

Social Motivation: The Impact of Social Status on the Other-Race Effect

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Abstract

The other-race effect refers to the phenomenon in which the chance of individuals misidentifying faces from other races more than their own race is significantly higher. This study explored the effect of motivation on the other-race effect by manipulating the social status of faces. The results showed that: (1) compared to other-race faces with low social status, when individuals' perceptions of the social status of other-race faces increased, individuals' recognition scores for high social status other-race faces increased, and the other-race effect disappeared, and (2) when individuals' perceptions of the social status of other-race faces decreased, there was no significant difference in individuals' recognition scores of other-race faces, of either high or low social status. These findings suggest that motivation has a significant impact on the other-race effect.

Highlights

- Motivation plays an important role in the generation of other-race effect (ORE).
- The ORE is attenuated when recognizing high social status.
- There was no significant difference in individuals' recognition performance of high and low social status heterogeneous faces when motivation attenuated.

Full Text

The other-race effect (ORE), a phenomenon in which the chance of individuals misidentifying other-race faces is significantly higher than misidentifying own-race faces^{1,2}, is also known as the own-race bias, or the cross-race effect. Misidentifying others, especially members of different races, can cause social difficulties for individuals³, and can even affect judicial justice⁴ and ethnic relations⁵. There has always been extensive attention from researchers regarding the causes of the ORE⁶⁻⁸. Research on this issue can help enhance understanding of the ORE, reduce related social problems, and promote interpersonal harmony.

Previous research on the causes of the ORE has mainly focused on areas such as contact experience or social classifications. Theories centered on contact experience believe that individuals have developed more perceptual experience of distinguishing and recognizing faces of their own race through long-term contact with members of their own race, resulting in recognition advantages for own-race faces⁷. Theories centered on social classifications suggest that the division of ingroup and outgroup members from different racial groups, enables individuals to adopt a more advantageous "conformational processing" strategy regarding faces of their own race (ingroup members), resulting in recognition advantages for own-race faces^{9,10}. All these studies hypothesize that cognitive processes are an important factor influencing the ORE. However, there are also theories proposing that motivation is intrinsic to influencing individuals to produce such cognitive differences¹¹.

The motivation-focused Categorization-Individuation Model (CIM) suggests that the ORE arises due to the intrinsic motivation of perceivers' category processing of outgroup members and individualized processing of ingroup members¹²⁻¹⁴. Category processing is the process of assigning social members to a particular social category, and is the processing of information about the common dimensions (category features) of category members (e.g., race), which can lead to lower recognition scores, due to the high similarity in category features of faces of members of the same category, and the tendency to confuse them during reidentification^{15,16}. In

contrast, individuation is the process of distinguishing, in detail, the identity information of each category member, and it is a diagnostic process of category member identity information, and thus higher recognition scores^{17,18}. Those other-race faces that are relevant to the perceiver and meet some need of the perceiver, are prone to motivate the perceiver to individualize and process other-race faces. When perceivers are motivated to individualize the processing of other-race faces, they improve individual recognition performance of other-race faces, thus attenuating the ORE. In addition, the model explains some experimental studies that the contact hypothesis cannot explain^{19,20}, and argues that merely increasing contact with members of the other-race group, without the motivation to individualize processing of other-race faces, does not attenuate the ORE of face recognition²¹.

Kawakami (2014) et al. elicited the motivation to individualize subjects' processing of other-race faces, by asking White subjects to look closely at and memorize Black faces through a guiding phrase, and found that subjects' recognition scores for other-race faces increased, compared to the group of subjects who did not use the guiding phrase¹². Baldwin (2013) et al. elicited motivation to individualize subjects' processing of other-race faces through the principle of outcome dependency, to increase the perceiver's connection to members of the opposite race and found that subjects' performance on Black faces increased significantly when they were partnered with Black individuals, compared to those who were told to be partnered with White individuals²². In summary, under certain motivational conditions, the ORE seems to be malleable. In this study, we focus on thus far unexamined motivation: social status of the faces.

