity condition



(c) First person view of a conversation in the Dissimilarity condition

(4) The data collection

-> To investigate participants' perceptions and the influence of appearance-similarity, we collected quantitative data and qualitative data.

- **Quantitative Data**

- **Personality Traits**
- **Uncanny Valley**
 - **Perceived humanness, Attractiveness, and Eeriness**
- **Persuasiveness**
 - **Objective measurement of DSP discussions**

- **Qualitative Data**

- **Discussion Content (Word Use in the DSP Tasks)**
 - **What participants said in their DSP discussions**
- **Semi-structured interviews**

RQ1 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars affect feelings of (dis)comfort?

-> People appear to differentially perceive, and communicate differently with, avatars of similar vs. dissimilar appearance to their self-representations.

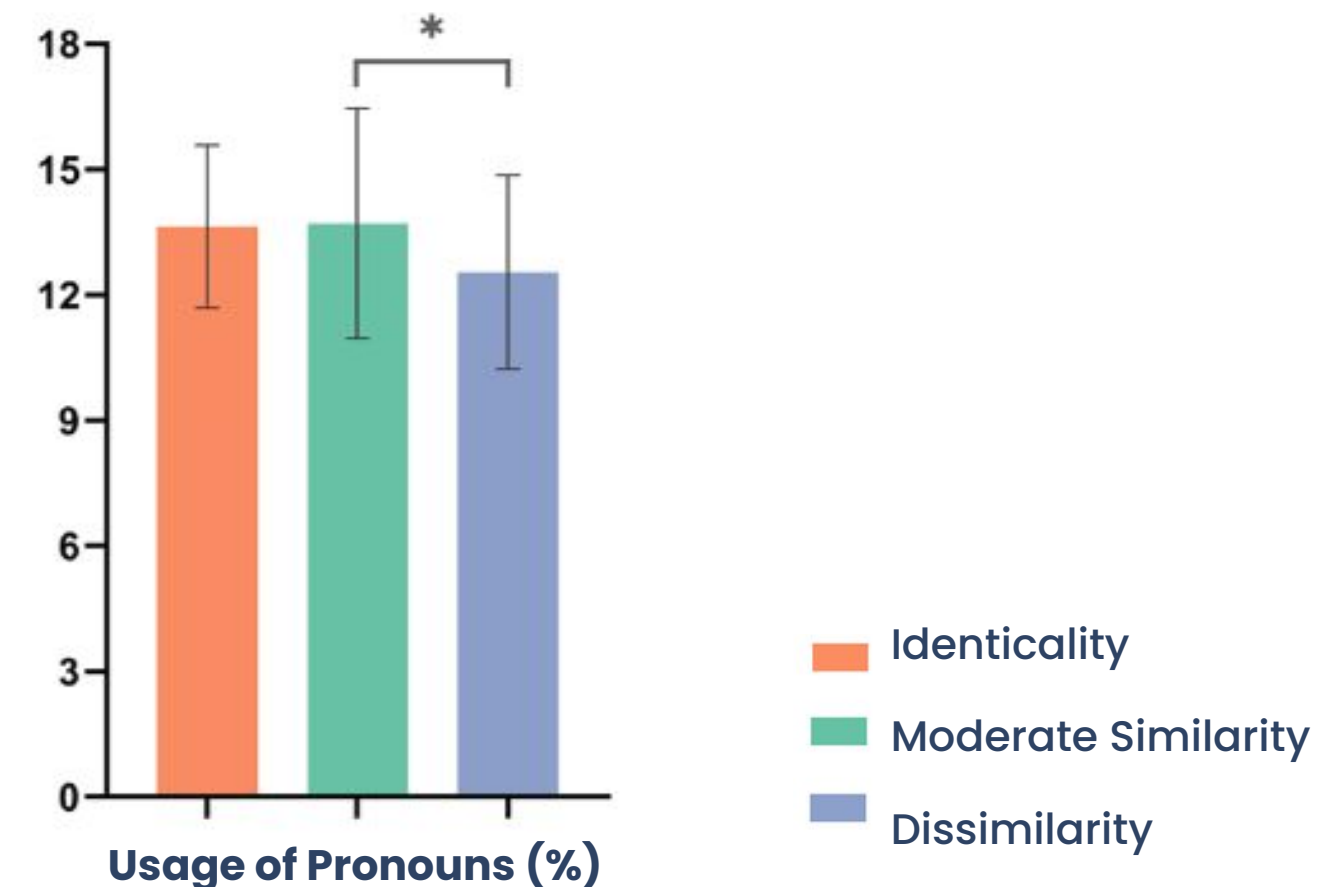
RQ1

