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Self-face advantage is modulated by social threat — Boss effect on self-face recognition

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ABSTRACT

Human adults usually respond faster to self-face than to faces of others. The self-face advantage has been associated with an implicit positive association with the self. The current work investigated whether social threats modulate self-face recognition by asking graduate students to identify orientations of self-face in a high-threat context, in which self-face and a faculty advisor's face were presented in one block of trials, or in a low-threat context, in which self-face and a face of another faculty member were presented in one block of trials. We found a self-face advantage in the low-threat context but a self-face disadvantage in the high-threat context (i.e., slower responses to self-face compared to the advisor's face). Moreover, the self-face disadvantage positively correlated with the degree of fear of negative evaluations from advisors. Our findings suggest that self-face recognition is strongly modulated by social interactions with influential superiors within social hierarchies.

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Introduction

A man has as many social selves as there are individuals who recognize him and carry an image of him in their mind. — William James, The principles of psychology (1890/1950, Vol. I, p. 294)

The distinctiveness of the self is reflected in multiple cognitive processes, such as self-face recognition (Keenan et al., 1999) and self-referential memory (Klein, Cosmides, Tooby, & Chance, 2002; Rogers, Kuiper, & Kirker, 1977), which have been associated with neural activity in several brain regions (see Northoff et al., 2006; Zhu & Han, 2008). However, since the time of William James, it has been noted that self-concept depends greatly on social contexts in which the self interacts with others. For example, while one may remember information about the self better than information about others (Conway, Wang, Hanyu, & Haque, 2005; Rogers et al., 1977), this self-advantage in memory is weakened in a context that includes close others (e.g., mother/father/best friend, Zhu & Zhang, 2002).

Similarly, self-face recognition is also influenced by contextual information. Human adults manifest distinct self-face recognition, responding faster to their own faces than to faces of unfamiliar or familiar others in visual search (Tong & Nakayama, 1999), face owner identification (Keenan et al., 1999), or face orientation identification tasks (Ma & Han, in press; Sui & Han, 2007). However, our recent research showed that self-face recognition is strongly affected by experimentally manipulated contexts. While adults responded faster to orientations of self-face compared to familiar faces, the self-face advantage was eliminated when self-concept was threatened by a priming procedure that associated the self with negative traits (Ma & Han, in press). The results support an implicit positive association (IPA) theory, which posits that self-face recognition and the concomitant self-awareness activate positive attributes in self-concept, which in turn facilitate behavioral responses to self-face and result in self-advantage in face recognition (Ma & Han, in press).

The current work assessed whether social threats confronted in naturalistic social situations to one's positive associations also modulate self-face recognition. One social threat commonly experienced is being negatively evaluated by influential superiors within a social hierarchy such as one's boss, which usually results in difficulty of promotion or even loss of one's job. The psychological consequences of such a social threat may include a reduction of positive self-associations, which induces weakened self-advantage during face recognition according to the IPA theory. Given that face perception induces both the processing of physical appearance and automatic access to information about familiar individuals such as personal traits and attitudes (Gobbini & Haxby, 2007), we hypothesized that the appearance of influential superiors within a social hierarchy may induce social threats and lead to elimination of self-face advantage. To assess this, we asked graduate students to identify orientations of self-face that was shown in one block of trials with either their faculty advisor's face (high-threat condition) or with the face of another faculty member who was not within

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their own lab (low threat condition)[1]. As negative evaluations from advisors constitute higher threats to self-esteem compare to those from other faculty members, as indicated by subjective reports of greater fear of being negatively evaluated by advisors (see "Results"), we expected that the self-face advantage would be reduced in the high than low threat conditions. To further quantify the relation between subjective evaluations of social threats and behavioral performances associated with face recognition, we examined whether differential responses to self-face and advisor's face co-varied with individuals' subjective ratings of fear of negative evaluations from the advisor. We would expect stronger influences on self-face recognition for those who reported greater fear of being negatively evaluated by their advisors.

Method

Participants

Twenty healthy Chinese graduate students (10 females, mean age = 24.8, SD = 1.94) participated in this study. All had worked with their advisors more than a year (14–48 months). All were right-handed and had normal or corrected-to-normal vision.

Questionnaire measurement

The Brief Fear of Negative Evaluation (Brief-FNE) scale (Leary, 1983) was modified to assess participants' fear of being negatively evaluated by others. All items were the same as the original Brief-FNE scale, except that participants had to rate each statement twice, once for the advisor and once for another faculty member who worked at the same department but not within one's own lab (e.g., I am frequently afraid of Prof. XXX noticing my shortcomings). Participants had to indicate how properly each statement applied to themselves using a 5-point scale (1 = not at all and 5 = extremely right). An independent question was used to evaluate subjective ratings of social status (defined as an individual's overall ability to control or influence other people and institutions) of the advisor and another faculty member using an 11-point scale (0 = not all dominant and 10 = extremely dominant).

