

Appendix of "Do You Feel Like Passing Through Walls?: Effect of Self-Avatar Appearance on Facilitating Realistic Behavior in Virtual Environments"

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Table 1: For body ownership and response to threat, we used Gonzalez–Franco and Peck’s avatar embodiment questionnaire [1]. We omitted items that were not applicable to our study, such as the question regarding tactile sensation. We used the word "body" for full-body groups but replaced them with "hand" for hand-only groups where it was appropriate. For presence, we used the Slater–Usuh–Steed questionnaire [2]. Items in italics represent control questions.

Subscale		Question
Ownership	O1	I felt as if the virtual body* was my body†.
	O2	<i>It felt as if the virtual body* I saw was someone else.</i>
	O3	<i>It seemed as if I might have more than one body†.</i>
	O4	I felt as if the virtual body* I saw when looking in the mirror was my own body†.
	O5	<i>I felt as if the virtual body* I saw when looking at myself in the mirror was another person‡.</i>
Response	R1	I felt that my own body could be affected by the electricity.
	R2	When the current flowed, I felt the instinct to the electricity.
	R3	I had the feeling that I might be harmed by the electric shock.
Presence	P1	Please rate your sense of being in the virtual environment, on a scale of 1 to 7, where 7 represents your normal experience of being in a place.
	P2	To what extent were there times during the experience when the virtual environment was the reality for you?
	P3	When you think back to the experience, do you think of the virtual environment more as images that you saw or more as somewhere that you visited?
	P4	During the time of the experience, which was the strongest on the whole, your sense of being in the virtual environment or of being elsewhere?
	P5	Consider your memory of being in the virtual environment. How similar in terms of the structure of the memory is this to the structure of the memory of other places you have been today? By 'structure of the memory' consider things like the extent to which you have a visual memory of the virtual environment, whether that memory is in colour, the extent to which the memory seems vivid or realistic, its size, location in your imagination, the extent to which it is panoramic in your imagination, and other such structural elements.
	P6	During the time of your experience, did you often think to yourself that you were actually in the virtual environment?

*: "body" was replaced with "hand" in Human Hand condition and "controller" in Controller condition.

†: "body" was replaced with "hand" in Human Hand condition and Controller condition.

‡: "another person" was replaced with "another person's" in Human Hand condition and Controller condition.

Table 2: Distribution of participants' behavior in each room according to avatar anthropomorphism and visibility. The numbers and the percentage out of 23 participants for each condition are shown.

Room 1

	Controller	Human Hand	Robot	Full-body Human
Walked around wall	17 (73.9%)	15 (65.2%)	18 (78.3%)	20 (87.0%)
Passed hand through aperture	3 (13.0%)	2 (8.7%)	2 (8.7%)	2 (8.7%)
Penetrated hand into wall	2 (8.7%)	4 (17.4%)	2 (8.7%)	1 (4.3%)
Walked through wall	1 (4.3%)	2 (8.7%)	1 (4.3%)	0 (0%)

Room 2

	Controller	Human Hand	Robot	Full-body Human
Walked around wall	11 (47.8%)	7 (30.4%)	9 (39.1%)	16 (69.6%)
Penetrated hand into wall	5 (21.7%)	3 (13.0%)	6 (26.1%)	2 (8.7%)
Walked through wall	7 (30.4%)	13 (56.5%)	8 (34.8%)	5 (21.7%)

Room 3

	Controller	Human Hand	Robot	Full-body Human
Penetrated hand into wall	2 (8.7%)	1 (4.3%)	2 (8.7%)	6 (26.1%)
Walked through wall	21 (91.3%)	22 (95.7%)	21 (91.3%)	17 (73.9%)

Room 4

	Controller	Human Hand	Robot	Full-body Human
Walked through wall	23 (100%)	23 (100%)	23 (100%)	23 (100%)