Members with high social status may be respected, admired, and obeyed by others in their social environment²³, which could be used as a motivator. Many studies have found that members of society with higher social status tend to receive more respect and admiration from others and that humans, as a social group, have an intrinsic need to be respected by others. Therefore, individuals will satisfy their intrinsic needs through various behaviors (e.g., choosing jobs or environments with higher social status), thus giving rise to an internal motivation in individuals that leads them to pursue high social status^{24,25}. According to the explanation of evolutionary psychology, individuals are internally motivated to pursue high social status, because it provides individuals with more resources for survival and development²⁶. Researchers have also used eye-movement studies to explore the internal mechanisms by which social status triggers social motivation. In Dalmaso, Pavan, Castelli, and Galfano (2012), subjects were asked to view 16 pictures of faces while reading statements that indicated the high or low social status of the individuals in the pictures²⁷. The results showed that subjects spent significantly more time looking at the high social status faces. This may be because high social status faces can motivate individuals to aspire to high social status. Therefore, the individuals would allocate more gaze time or cognitive resources to the higher social status faces, thereby increasing their expectation of being respected and obeyed by others. In summary, social status, as an intrinsic need of individuals, has the effect of generating motivation.

The purpose of this study was to examine the relationship between motivation and the ORE by manipulating social status. Study 1 examined the relationship between motivation and the ORE by increasing the subjects' perceptions of the social status of other-race faces by presenting face images in combination with labels. According to Hugenberg et al., manipulations of social status can lead to individuals re-perceiving other-race faces based on social status, thereby increasing subjects' motivation to individualize and process other-race faces¹³. Conversely, if subjects' perception of the social status of other-race faces is weakened, does the

subjects' recognition advantage in identifying other-race faces with high social status, disappear as a result of attenuated motivation? Based on research related to emotional priming on the individual attentional bias, it is known that emotional picture priming affects subjects' attentional bias. If the priming emotional picture is more congruent with the target stimulus (picture, text), subjects tend to gaze at and allocate more cognitive resources to the target stimulus that is more congruent with the priming emotional picture²⁸. Thus, Study 2 also attenuated subjects' perceptions of the social status of other-race faces through this manipulation, which in turn attenuated subjects' motivation to individualize and process other-race faces. Specifically, scenes representing high and low social status were selected as priming stimuli to attenuate the subjects' perception of the social status of the pictures of foreign faces. The scenes were selected from the Chinese scenes, and then a pair of Chinese and Caucasian faces matching the social status of the scenes was presented, to allow the subjects to allocate more attention and cognitive resources to the native faces.

We hypothesized that, firstly, if motivation is necessary to produce the ORE, individuals' recognition scores for high social status other-race faces would significantly increase when individuals' perceptions of the social status of other-race faces are triggered, thereby attenuating the ORE of face recognition. Secondly, no significant differences in individuals' recognition scores for other-race faces would occur when the cognitive resources required for individuals' perception of the social status of other-race faces are more occupied by faces of their race that are consistent with the priming stimuli.

Study 1

Research Methodology

Subjects. Forty-six college students (23 females, 23 males), aged 20-24 years, with normal or corrected vision, all correctly understood the experimental task and signed an informed consent form before the start of the experiment. The present study was approved by the Ethics Committee of Northwest Normal University. This study follows the principles of the Declaration of Helsinki. All subjects signed an informed consent statement.

Study Design. The current study used a 2 (racial faces: other-race faces - Caucasian faces; own-race faces - Asian faces) × 2 (social status: high social status occupation labels - doctor, university professor, military officer, CEO; low social status occupation labels - civilian worker, courier, waiter, cleaner) in-subject experimental design.

Study Materials. Face pictures: there were 64 pictures in total from the PAL/CAL database (Minear & park, 2004) (32 Asian faces, 32 Caucasian faces, 50 male faces, and 50 female faces). Occupation labeling: 12 subjects who did not participate in the experiment were asked to classify the social status for eight occupations (CEO, doctor, military officer, university professor, courier, restaurant waiter, janitor, and civilian worker) as high and low. As expected, the occupation labels with high social status were usually classified in the higher social status category, while the occupation labels with low social status were usually classified in the lower social status category. Finally, these occupational labels were added below the images of faces of different races.

