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The Influence of Threat on Perceived Spatial Distance to Out-group Members

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Abstract: A classic example of discriminatory behavior is keeping spatial distance from an outgroup member. In order to explain this social behavior, the literature offers two alternative theoretical options that we label as the "threat hypothesis" and the "shared experience hypothesis". The former relies on psychological and neuroscientific studies showing that observing out-group members reates a sense of alertness. Consequently, potentially threatening out-group members are represented as spatially close allowing the prevention of costly errors. The latter hypothesis suggests that the observation of out-group members reduces the sharing of somatosensory experiences, and thus, increases the perceived physical distance between oneself and others. In the present paper, we pitted the two hypotheses against each other. In Experiment 1, a aucasian sample expressed multiple implicit "Near/Far" spatial categorization judgments from a Black-African Avatar and a White-Caucasian Avatar located in a 3D environment. Results indicate that the Black-African Avatar was categorized as being closer to oneself, as compared with the White-Caucasian Avatar, providing support for "the threat hypothesis". In Experiment 2, we tested to which degree perceived threat contributes to the categorization bias observed in the first experiment. That is, we manipulated the avatar's perceived threat with brief verbal stories. Results show that perceived threat, but not the mere group membership affects the spatial categorization bias: Irrespective of group membership, threatening avatars were categorized as being closer to oneself as compared with friendly avatars.

The Influence of Threat on Perceived Spatial Distance to Out-group Members

Be it on a square, in a shopping center, or in a street, as soon as we are surrounded by other individuals, we immediately categorize them as similar or dissimilar to ourselves

(Festinger, 1954). In order to categorize others, people select salient physical or social discriminators such as race or other types of group membership (Fazio & Dunton, 1997; Taylor, Fiske, Etcoff, & Ruderman, 1978). Moreover, the most important social interactions, such as mate selection, reciprocal exchange, or negotiations, take place within social or ethnic in-groups (Fiske, 1992; Ackerman et al., 2006). While contact with in-group members is often rewarded by benefits, contact with outgroup members is often perceived as being outweighed by costs (Ackerman et al., 2006). Thereby, keeping spatial distance from an out-group member is a well-suited example to express social discriminatory behavior. In seminal studies, Amodio and Devine (2006), for instance, showed that White-Caucasian participants chose to sit farther away from a Black-African person than from a White-Caucasian person (see also Goff, Steele & Davies, 2008; Levy et al., 2005; Macree, Bodenhausen, Milne & Jetten, 1994). More recently, Dotsch and Wigboldus (2008) conceptually replicated this finding in a virtual reality setting and found that Dutch participants kept more distance from approaching Moroccan than from White-Caucasian avatars. While previous research demonstrates that group membership affects how close individuals are willing to approach others, an open question is how group membership affects *perceived* interpersonal space. Interestingly, previous literature offers two potential alternative hypotheses to this question that we label as the “threat hypothesis” and the “shared-experience hypothesis”.

Threat Hypothesis

Previous research demonstrates that observing out-group members usually accompanies a sense of novelty, insecurity, and apprehension (see Park, 1928). In line with this notion, it has been found that threatening stimuli lead to increased alertness. For example, threatening stimuli are detected and recognized faster than nonthreatening stimuli (e.g., Genschow, Florack, & Wänke, 2014; Lipp & Waters, 2007; Öhman, Flykt, & Esteves, 2001; Tipples, Young, Quinlan, Broks, & Ellis, 2002). When investigating event-related brain potentials Ito and Urland (2003) found that individuals direct the attention more strongly to Black targets than to White targets and that this effect is taking place very early in time (i.e., 100 ms after stimulus onset). In a related study, Phelps et al. (2000) measured amygdala activity—a neurophysiological marker of fear—while participants observed Black-African or White-Caucasian persons. The results indicate that the activation of the amygdala responds more strongly during the observation of Black-African than during the observation of White-Caucasian faces and that this difference in amygdala activity predicts implicit prejudice measured with an Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998).