-> People appear to differentially perceive, and communicate differently with, avatars of similar vs. dissimilar appearance to their self-representations.

- **Qualitative data – Intimacy with a Similar Other as a Spur to Conversation**

“when seeing an avatar whose appearance is similar to mine, I feel more intimate with him, and thus that it’s easier to communicate; conversely, I feel distance between myself and a dissimilar avatar.”

- **Quantitative data – Word Use in the DSP Tasks**



RQ1 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars affect feelings of (dis)comfort?

- Our key finding is that both our interview data and the word use in the DSP tasks imply that the participants felt closer to, or that it was easier to communicate with, avatars of similar rather than dissimilar appearance.

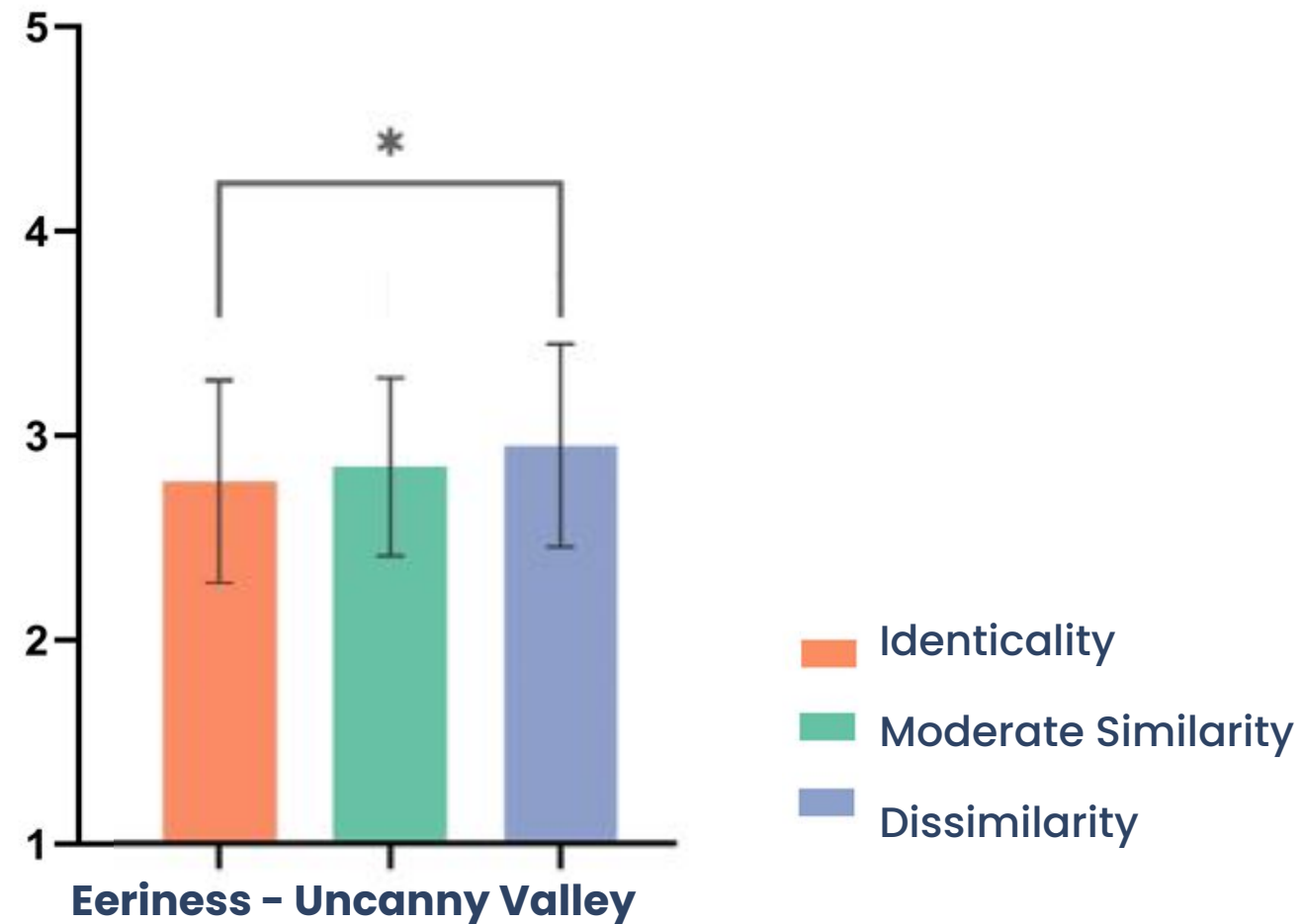
RQ1 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars affect feelings of (dis)comfort?

