Abstract

Can multisensory stimulation lead participants to experience ownership over a hand of different skin colour? Results from two studies show that, following synchronous visuotactile (VT) stimulation, participants can experience body-ownership over hands that seem to belong to a different racial group. These findings suggest that multisensory experiences can override strict ingroup/outgroup distinctions based on skin colour and point to a key role for sensory processing in social cognition.

I. Introduction

Rubber Hand Illusion
- Can produce sensation of body ownership for non-self objects
- Sensitive to properties of corporeality & posture
- Skin Colour
- Salient difference between racial groups.
- Key role in social cognition processes (e.g., stereotyping)
- Examining how Skin colour affects the RHI allows investigation of whether social distinctions influence body-ownership

Social Distinctions and the Body
- Avenanti et al. (2010) Different MEP response to pain for ingroup vs outgroup hands.
- Holmes et al. (2006) & Longo et al. (2009) Skin colour of participant seemed to have no effect on RHI.

Our Study
- However neither Holmes et al. (2006) nor Longo et al. (2009) directly manipulated the skin colour of either the rubber hand used or the population tested.
- In two studies we directly manipulated skin colour of RH to examine the extent to which white participants experienced a sense of body-ownership for a RH from the same or different racial group.

II. Experiment 1

Participants n=20 self-identified as white.

Measures
- RHI assessed using introspective (Likert scale questionnaire), behavioural (proprioceptive drift) and physiological (SCR to pain and touch stimuli) measures.
- Measured participants’ pre and post racial bias using the Implicit Association Task (IAT; Greenwald, McGhee, & Schwartz, 1998) post IAT at end of all blocks of VT stimulation

Design
- Repeated measures – 2x2x2 – type of VT stimulation (synch/asynch) x skin colour of hand (white/black) x type of stimulus (pain/touch)

Materials

Measures
- RHI assessed using introspective (Likert scale questionnaire) and physiological (SCR to pain stimuli) measures.

Significant effects of type of VT stimulation for all 4 questions (Q1: F(1,19) = 25.97, p < .001; Q2: F(1,19) = 31.32, p < .001; Q3: F(1,19) = 31.32, p < .001; Q4: F(1,19) = 4.89, p < .05) and for skin colour for questions 1 and 2, the questions most related to feelings of ownership (Q1: F(1,19) = 7.89, p < .01, Q2: F(1,19) = 16.62, p < .01).

Proprioceptive Drift

Significant effect of type of VT stimulation( (F(1,16) = 11.96, p = .01) and for type of stimuli (F(1,16) = 28.3, p < .001) but not for skin colour

Racial Bias

No relationship was found between pre test racial bias and feeling ownership of the outgroup hand. However a linear regression found that strength ownership over both the white and black RH was a significant negative predictor of post test racial bias (R2 = .32, (F(2,17) = 3.96, p < .05, indicating that those participants who felt greater ownership over the RH showed a lower post-RH racial bias than those who felt less ownership over the RH.

III. Experiment 2

Changes to Design
- Video stimuli for greater temporal accuracy.
- Synchronous 3rd person perspective (3PP) hand included to control for synchrony.
- Pre-VT stimulation SCRs to pain measured to observe change in SCRs due to VT stimulation

Participants
- N=48, self identified as white.

Measures
- RHI assessed using introspective (Likert scale questionnaire) and physiological (SCR to pain stimuli) measures.

Significant effect of type of VT stimulation( (F(1,16) = 11.96, p = .01) and for type of stimuli (F(1,16) = 28.3, p < .001) but not for skin colour

Introspective Measures

ANOVA replicated the findings of Experiment 1. Post hoc tests showed significant differences between the synch 1PP condition and both the asynch 1PP condition and the synch 3PP condition.

SCRs
- a) A significant interaction was found between timing and type of VT stimulation (F(2,82) = 4.46, p < .05). Post hoc tests showed this was driven by increases in post vs pre SCR in the synch 1PP conditions but not in the asynch 1PP or synch 3PP conditions.
- b) Pts were then separated out into those who did (n=21) and did not experience ownership of the black hand (n=21). An interaction between skin colour, timing, and experience of ownership was found (F(1,40) = 8.18, p < .01). With those who experienced ownership of the black hand showing significantly greater increase in SCRs in the black synch 1PP condition

IV. Discussion

Multisensory stimulation can induce body-ownership over a hand with the skin colour of a different racial group than that of the participant.

Experiment 1 found that synchronous, but not asynchronous, VT stimulation led to a feeling of body-ownership for both the white and black rubber hands as measured introspectively, behaviourally and physiologically.

Experiment 2 replicated the findings for introspective and physiological measures and showed, by including the synch 3PP condition that the observed increase in SCR was caused by the experience of body-ownership rather than merely synchronous stroking.

The finding in Experiment 1 that greater feelings of ownership of the black hand predicted lower post-test racial bias indicates that the experience of body-ownership as induced by synchronous VT stimulation can exert a bottom-up effect on participants’ perceptions of an outgroup

V. Conclusions

To the extent that race is a strong modulator of social cognition and its underlying neural processes, understanding if and how multisensory processing can alter self-representations across the boundaries of racial groups might be important for probing the sensorimotor basis of social cognition (Farmer & Tsakiris, 2012). Our study takes a first step towards that direction by showing that changes in body-awareness as a result of multisensory stimulation can go beyond one’s own skin colour.

References

Farmer & Tsakiris, 2012
Serino et al. (2009). I feel what you feel if you are similar to me. PloS One, 4(3), e4930.