Taken together, past research indicates that threatening targets lead to a state of alertness. As the objects that increase alertness are usually perceived as close to oneself (Gogel & Tietz, 1977; Wist & Summons, 1976), it is reasonable to assume that threatening targets should be perceived as relatively close to oneself as well. Indeed, threat theory (see Xiao & Van Bavel, 2012) indicates that a stimulus that is aversive towards the collective identity of a group induces a state of alertness and consequently leads to a misperception of the stimulus as being close to oneself. Error Management Theory (EMT; Haselton & Buss, 2000) supports this claim by suggesting a motivational account. That is, EMT indicates that when judgments are made under uncertainty, there is a biased predisposition toward committing errors that are less costly. Accordingly, it may be adaptive to represent a potential threat closer in order to prevent costly errors (cf. Blanchard, & Blanchard, 1989; Lang, Bradley, & Cuthbert, 1997). Therefore, the threat hypothesis postulates that individuals should perceive potentially threatening out-group members as being physically closer to oneself than in-group members.

Shared-experience Hypothesis

The shared-experience hypothesis is based on research investigating the mirror sensorimotor system—a system that allows the sharing of others' experiences through somatosensory resonance (Bernhardt & Singer, 2012; Gallese, Keysers & Rizzolatti, 2004). Within the realm of this research, it has been shown that the observation of out-group members reduces the sharing of somatosensory experiences (Avenanti, Sirugu & Aglioti, 2010; Genschow & Schindler, 2015; Gutsell & Inzlicht, 2010). For example, when a painful stimulus is delivered to an out-group member, sensorimotor resonance in observers decreases, and this decrease correlates with participants' implicit racial bias against that out-group (Avenanti, Sirugu & Aglioti, 2010). In a related study, Gutsell and Inzlicht (2010) registered electroencephalographic oscillations as an index of perception–action-coupling and found stronger activity over the motor cortex when participants observed in-group members than when they observed out-group members.

In line with the studies showing decreased sensorimotor resonance when observing outgroup members, studies on imitation with adult (e.g., Genschow & Schindler, 2015; Yabar et al., 2006, Bourgeois & Hess, 2008) as well as infants (Buttelmann et al., 2013) provide evidence for weaker mapping of observed action performed by out-group members. These results can be framed within the construal-level theory (CLT; Trope & Liberman, 2010),

claiming that out-group members are represented on a relative high, abstract, construal level and are thus perceived as psychologically more distant from the self than in-group members. Therefore, in accordance with the shared-experience hypothesis, out-group members should be perceived as spatially farther away from oneself than in-group members. In sum, the threat hypothesis suggests that people are more strongly alerted when faced with potentially threatening out-group members and may thus perceive them as closer towards themselves than in-group members. In contrast, the shared-representation hypothesis postulates that the presence of out-group members, as compared to in-group members, decreases the sharing of sensorimotor resonance leading to an increase in perceived distance. In order to pit against each other these two hypotheses, we exploited a 3D environment and asked participant to express consecutive implicit, dichotomic “Near/Far” judgments (cf. Fini, Costantini, Committeri 2014; Fini, Brass, Committeri 2015) towards a Black-African Avatar and a White-Caucasian Avatar from an egocentric reference point (Experiment 1). Moreover, to investigate whether the mere group membership is intrinsically perceived as a source of threat, we manipulated perceived threat orthogonally to group membership by providing details about a supposed criminal/moral past of the avatars (Experiment 2).

Experiment 1

In order to test the threat-hypothesis against the shared-representation hypothesis, in the first experiment, we investigated whether participants subjectively categorize a Black-African or a White-Caucasian avatar located in a 3D environment as “Near” or “Far” using the extrapersonal space categorization task introduced by Fini, Costantini and Committeri (2014), see also Fini, Brass, Committeri (2015).

Method

Participants. Twenty-five White-Caucasian healthy students recruited at Ghent University participated in this experiment (19 females, all right handed, mean age 22.2 ± 2.6 , range 18-30). Three of them were excluded because they showed a lack of coherence¹ in the three consecutive spatial judgments required in each session. All participants had normal or corrected-to-normal vision. In return for their participation, participants received course credits. The study was in accordance with the Declaration of Helsinki.