-> The mixed findings about which condition was the eeriest, with seeming contradictions between the quantitative and qualitative data.

RQ1

-> The mixed findings about which condition was the eeriest, with seeming contradictions between the quantitative and qualitative data.

- Quantitative data – Feelings of Comfort in Appearance Similarity



- Qualitative data – Sense of Eeriness

■ Dissimilarity

“I found it eerie when sometimes he [the avatar] clapped in a strange pose.”

■ Identicality

■ Moderate Similarity

“I felt eerie when communicating face to face with an avatar whose appearance was exactly the same.”

RQ1 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars affect feelings of (dis)comfort?

- We suspect that the overall eeriness ratings were lower in the identicality and moderate similarity conditions than in the dissimilarity condition because it was compensated for by intimacy or comfort, which in the latter condition was rarely felt.
- Our results point to appearance-similarity as another possible contributor to the uncanny valley.
-> **However, further study of this phenomenon will be needed before any firm conclusions can be drawn about it.**

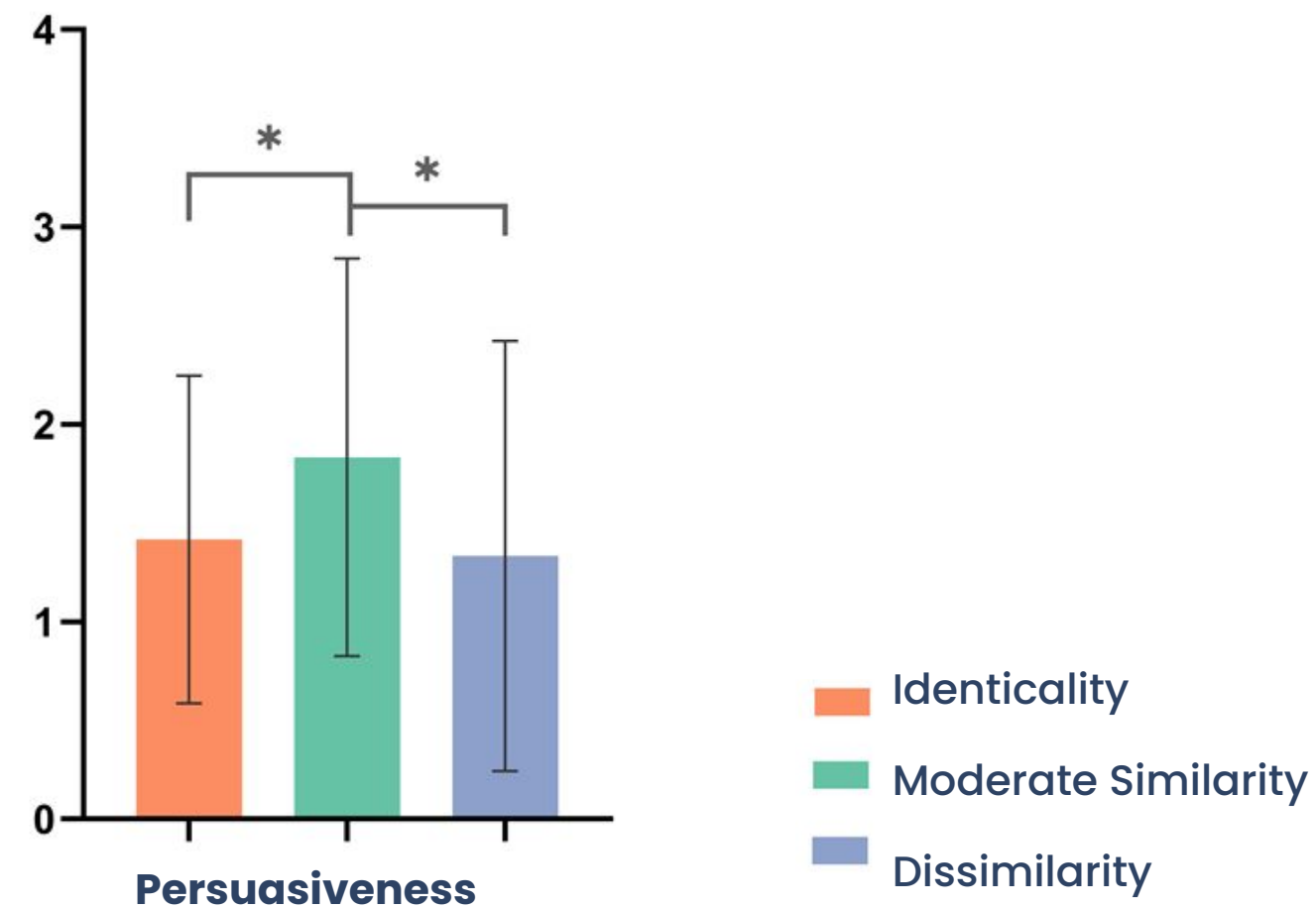
RQ1 – Summary

1. Extend the understanding of how people perceive and interact with an avatar that looks familiar or like themselves by providing insights on the influence of appearance similarity in a VR-based environment.
2. Further suggests the potential for the uncanny valley effect should be carefully considered when applying the influence of appearance similarity in social VR.

RQ2 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's

persuasiveness? Appearance – especially moderate similarity – will have measurably greater persuasiveness than a dissimilar one.

- **Quantitative data – Persuasiveness**



RQ2 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's persuasiveness?

- While previous work mainly studied the effect in the screen-based environment and utilized highly realistic face via scanning techniques to represent the users, our study results extend the persuasion-related findings of the similarity effect to the context of social VR in which users can create and embody their self-representations.

RQ2 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's

persuasiveness? We did not observe our participants being more persuaded in the identity condition than in the moderate similarity condition.