Study Procedures. Subjects perform experiments separately in a quiet room in the laboratory. Before the experiment began, they were informed that the whole experiment consisted of two phases: learning and recognition. The main task of the learning phase was to try to learn and memorize the 32 faces that appeared in the center of the screen, which were collected from members of society from different countries and different

occupational fields. The recognition phase was simply to determine whether the faces appearing in the center of the screen in sequence, had appeared during the learning phase. The specific experimental procedures were as follows: a black gaze point was first presented at the center of the screen for 800 ms, followed by 2000 ms of pictures of faces with different occupational labels, all pictures were presented only once and the learning phase ended. Immediately after the subjects completed an irrelevant task for about two minutes, they entered the recognition phase, in which they were asked to respond whether they had seen the 64 faces from different countries and occupations presented in the center of the screen (half of them were old and half were new). They pressed the "F" key if they had seen them, and the "J" key if they had not. The duration was the time it took for the subjects to finish responding.

Study Results

This study uses the discrimination index (d') of signal detection theory to analyze the discrimination ability of subjects in recognizing faces of different races and social statuses. The d' is a common parameter used to measure the ability of subjects to distinguish old and new faces. It can be obtained from the hit condition rate ($P(\text{"yes"}/\text{Signal})$) and the misrepresentation condition rate ($P(\text{"yes"}/\text{Noise})$), and the $Z_{(H)}$ and $Z_{(F)}$ corresponding to the two probabilities can be found using the POZ conversion table, which is expressed by the formula:

$$d' = Z_{(H)} - Z_{(F)}.$$

The larger d' means the stronger discriminative power; the smaller d' means weaker discriminative power. The discriminative power (d') is an important indicator of the ability to distinguish between old and new faces, and the reporting criterion C indicates the stringency of the subject's judgment standard, which is often calculated by the formula: $Z_{(H)} + Z_{(F)}/2$.

Subjects' hit condition rate, misrepresentation condition rate, discriminative index d' , and reporting criteria C , for pictures of faces of different racial ethnicities and social statuses during the recognition phase, are shown in Table 1. Censoring was performed using d' as the indicator, where 1 subject had all 0s for the discrimination indicator (d'), so one subject's data was removed. Based on the data of the remaining 45 subjects, a repeated measures ANOVA of 2 (racial faces: other-race faces, own-race face) \times 2 (occupation labels: high social status occupation label, low social status occupation label) was conducted, with the discriminative index d' of the subjects' recognition of different types of faces as the dependent variable (see Figure 1). Results found that subjects' discriminative index d' for faces with high social status occupations, d' ($M = 0.51$, $SD = 0.10$) was significantly better than that for faces with low social status occupations, d' ($M = 0.23$, $SD = 0.09$), $F(1, 44) = 4.85$, $p < 0.05$, $\eta_p^2 = 0.09$. Subjects' discriminative power for faces of different races did not differ significantly, $F(1, 44) = 0.06$, $p > 0.05$, $\eta_p^2 = 0.001$. The interaction between racial faces and social status was significant, $F(1, 44) = 4.81$, $p < 0.05$, $\eta^2 = 0.09$. A subsequent simple effects analysis of the interaction found that when it was a Caucasian face, subjects' discrimination index d' ($M = 0.65$, $SD = 0.10$) for faces with high social status occupations was significantly better than that for faces with low social status occupation, d' ($M = 0.11$, $SD = 0.12$), $F(1, 44) = 10.02$, $p < 0.01$. When it was an Asian face, there was no significant difference between subjects' discriminatory index for faces with high social status occupations d' ($M = 0.36$, $SD = 0.14$) and the discriminative index d' ($M = 0.34$, $SD = 0.10$) for faces with low social status occupations, $F(1, 44) = 0.01$, $p > 0.05$. The above results indicate that subjects did not show the recognition advantage of faces with high social

status in their own racial group, but showed a significant recognition advantage for high social status faces when recognizing faces of different races with different social statuses. Reporting criteria C : The reporting criteria of the subjects under each condition were relatively stringent (above "0") and were not significantly different.

Table 1. Average hit rate, misrepresentation rate, d' , and C in Study 1

Faces	Occupation Labels							
	High				Low			
	hit rate	misrepresentation rate	d'	C	hit rate	misrepresentation rate	d'	C
other-race	0.49	-0.15	0.65	0.17	0.30	0.18	0.11	0.24
	(0.82)	(0.58)	(0.73)	(0.61)	(0.8)	(0.56)	(0.86)	(0.54)
own-race	0.45	0.10	0.36	0.28	0.48	0.13	0.34	0.30
	(0.88)	(0.71)	(0.98)	(0.64)	(0.9)	(0.71)	(0.71)	(0.73)

Discussion

Based on the relationship between occupational status and social status, Study 1 explored the effect of motivation on the other-face effect by manipulating the social status of faces through occupational labels. The results showed that individuals' recognition scores for other-race faces with high social status occupation labels significantly improved, and the ORE disappeared, demonstrating the impact of motivation on the ORE. However, the social status manipulation did not result in significantly better individual recognition scores for own-race faces with high social status, than for those with low social status.

