Give me some room please!
Personal space bubbles for safety and performance

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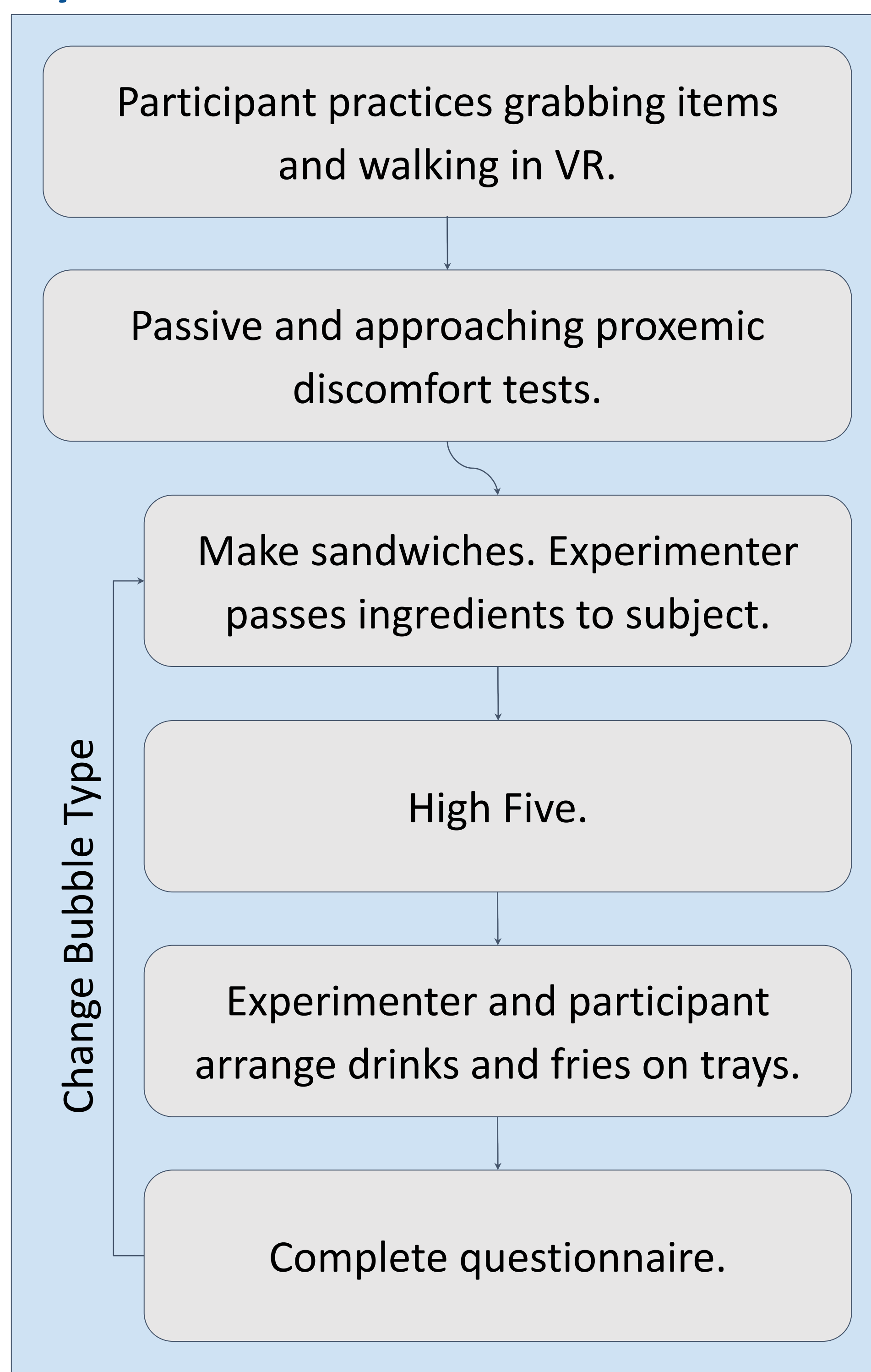
Overview

Personal space bubbles in VR intend to protect users from physical harassment but may complicate collaborative tasks. We envision a design space for personal space bubbles and evaluate their impact on task performance. Thoughtful bubble designs have the potential to balance safety and performance.