Materials and procedure. Stimuli were presented in a 3D naturalistic scene: a square arena defined by a long central wing of a palace and two short lateral wings. The scene was created by means of 3D modelling software (3D Studio Max 4.2, Autodesk, Discreet) and the relative

proportions resembled those of a real scene. Depending on the condition, we placed either a White-Caucasian or Black-African avatar into the arena. Lack of coherence means that participants did not express three consecutive “Near” judgments or three consecutive “Far” judgments, respectively in the descending/ascending series. That is, for example a “Near” judgment in a descending series, was followed again by a “Far” judgment, in such case the shift of judgment cannot be considered as being valid, since it is not stable and consistent.

Relative to the depicted arena, both avatars’ height was scaled to be 178 cm in the reality and the appearance of the virtual human was of a young man of about 30 years old age. The avatar’s gaze was straight and his facial expression was neutral (see Figure 1). The avatars were frontally located along a central vector aligned with a central camera representing the participant’s perspective at 25 different distances (in relation to the arena, these steps represent distances between 1 to 25 m). The experiment followed the same experimental procedure employed in previous work (Fini, Costantini, Committeri 2014; Fini, Brass, Committeri 2015) and consisted of ascending and descending series of trials. Each series of trials started with a white fixation cross on a black background (1.5 x 1.5 cm) for 2500 ms and consisted of a maximum of 25 trials, but was terminated when a perceptual shift occurred. Each trial lasted 2500 ms. Participants were asked to judge whether the avatar was “Near” or “Far” from them, by pressing two different buttons arranged horizontally on the computer keyboard. The location (left vs. right) of the “Near” or “Far” keys was counterbalanced across participants. In ascending series of trials, the avatar was progressively moved (in steps of a predetermined value of 1 m) away from the central position of the arena until participants provided three consecutive “Far” judgments. In descending series of trials, the avatar was progressively moved closer to the central position of the arena until participants provided three consecutive “Near” judgments. This procedure was employed in order to ensure judgement consistency. Then, the following series started. The point where participants expressed a transition from “Far” to “Near” (descending series) and from “Near” to “Far” (ascending series) is defined as the Near Extrapersonal Space (NES) value. The NES value, expressed in meters, was calculated in each series for each subject. NES values across all series were then averaged into a total score to obtain a mean NES value for each condition. High/low NES values indicate a categorization of space as “Near”/“Far” between a target and oneself: the more extended is the portion of space categorized as “Near”, the less extended is the represented spatial distance. Each series of trials was repeated three times for each avatar (i.e., White-Caucasian, Black-African). In total, each participant was submitted to 12 series: 2

avatars (White-Caucasian, Black-African) x 6 series of trials (3 ascending, 3 descending). Stimuli were presented at full screen on a 17" computer display placed 57 cm from the subject. The presentation of the stimuli and the recording of participants' responses were controlled by a customized script for Presentation version 14.9.08.11.

Results

A t-test for dependent samples revealed a significant difference between the two conditions (see Figure 2) indicating that the Black-African avatar ($NES = 12.66$ m, $SD = 2.23$) was categorized as closer compared to the White-Caucasian avatar ($NES = 11.73$ m, $SD = 2.14$), $t(21)=4.76$, $p < .001$, $d_z = .96$. This result supports the threat hypothesis.

Experiment 2

Experiment 1 demonstrated that White-Caucasian participants categorize a Black-African avatar as closer to themselves than a White-Caucasian avatar. This result supports the threat hypothesis, according to which a potential threatening out-group member induces in individuals a state of alertness and consequently leads them to misperceive the distance between themselves and the out-group member as being close. However, an open question is whether differences in perceived distance indeed result from perceived threat. In order to shed light onto this question, we conducted a second experiment in which we manipulated perceived threat through brief verbal stories, orthogonally to group membership.