- Identity
- Moderate Similarity
- Dissimilarity

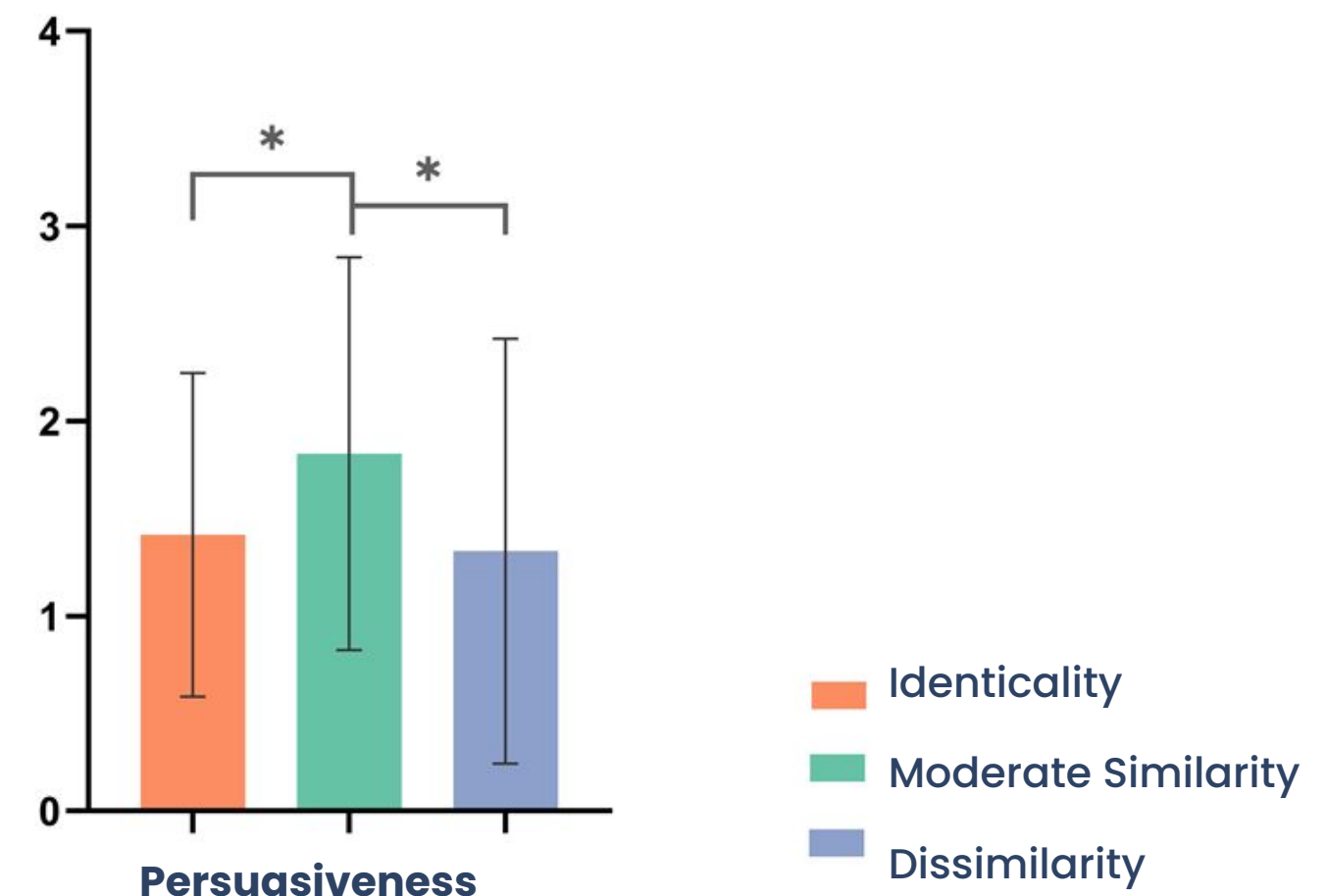
RQ2

-> Furthermore, we did not observe our participants being more persuaded in the identity condition than in the moderate similarity condition.

- **Qualitative data – Possible Confusion Caused by Identity**

“It’s weird the avatar is the same-looking but is not controlled by me.”

- **Quantitative data – Persuasiveness**



RQ2 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's persuasiveness?

