Influence of tactile presence and body ownership on virtual stroking pleasantness

東京科学大学 長谷川研究室
Hasegawa lab.
Rikuto Sagehashi Shoichi Hasegawa
Institute of Science Tokyo

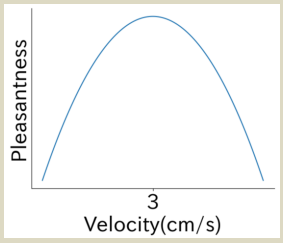
1. Introduction

Phantom sense

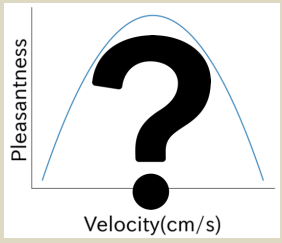
- In social VR, users report feeling "phantom sense" without any physical input.
- What makes this virtual touch feel pleasant is still an open question.

Pleasant feeling of being stroked

- Human hairy skin contains receptors called C-tactile (CT) afferents.
- Activation of these CT afferents produces a pleasant sensation, and their firing frequency varies with stroking speed.

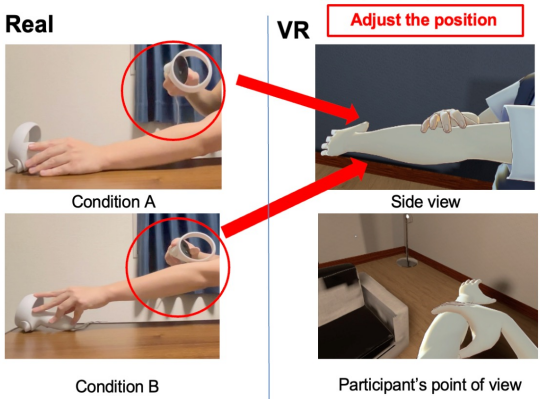


Real



VR

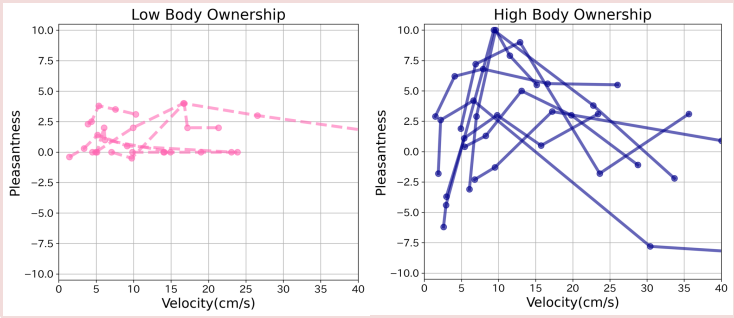
2. Methods



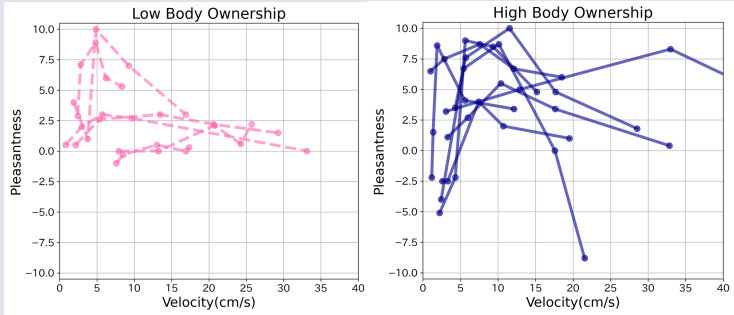
Participants	14 individuals (age 21-46)
Environment	A custom world on the VRChat platform.
Grouping	Grouping by Body Ownership (from questionnaire score): • High Group (n=8) • Low Group (n=6)
Task	Stroke the avatar's left forearm from elbow to wrist.
Conditions	**Condition A**: Stroked the avatar's arm with no physical contact (5 trials) **Condition B**: Simultaneously stroked their real forearm with a VR controller (5 trials)
Measurements	**Pleasantness Rating**: Visual Analog Scale (-10 to +10)

3. Result

Visual Only (Condition A)



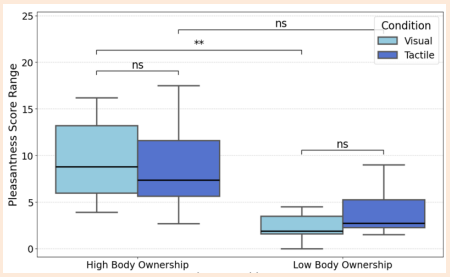
Visual + Tactile (Condition B)



Key Point:

- High Body Ownership group felt a significantly wider range of pleasantness from visual information alone compared to the Low Body Ownership group ($p = 0.0027$).
- Low Body Ownership group reported low pleasantness even in the Visual + Tactile condition where physical touch was present.

Pleasantness Score Range = max score - min score



**: $p < 0.01$, ns: not significant (Wilcoxon signed-rank for within-group, Mann-Whitney U for between-group comparisons)

4. Future work

A: Replication & Refinement

- Validation with a Larger Sample
- Avatar self-collision : Restrict avatar movement to prevent hands from penetrating arms upon contact.

B: New Experiments

- Diversification of Stimulus Patterns (e.g. Other-Touch Stimulation)
- fMRI Analysis of Brain Activity