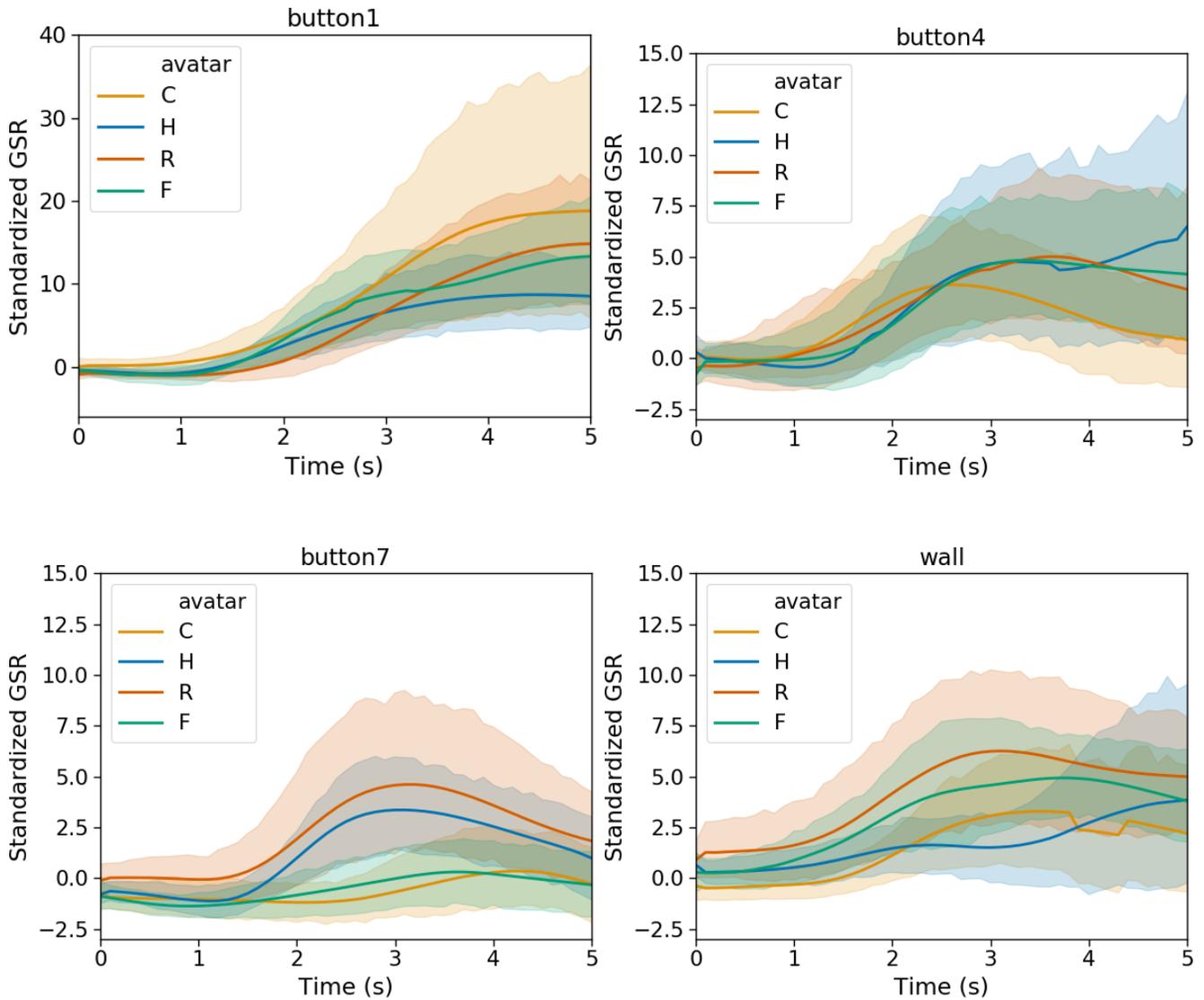


Figure 1: Line plots of time series data of mean standardized GSRs for each threat in room 4 according to avatar types. C, H, R, and F represent Controller, Human Hand, Robot, and Full-body Human, respectively. Time 0 indicates the moment the participants were presented with the threat. The raw data was registered at a sample rate of 125 Hz in real time. The software applied a median filter with a time window of 500 ms, followed by a mean filter with a time window of 1000 ms. Thereafter, the GSRs were averaged among each time window of 0.1s for each participant to plot the graph. Translucent bands indicate 95% CIs, estimated by 1,000 bootstraps.

References

- [1] Mar Gonzalez-Franco and Tabitha C Peck. 2018. Avatar Embodiment. Towards a Standardized Questionnaire. *Frontiers in Robotics and AI* 5 (2018), 74. DOI:<http://dx.doi.org/10.3389/frobt.2018.00074>
- [2] Martin Usoh, Ernest Catena, Sima Arman, and Mel Slater. 2000. Using presence questionnaires in reality. *Presence: Teleoperators and Virtual Environments* 9, 5 (2000), 497–503. DOI: <http://dx.doi.org/10.1162/105474600566989>