Stimuli and procedure

Ten digital face images were taEl'cial

rays using MatLab and reorganized randomly to form scrambled faces that did not contain any facial features but contained a gray bar on the left or right (Fig. 1a). All images were calibrated in luminance and contrast. Each stimulus subtended a visual angle of $2.13° \times 2.17°$ at a viewing distance of 70 cm and was presented for 200 ms at the center of the screen followed by a fixation cross with a duration varying between 800 and 1200 ms. Participants had to judge whether each face oriented to the left or right or to judge locations of a gray bar in scrambled faces (left or right) by pressing two keys using the index and middle fingers. Instructions emphasized both response speed and accuracy.

There were 40 faces and 20 scrambled faces in each block of trials. Self-face was presented in a high-threat context in two blocks of trials (20 trials of self-face and 20 trials of advisor's face in each block) and in a low-threat context in two blocks of trials (20 trials of self-face and 20 trials of another faculty member's face in each block). A labmate's face and the advisor's faces were presented in two blocks of trials to examine whether participants responded generally faster to advisors' faces even when shown in one block with other non-self faces. For each stimulus condition, participants responded with the left hand in one block but with the right hand in another block. The orders of responding hands and conditions were counterbalanced across participants.

Results

Subjective ratings

Subjective report indicated comparable social status of advisors and faculty members (8.30 ± 1.45 vs. 7.85 ± 1.57, $t(1, 19) = 1.690$, $p = 0.107$). The results of the Brief-FNE Scale suggested that participants were more afraid of negative evaluation from advisors than from faculty members (3.38 ± 0.73 vs. 2.41 ± 0.66, $t(1, 19) = 5.265$, $p < 0.001$).

RT results

Response accuracy was high in face orientation judgment tasks (mean = $94.96\% \pm 2.43\%$). Reaction times (RTs) with correct responses and within three standard deviations were analyzed. Similar to our previous study (Ma & Han, in press), RTs were normalized by dividing RTs to self/other faces by RTs to scrambled faces to rule out the influence of difference in response selection and execution between different blocks of trials. Response accuracies and normalized RTs were subjected to repeated measure analyses of variance (ANOVAs) with Hand (left vs. right hand), Face (self vs. other faces), and Threat (high- vs. low-threat) as independent within-subjects variables.

ANOVAs of response accuracies did not show any significant effect ($ps > 0.05$). ANOVAs of normalized RTs showed a significant interaction of Face and Threat ($F(1, 19) = 58.469$, $p < 0.001$, $\eta^2 = 0.755$, Fig. 1b and c) as normalized RTs to one's own and others' faces showed a reverse pattern in the high-threat and low-threat context conditions. Post-hoc analysis confirmed that normalized RTs were significantly shorter to self-face than faculty members' faces ($F(1, 19) = 15.531$, $p < 0.001$, $\eta^2 = 0.450$) but significantly longer to self-face than advisors' faces ($F(1, 19) = 38.452$, $p = 0.001$, $\eta^2 = 0.669$). This "boss effect" was more salient with the left-hand responses, resulting in a marginally significant triple interaction of Face × Threat × Hand ($F(1, 19) = 3.757$, $p = 0.068$, $\eta^2 = 0.165$). Moreover, left-hand responses to self-face were faster in the low-threat than high-threat contextual conditions ($F(1, 19) = 4.785$, $p = 0.041$, $\eta^2 = 0.201$) whereas left-hand responses did not differ significantly to faces of advisors and faculty members ($F(1, 19) = 1.116$, $p = 0.304$, $\eta^2 = 0.055$), suggesting that

responses to self-face were inhibited by the presence of advisors' faces.

Normalized RTs to faces of labmates and advisors were also subjected to ANOVAs with Hand (left vs. right hand) and Face (labmate vs. advisor) as independent within-subjects variables. However neither the main effects nor the interaction reached significance ($ps > 0.05$, Fig. 1b and c), suggesting that social threat from superiors within a social hierarchy does not necessarily result in slowed responses to inferiors.

Correlation analysis

To further quantify the relation between subjective evaluation of social threat from others and behavioral performances associated with self-face recognition, we calculated the correlation between the mean rating scores of the Brief-FNE Scale related to advisors and the differential RTs (normalized RTs to self-face minus normalized RTs to advisors' faces). We found a significant positive correlation between subjective rating scores of the Brief-FNE Scale and left-hand responses ($r = 0.500$, $p = 0.025$, Fig. 1d) but not between subjective rating scores and right-hand responses ($r = -0.146$, $p = 0.538$). The higher the Brief-FNE scores, the stronger the self-face disadvantage in left-hand responses. Similar analysis of differential RTs in the low-threat context failed to show significant correlation ($p > 0.1$). The rating scores of social status did not show significant correlation with the differential RTs to self-face and advisors' faces ($r = -0.205$, $p = 0.385$).

