Influence of Vestibular Signals on Bodily Self- Consciousness: Different Sensory Weighting Strategies Based on Visual Dependency

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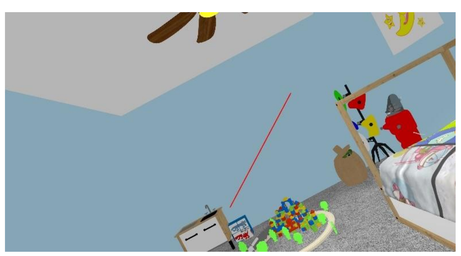
Introduction

Bodily self-consciousness (BSC) referred to the basic sense of the self resulting from integration of multisensory bodily inputs which is investigated by full-body illusion (FBI) (Blanke, 2012). Similarly, verticality perception requires the process of sensory weighting and integration of vestibular, somatosensory, and visual signals (Lopez et al., 2011). To study verticality perception, people are asked to orient a line embedded in a tilted frame with respect to gravity – Rod and Frame Task (RFT) (Witkin & Asch, 1948). People with greater deviations are classified as visual field-dependent and those with smaller deviations are classified as visual field-independent.

We hypothesized that FD participants will make fewer errors in their verticality judgments after synchronous visuo-tactile stimulation in FBI which might be considered as illusory change in perceived self-orientation and thus they will experience a stronger FBI.

Measurements

- RFT

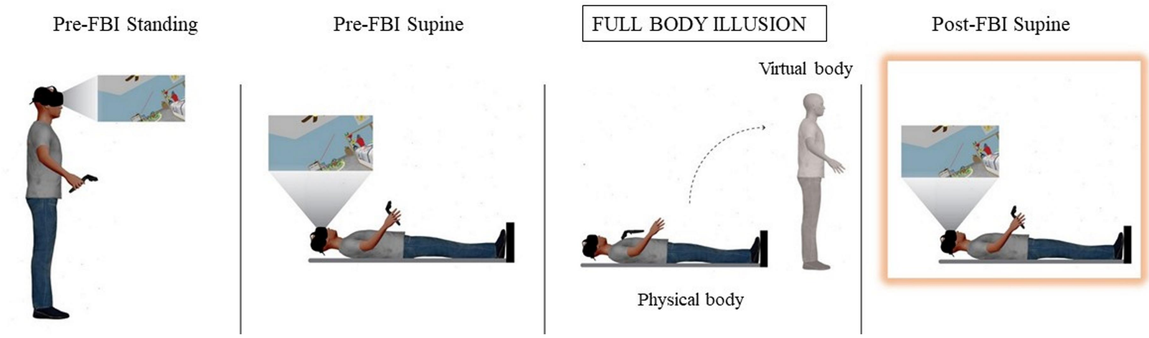


- Subjective Report for the Full-Body Illusion

Q1	I felt as if the virtual body was my own body.
Q2	I felt as if my body was located at where the virtual body was.
Q3	I felt as if the position of my 1PP had changed.
Q4	I felt as if I was standing.

Methodology

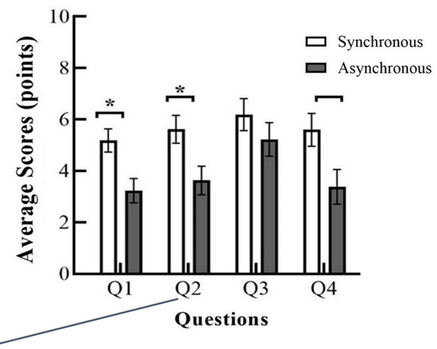
- A total of 52 volunteers (21 male, 31 female) of İzmir University of Economics with a mean age of 24 (SD= 4.33) participated.
- A mixed-subject experiment was designed by including **visuo-tactile stimulus** (Synchronous vs. Asynchronous), **visual field dependency** (FD vs. FI) as between-subject factors and **RFT condition** (pre-FBI supine vs. post-FBI supine) as a within subject factor.

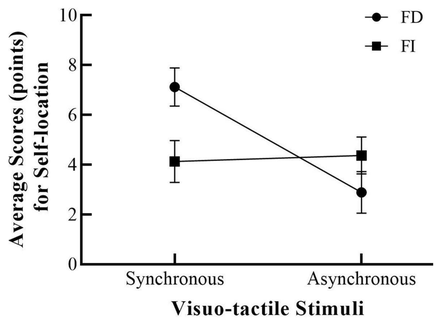


Results

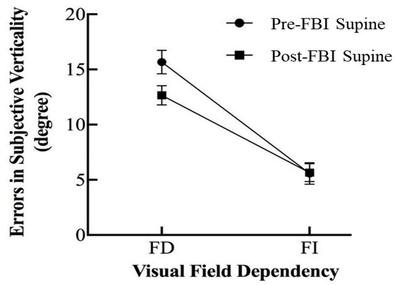
➢ The hierarchical cluster analysis revealed a group of 24 visual FD participants (mean value of subjective visual vertical = 14.48, *SE* = 1.08) and a group of 28 visual FI participants (mean value of subjective visual vertical = 4.55, *SE* = .36).

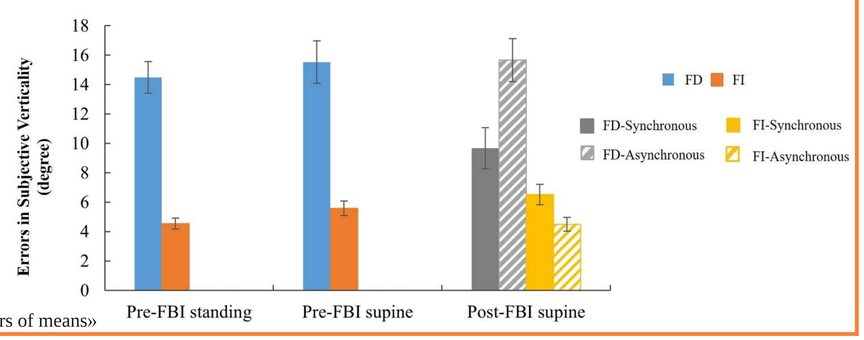
- There was a significant main effect of visuo-tactile stimulus for ownership (Q1), $F(1,48) = 9.10$, $p = .004$, partial $\eta 2 = .159$, self-location (Q2), $F(1,48) = 6.64$, $p = .013$, partial $\eta 2 = .112$, orientation perception (Q4), $F(1,48) = 5.79$, $p = .020$, $\eta 2 = .108$.





- There was a significant interaction effect of visuo-tactile stimuli and visual field dependency for the self-location (Q2), $F(1,48) = 8.36$, $p = .006$, partial $\eta 2 = .148$
- There was a significant interaction effect for the visual field dependency X RFT condition, $F(1,48) = 5.69$, $p = .021$, partial $\eta 2 = .106$.





«Error bars represent standard errors of means»

Conclusion and Discussion

✓ Our study introduced RFT as a new implicit measure of FBI. The results of our study suggest that FD participants are more prone to synchronous/asynchronous stimulation manipulations, and that they might utilize different sensory weighting strategies on body ownership, self-location, and orientation perception.

! Altough the study include visuo-vestibular conflict, one should be cautious in interpreting the contribution of the vestibular system because of the the possibility of the involvement of somatosensory and proprioceptive signals.

References

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