Method

Bubble designs were implemented and tested in Unity. Our study focused on female-female interactions. 21 female participants completed collaborative tasks with a female experimenter in the VR environment. Participants used an Oculus Rift S headset while the experimenter steered a keyboard-controlled avatar.

Study Flow

Participant practices grabbing items and walking in VR.

Passive and approaching proxemic discomfort tests.

Change Bubble Type

Make sandwiches. Experimenter passes ingredients to subject.

High Five.

Experimenter and participant arrange drinks and fries on trays.

Complete questionnaire.

Related Work

Users report harassment in virtual reality as a growing problem [1]. Personal space in virtual reality has been explored [2], and personal space bubbles seem to be an elegant solution to physical harassment. However, the design of these bubbles has yet to be explored.

References

[1] G. Freeman, S. Zamanifard, D. Maloney, and D. Acena. Disturbing the peace: Experiencing and mitigating emerging harassment in social virtual reality. Proc. ACM Hum.-Comput. Interact., 6(CSCW1), apr 2022. doi: 10.1145/3512932
[2] J. N. Bailenson, J. Blascovich, A. C. Beall, and J. M. Loomis. Interpersonal distance in immersive virtual environments. Personality and Social Psychology Bulletin, 29(7):819–833, 2003. doi: 10.1177/0146167203029007002