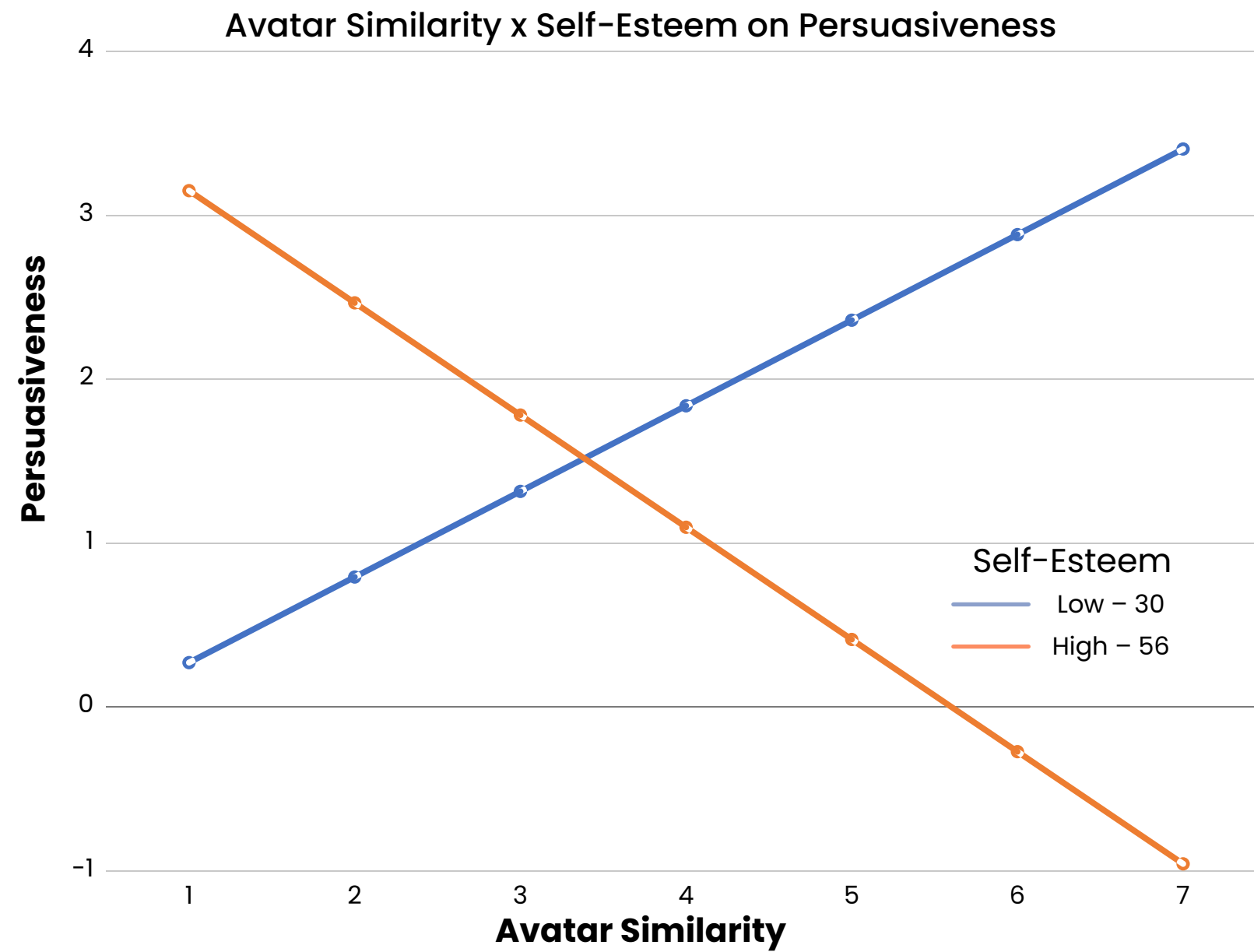
- Although participants had positive feelings about, and gave low eeriness ratings to, interaction with the identical-appearance avatar, it still blurred the boundary between self and other.
- This possible confusion about agency could have caused negative perceptions, but which nevertheless negatively influenced the researcher-controlled avatars' persuasiveness.