Discussion

The results of questionnaire measurements suggest that, although subjective feelings of social status were comparable to one's own advisor and to another faculty member, participants showed greater fear of being negatively evaluated by one's own advisor than by the faculty member. This indicates that advisors constitute a higher social threat to one's self-esteem compared to other faculty members. More interestingly, we showed evidence that self-face processing was strongly modulated by social contexts that carry information of threats to the self. Participants responded faster to self-face than to a faculty member's face. This is consistent with previous observations (Tong & Nakayama, 1999; Keenan et al., 1999; Ma & Han, in press) and indicates a self-face advantage over faces of others who implicate low threats to the self. However, the self-face advantage was eliminated when self-face was presented with advisors' faces that implicated a high social threat to the self so much so that RT results even illustrated a self-face disadvantage under this circumstance. The distinct patterns of self-face processing, i.e., self-advantage in the low-threat context and self-disadvantage in the high-threat context, arose from delayed responses to self-face in the high-than low-threat contexts since responses to others' (advisors and other faculty members) faces did not differ between high and low-threat contexts.

Our results suggest that perceiving faces with high social status alone cannot modulate self-face processing because comparable subjective ratings of social status between advisors and faculty members did not necessarily result in comparable RTs to self-face shown together with advisors' or faculty members' faces. The boss effect on self-face recognition could not be interpreted as the effect of general fear or attentional capture because RTs did not differentiate advisor's faces from labmates' faces. The boss effect could not simply reflect influence of a positive and respected person because, although subjective reports on social status indicated comparable social status of the advisor and the faculty member, the faculty member did not induce faster responses compared to self-face.

The fact that the self-face disadvantage in the high-threat context positively correlated with subjective feelings of fear of being negatively evaluated by advisors supports the proposal that social threat modulates self-face processing through changing one's IPA and provides further evidence for the role of IPA in self-face advantage (Ma & Han, in press). The effect of social threats on self-face advantage indicates that positive self-associations depend on social interactions with influential superiors in real life situations since negative evaluations from the influential superiors alert individuals to the possibility of social exclusion (Leary, Tambor, Terdal, & Downs, 1995). The presence of influential superiors modulates self-face recognition by shaping self-concept and gives rise to multiple social self-identities.

Although the correlation analysis suggests a relation between the self-face disadvantage in the high-threat context and subjective feelings of fear of being negatively evaluated by advisors, such correlation was more salient with left-hand than right-hand responses. Similarly, the effect of self-concept threat on self-face recognition was more salient on left-hand than on right-hand responses (Ma & Han, in press). Prior brain lesion and neuroimaging studies suggest right-hemisphere dominance in self-face recognition (Breen, Caine, & Coltheart, 2001; Keenan, Nelson, O'Connor, & Pascual-Leone, 2001; Sui & Han, 2007; Uddin, Iacoboni, Lange, & Keenan, 2007; but see Turk et al., 2002 for opposite observations). There is also evidence that the right hemisphere dominates the processing of negative emotion such as fear (Adolphs, Damasio, Tranel, & Damasio, 1996; Davidson, 1992) and the processing of negative concepts (Cunningham, Espinet, DeYoung, & Zelazo, 2005). Thus the correlation results possibly reflected the interaction between self-face recognition and anxiety about negative attitudes on the self from influential superiors that are represented mainly in the right hemisphere.

It should be noted that, as only 20 subjects were recruited, our study provided a preliminary test of the effect of social threat on self-face recognition. Moreover, self-concept is strongly influenced by cultures such that Western cultures encourage the independent self that is autonomous and insusceptible whereas East Asian cultures foster the interdependent self that emphasizes the interconnectedness of human beings and is vulnerable to contextual influences (Markus & Kitayama, 1991). Recently, Sui, Liu, and Han (in press) showed that self-face advantage was stronger in Westerners than in Chinese and that such cultural difference in self-face advantage was associated with frontal activity as early as 300 ms after sensory stimulation. Cultural attitudes towards peoples' status within social hierarchies also exist between Western and East Asian cultures. An individual's dominant behavior is positively reinforced and people are generally encouraged to dominate and climb the hierarchy in the United States (Triandis & Gelfand, 1998). In contrast, a collectivist society (e.g., Japanese society) encourages subordination (Triandis & Gelfand, 1998) and praises being agreeable rather than being dominant (Moskowitz, Suh, & Desaulniers, 1994; Realo, Allik, & Vadi, 1997). The fact that advisors constitute a high threat to positive self-association may be specific to East Asian cultures that foster both interdependent selves and subordination. In Western cultures, however, one may expect less effects of social anxiety of threat from influential superiors on self-face recognition. This can be assessed in future cross-culture studies. Future research may also examine the interaction of emotion and social relevance using advisors' faces with positive or negative expressions.

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