Bubble Design

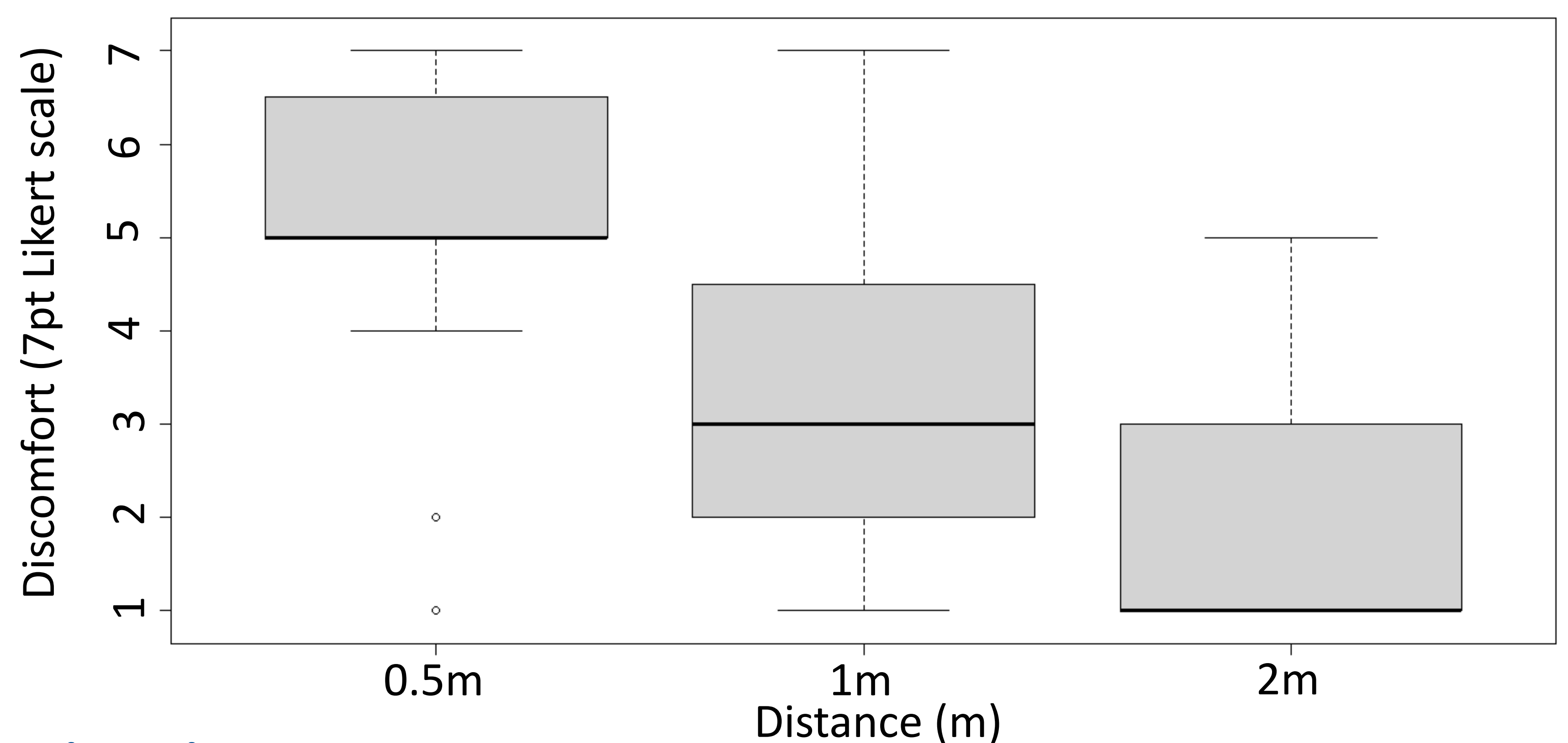Body Shape   Polygon   Cylinder
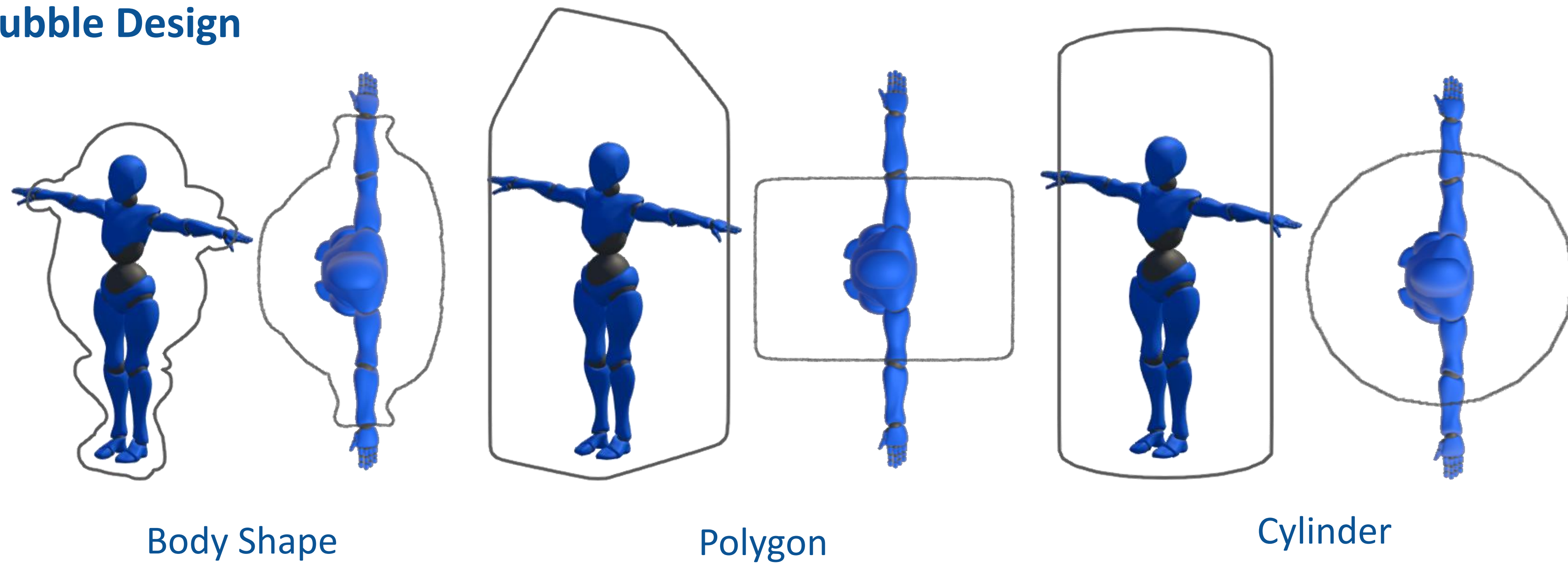
Task Design