RQ2 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's

persuasiveness?
The regression model revealed two interactive effects of appearance similarity and personality traits jointly influenced persuasiveness.

RQ2

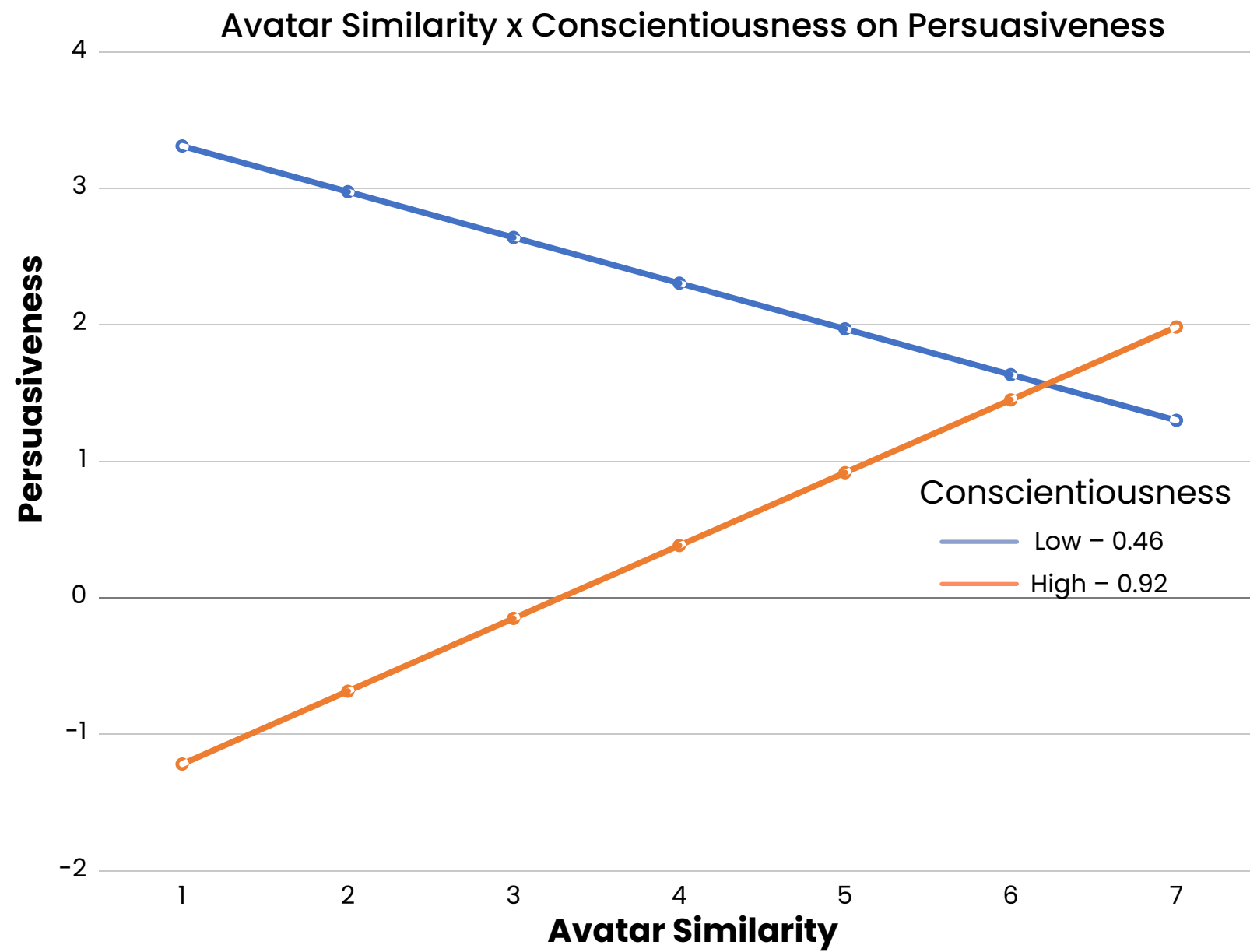
-> The regression model revealed two interactive effects of appearance similarity and personality traits jointly influenced persuasiveness.



