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Putting yourself in the skin of a black avatar reduces implicit racial bias

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ABSTRACT

Although it has been shown that immersive virtual reality (IVR) can be used to induce illusions of ownership over a virtual body (VB), information on whether this changes implicit interpersonal attitudes is meager. Here we demonstrate that embodiment of light-skinned participants in a dark-skinned VB significantly reduced implicit racial bias against dark-skinned people, in contrast to embodiment in light-skinned, purple-skinned or with no VB. 60 females participated in this between-groups experiment, with a VB substituting their own, with full-body visuomotor synchrony, reflected also in a virtual mirror. A racial Implicit Association Test (IAT) was administered at least three days prior to the experiment, and immediately after the IVR exposure. The change from pre- to post-experience IAT scores suggests that the dark-skinned embodied condition decreased implicit racial bias more than the other conditions. Thus, embodiment may change negative interpersonal attitudes and thus represent a powerful tool for exploring such fundamental psychological and societal phenomena.

1. Introduction

There is mounting evidence that virtual reality techniques can be used to produce a strong ownership illusion over a virtual body (Ehrsson, 2007; Lenggenhager, Tadi, Metzinger, & Blanke, 2007; Petkova & Ehrsson, 2008) even when there are radical changes in comparison to the true body (Kilteni, Normand, Sanchez Vives, & Slater, 2012; Normand, Giannopoulos, Spanlang, & Slater, 2011; van der Hoort, Guterstam, & Ehrsson, 2011). However, information as to whether transformation in body representation can change interpersonal attitudes is meager. There is some evidence that virtual alteration of age through embodiment in an elderly person can reduce negative stereotypes toward the elderly (Yee & Bailenson, 2007) and also that embodying men in a female child virtual body produces a strong physiological response when the child is placed in a threatening situation (Slater, Spanlang, Sanchez-Vives, & Blanke, 2010).

Our specific concern here is the hostility toward 'out-groups' that seems to be present in all human cultures. Hostility towards racial out-groups in particular seems so ingrained in human nature that it is at play even when interacting with

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virtual characters. It has been shown, for example, that people are less likely to help black avatars (Eastwick & Gardner, 2009) and show more aggression toward them than white avatars (McCall, Blascovich, Young, & Persky, 2009).

Encoding people by race may be a reversible by-product of human evolution used to detect coalitional alliances (Kurzban, Tooby, & Cosmides, 2001). This carries the remarkable implication that racism might be overcome in a number of circumstances. For example, evidence has suggested that the sensation of ownership over a black rubber arm by White subjects may be associated with a change in implicit racial bias (Farmer, Tajadura-Jimenez, & Tsakiris, 2012; Maister, Sebanz, Knoblich, & Tsakiris, 2013). Further, it has been shown that constructing artificially a mixed-race coalitional alliance with still photographs that depicted members of two teams, led to enhanced positive automatic evaluation of Black in-group (same team) members by White in-group members in the absence of any effect on White participant views of Black out-group (other team) members (Kurzban, Tooby, & Cosmides, 2001; Van Bavel & Cunningham, 2009).

Immersive Virtual Reality (IVR) provides a powerful tool for potentially placing people into a different 'coalition', here specifically race, by changing the form of their body representation. This is achieved by a setup that we refer to as 'virtual embodiment'. The participants wear a wide field-of-view head tracked head mounted display. When they look down towards themselves in the VR they would see a programmed virtual body (VB) substituting their own real body. They would also see this body when looking at their (geometrically correct) reflection in a virtual mirror. Additionally, participants wear a body-tracking suit that provides real-time motion capture. So as they move their real body they would see their VB move synchronously. By embodying participants in bodies of different skin color we sought to determine whether (i) we could induce a body-ownership illusion in a differently raced avatar, and (ii) whether the body-ownership illusion could reduce negative implicit responses toward that other race.

2. Materials and methods

2.1. Experimental design

The experiment reported in this paper was a between-groups design including 60 light-skinned female participants of Spanish origin recruited from the same population of female students at the University of Barcelona, none of whom had any connection with our laboratories. They were distributed arbitrarily into 4 conditions of 15 each: (EL) embodied-light or (ED) embodied-dark or (ND) non-embodied-dark or (EA) embodied-alien. Specifically (see Fig. 1),

- Embodied-Light-Skinned (EL) – Here participants were embodied in a light-skinned virtual body (VB). Embodiment was achieved through visual-motor synchrony between the real and VB that could be seen either directly when looking towards the own body, and in a reflection in a virtual mirror.
- Embodied-Dark-Skinned (ED) – This was identical to the previous one except that the VB was dark-skinned.
- Non-Embodied Dark-Skinned (ND) – In this case there was no VB substituting for the participant's own body, and the VB seen in the mirror, although in the geometrically correct place and of size to be a mirror reflection, moved asynchronously with respect to the participant's movements. The body seen in the mirror was dark-skinned.
- Embodied-Alien-Skinned (EA) – Here the virtual body was colored in a bright medium toned purple color that was alien and unnatural for people. We also refer to the skin color as purple.

In each condition participants experienced the same events always from the same visual perspective. We included the last condition in order to check whether any effects we might find were specifically due to the effect of the dark-skinned color (i.e., different human race), or only because it was different (not specifically related to race).

2.2. Procedures

On a first visit to the laboratory participants completed an Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998) on a laptop and the results were recorded (variable *preIAT*). After a period of at least three days they returned for the main experiment. They put on a wide field-of-view, stereo head-tracked head-mounted display through which they would find themselves in the center of a 14 m by 3 m long hallway with a mirror on one wall. For those in the embodied conditions (EL, ED, EA) the scene included a virtual body that substituted their own viewed from first person perspective (1PP). Additionally, they wore a motion capture suit so that when they moved their real body, the VB moved correspondingly in real-time. They saw their VB when looking directly down at themselves toward their real (but unseen) body, and also when looking in the virtual mirror. Those in the non-embodied (ND) condition wore the same equipment, and saw the same environment and events, from the same viewpoint and perspective, including a dark-skinned body in the virtual mirror at the correct place to represent a mirror reflection. For these participants there was no VB that substituted their own body, and the mirror body moved independently of their own movements.

There was a 5-min *embodiment phase* where participants in all experimental conditions were asked to look around the environment, look in the mirror, explore and move their virtual body, and describe their surroundings and body. This was followed by a 6.5 min *approach phase* when 12 virtual human female characters (6 light and 6 dark-skinned) walked past them one by one, either to the right or left.