Method

Participants. Fifty White-Caucasian healthy students (25 females, all but 7 right handed, mean age 21.8 ± 2.3 , range 18-30) were recruited at Ghent University. Seven participants were excluded because they showed a lack of coherence in the three consecutive spatial judgments required in each session. All participants had normal or corrected-to-normal vision. Participants received course credits for their participation. The study was in accordance with the Declaration of Helsinki.

Materials and procedure. The procedure was similar to that of Experiment 1. However, in contrast to Experiment 1, we used four avatars and for each avatar different background information was provided. The experimenter repeated the most important information by saying: "You will see pictures of two pairs of twins who were separated after birth and grew up in different environments. While one twin of each pair has a criminal past of brutally

murdering several persons, the other twin is known to be very friendly”. After this instruction, the picture of each avatar was presented on the screen. Crucially, one pair of twins consisted of two Black-African avatars and the other pair consisted of two White-Caucasian avatars. The avatars were the exact same ones that we used in Experiment 1. However, in order to make them distinguishable, each avatar wore a different colored shirt (i.e., blue, yellow, green, or violet). The colors of the shirts were counterbalanced in four different combinations among the four avatars. Each avatar was introduced together with a sentence describing his past. For one of the threatening avatars it was written: “This person has been imprisoned for brutally killing several people”. For the other threatening avatar, we wrote: “This person is a convicted criminal who has brutally murdered several people”. For one of the friendly avatars, participants read “This is a very friendly person who has never been in trouble with the law” and for the other friendly avatar it was written: “This is a very likeable and friendly person who has never done anything wrong”.

The experiment started with a learning phase in which participants learned to identify each avatar presented on the screen as a friendly or a criminal person by pressing the “k/f” keys. This learning phase was terminated as soon as participants correctly recognized each avatar as friendly or criminal in 30 consecutive trials. The presentation of the stimuli and the recording of participants’ responses were controlled by E-Prime 2. After the learning phase, the same experimental procedure of Experiment 1 was implemented with one adjustment. That is, instead of presenting one White-Caucasian and one Black-African avatar without any background information we presented the four avatars for which participants had learned their background information (i.e., friendly vs. threatening). Hence, our experimental design was a 2 (group membership: White-Caucasian vs. Black-African) x 2 (background information: friendly vs. threatening) within-subject design. In total, each participant was submitted to 24 series of trials: 2 types of group membership (White-Caucasian, Black-African) x 2 types of background information (friendly, threatening) x 6 series (3 ascending, 3 descending).

Stimuli were presented at full screen on a 17” computer display placed 57 cm from the subject. The presentation of the stimuli and the recording of participants’ responses were controlled by a customized script for Presentation version 14.9.08.11.

Results and Discussion

The results are depicted in Figure 3. A 2 (group membership: White-Caucasian vs. Black-African) x 2 (background information: friendly vs. threatening) repeated measures ANOVA showed a main effect of background information, $F(1, 42) = 7.8$ $p < .01$, $\eta^2 = 0.16$,

indicating that participants perceived threatening avatars as closer to themselves ($NES = 8.69$ m, $SD = 2.34$ m) than friendly avatars ($NES = 8.44$ m, $SD = 2.39$ m). Neither, the main effect of group membership, $F(1, 42) = 1.29, p = .27$, nor the interaction between group membership and background information $F(1, 42) = 1.40, p = .24$, was significant. These results suggest that it is not group membership per se, but rather perceived threat that decreases perceived distance.

General discussion

In the present paper, we pitted two different hypotheses of the role of group membership on perceived distance with an implicit “Near/Far” judgment task (Fini, Costantini, Committeri, 2014) against each other. No evidence was found for the shared-representation hypothesis: Participants did not perceive an in-group member as spatially closer to themselves than an out-group member. Instead, results from the present experiments revealed support for the threat hypothesis: Participants perceived an out-group member as spatially closer to themselves as compared to an in-group member (Experiment 1). In line with the theoretical considerations underlying the threat hypothesis, Experiment 2 revealed that when manipulating perceived threat orthogonally to the group membership, it is perceived threat and not the mere group-membership that affects perceived distance.