- It suggests that people with relatively lower self-esteem are more easily persuaded, while those with relatively higher self-esteem are less easily persuaded.

RQ2

-> The regression model revealed two interactive effects of appearance similarity and personality traits jointly influenced persuasiveness.



- It suggests that people with relatively higher conscientiousness were more easily persuaded, and those with relatively lower conscientiousness were harder to persuade.

RQ2 – To what extent does appearance similarity between social VR users' self-representations and other users' avatars influence the latter's persuasiveness?

- Extend the findings that how interaction effect of similarity effect and personality traits impact persuasiveness in a VR-based communication platform.
- This conflicts with previous findings that people with relatively higher conscientiousness are less susceptible to a similarity-based persuasion.
 - > **One possible explanation for this discrepancy may be the difference of subjective and objective measurement.**
 - > **Another explanation may be cultural differences.**

RQ2 – Summary

1. Emphasize the persuasive impact of appearance similarity in social VR, confirming and expanding upon previous screen-based research.
2. While social VR can support the similarity effect, it could also lead to a blurring of self-other boundaries with identical-appearance avatars, which negatively affects persuasiveness.
3. Offer valuable insights into how the interaction effects between different levels of some personality traits and appearance-similarity impact on persuasiveness.

1. Positive Impact on Social VR Applications

-> These affordances of our findings, coupled with previous research, signal social VR's potential for benefiting self-disclosure in psychotherapy, collaborative learning, or advertising campaigns when interacting with avatars of similar appearance.

2. Negative Impact on Social VR Applications

-> However, designer should consider the misuse the findings could lead to modify user's behavior or emotion for detrimental purpose. Moreover, if combined our findings with deep fake technology, it might unconsciously change the preference, beliefs, or attitudes toward that representation.

1. Possible Constraints or Particular Forms of Biasing Behind Similarity Effect

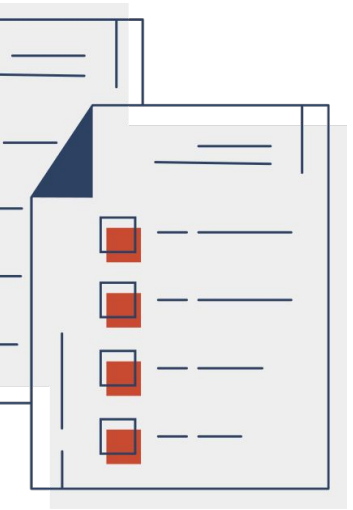
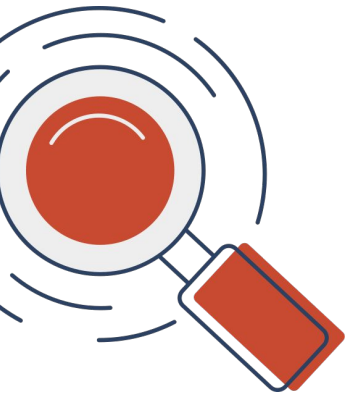
-> However, we suggest future research measuring and controlling the similarity of other attributes, such as movement, beliefs or attitudes, may have affected the results.

2. Group and Dyadic Communication

-> Future work could be focused in this direction by examining the similarity effect in group conversations.

3. Appearance and Construction of Avatar

-> Future work might consider 1) users' perceptions of multiple avatar styles, and 2) construction of representation.



- The empirical exploration of how people's self-representations interactions with other users' avatars in social VR are affected by appearance-similarities of various levels.
- It provides novel insights into how people in social VR communicate with an avatar of similar appearance, both objectively (e.g., persuasiveness) and subjectively (e.g., intimacy and fluency).
- There are interactive effects of avatar similarity and each of two personality traits, self-esteem, and conscientiousness, on others'

**Thank you
for listening**





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