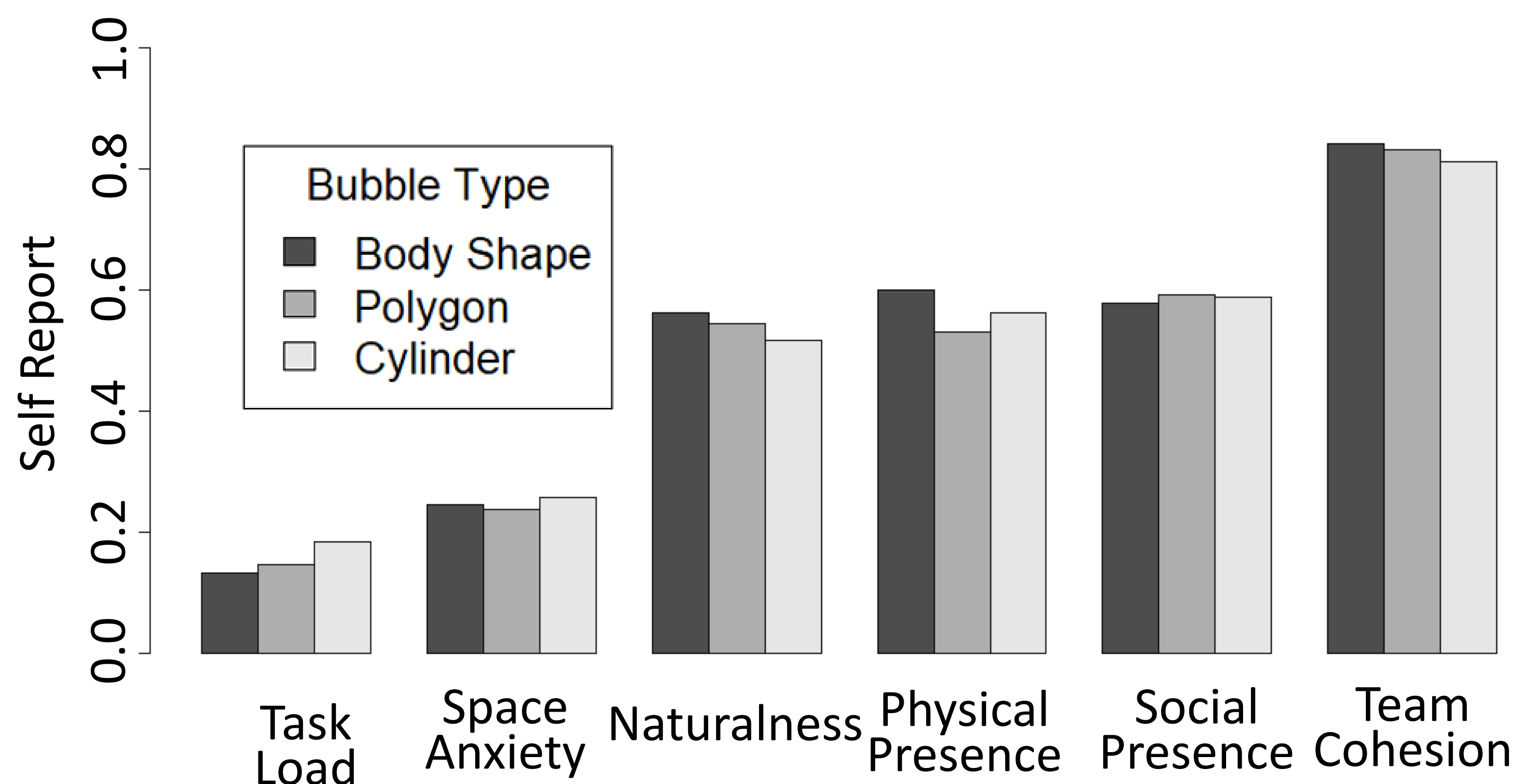Sandwich Task   Arranging Task

Results

Proxemic Discomfort

Questionnaire

Conclusion

Promising trends may suggest:
- Existing bubble designs such as the cylinder result in participants perceiving greater difficulty in completing their tasks and reduced naturalness in interactions.
- More flexible bubble designs like the body shape may lead to increased team cohesion and presence.

Future work could investigate bubble shape and behavior (passive versus active). Varying task contexts, such as social VR or workplace VR may also be explored.