A well-known method to measure implicit prejudice towards different groups is by comparing the seating distance that participants take with regard to members of these different groups (Goff, Steele & Davies, 2008; Levy et al., 2005; Macree, Bodenhausen, Milne, & Jetten, 1994). Within such a setting, it is commonly found that people keep distance from out-group members than from in-group members (Dotsch & Wigboldus, 2008; Amodio & Devine 2006). Yet, past research leaves open the question of which underlying mechanisms drive this effect. The threat hypothesis is supported by many studies (Phelps et al., 2002; Ito & Urland, 2003) showing that when facing with an outgroup member, the alertness increases. Thus, the effect would be driven by perceiving the outgroup members as being threatening and consequently closer (Blanchard, & Blanchard, 1989; Lang, Bradley, & Cuthbert, 1997), and keeping distance would serve the need to restore a safety boundary between the self and the other dissimilar. The shared-representation hypothesis, instead relies on the evidences demonstrating that the observation of out-group members reduces the sharing of somatosensory experiences (Avenanti, Sirugu & Aglioti, 2010; Genschow & Schindler, 2015; Gutsell & Inzlicht, 2010). From this perspective, keeping distance is the behavioral expression

of a lack of interest towards the other dissimilar, that would be considered as psychologically and physically far from the self. Our research supports the threat hypothesis: Individuals may perceive (threatening) out-group members as closer to themselves than in-group members. Thus, in order to restore a pleasant distance, they may sit farther away from (threatening) out-group members than from in-group members.

In order to test whether the results in the first experiment were driven by the mere group membership or the perceived threat of the avatars, we ran a second Experiment 2 in which we manipulated the threat value of the avatars (through brief stories) orthogonally to their group membership. The analysis yielded a main effect for manipulated threat indicating that threatening avatars are perceived as closer to oneself than non-threatening avatars. This finding is in line with previous findings that participants underestimate the distance to a stimulus that symbolizes a threat to their identity, such as the stadium of an aversive football team, for instance (Xiao & Van Bavel, 2012; Xiao, Wohl, & Van Bavel, 2016). Yet an open question is how such an effect could be explained. In line with the threat hypothesis, one could argue that reduced distance perception to a threatening stimulus is very functional. That is, it might be advantageous to categorize threatening stimuli as closer, so that behavior is subsequently undertaken to again increase the distance from these stimuli. In line with this, Iachini, Pagliaro, and Ruggiero (2015) demonstrated that participants increased their comfort distance when they were faced with threatening people.

In our experiments, we assessed only White-Caucasian participants but no Black-American participants. Thus, an open question is whether Black-African participants would show the same pattern or a reversed pattern of results. Nosek, Banaji, and Greenwald (2002) compared IAT scores of race IATs in which respondents classified Black and White faces or names while classifying words of positive or negative valence. Overall, the observed IAT effect revealed an automatic preference for White as compared to Black faces. Interestingly, this effect was found for White-Caucasian as well as for Black-African participants although the effects were somewhat smaller for Black-African participants. Future research may aim at testing whether similar results can be found in the implicit “Near/Far” judgment task that we have used in the present research.

Summary

We have demonstrated that White-Caucasian participants show a spatial categorization bias towards out-group members, such that they misperceive them as being closer than in-group members. Moreover, after manipulating the threat value of avatars orthogonally to their group

membership, we found that participants perceived threatening avatars as being closer to themselves than friendly avatars, regardless of the group membership of the avatars.

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Figure Captions

Figure 1 . The stimuli used in the experiment: (A) The White-Caucasian avatar, (B) The Black-African avatar.

Figure 2. Significant difference in Near Extrapersonal Space (NES) between the Black-African and the White-Caucasian avatars.

Figure 3. Near Extrapersonal Space (NES) values for the Black-African-Criminal, the White-Caucasian-Criminal, the Black-African-Friendly, and the White-Caucasian-Friendly avatars.