The relationship between motivation and the other-face effect was explored by increasing subjects' perceptions of the social status of other-race faces. Results showed that subjects' recognition scores for other-race faces with high social status increased significantly and the ORE disappeared. However, does attenuate individuals' perceptions of the social status of other-race faces decrease subjects' recognition scores for other-race faces with high social status, thereby increasing the ORE? Study 2 further examined the relationship between motivation and the ORE, by attenuating subjects' perceptions of the social status of other-race faces through the principles of priming paradigm and paired presentation.

Study 2

Research Methodology

Subjects. Forty-four university students (22 females, 22 males), aged 20-24 years, with normal or corrected vision, all correctly understood the experimental task and signed an informed consent form before the start of the experiment.

Study Design. The current study used a 2 (starter stimulus: high social status scene pictures/low social status scene pictures) × 2 (racial faces: other-race faces - Caucasian faces; own-race faces - Asian faces) × 2 (social status: high social status occupation labels - doctor, university professor, military officer, CEO; low social status occupation labels - civilian worker, courier, waiter, cleaner) in-subject experimental design.

Study Materials. The face pictures and occupation labels were identical to those in Study 1, except for the eight starter pictures. The eight starter stimuli were scene pictures matching their occupational identities. All these scene pictures were selected from a Chinese context. For example, the starter stimulus picture of a CEO's face was the picture of a CEO who was on the Hurun Top 100 Rich List.

Study Procedures. To correctly distinguish the social status of different faces, the current study uses the background color for this purpose. A guideline on the meaning of the background is given below:

The background color represents the social status of the face members. The members in the yellow background have higher social status, higher social prestige, and some special power in the society, while the members in the green background are usually at the bottom of the society, have lower salaries, and less respected jobs. Your task is to try to remember and distinguish the differences between the faces, especially those appearing in yellow. To balance the effect of the background color on the recall performance, each face picture is presented in green or yellow.

After the instructions have been presented, the experiment begins when the subject has read and understood the instructions and the meaning of the background color. The study procedures were the same as in Study 2, except for the following two differences (see Figure 2): (1) the 800 ms black gaze point presented during the learning phase became an 800 ms priming stimulus, and (2) the face presentation during the learning phase was a paired presentation of Caucasian and Asian faces, with the same occupational identity and a presentation time of 4000 ms.

Study Results

Subjects' hit condition rate, misrepresentation condition rate, discriminative index d' and reporting criteria C for pictures of faces of different races and social statuses, during the recognition phase, are shown in Table 2. Discriminative index (d'): using the discrimination indicator d' for subjects' recognition of different types of faces as the dependent variable (see Figure 3), a 2 (face race: other-race face, native face) × 2 (social status: high social status occupation label, low social status occupation label) repeated measures ANOVA was conducted. Results showed that subjects' discriminative index d' for faces with high social status occupation labels, d' ($M = 0.64$, $SD = 0.09$) was significantly better than that for faces with low social status occupation labels, d' ($M = 0.21$, $SD = 0.09$), $F(1, 43) = 12.08$, $p < 0.01$, $\eta_p^2 = 0.21$. Subjects' discrimination for faces of different races did not differ significantly, $F(1, 43) = 0.96$, $p > 0.05$, $\eta_p^2 = 0.05$. The interaction between race and social status was significant, $F(1, 43) = 4.50$, $p < 0.05$, $\eta_p^2 = 0.02$. A subsequent simple effects analysis of the interaction found that when faces were native faces, subjects' discriminatory index for faces with high social status occupations d' ($M = 0.83$, $SD = 0.14$) was significantly higher than the discriminatory indicator d' for faces with low social status occupations ($M = 0.12$, $SD = 0.14$), $F(1, 43) = 5.86$, $p < 0.05$. When racial faces were other-race faces, subjects' discriminatory index d' for faces with high social status occupations ($M = 0.44$, $SD = 0.09$) and the discriminative index d' ($M = 0.30$, $SD = 0.10$) for faces with low social status occupations were not

significantly different, $F(1, 43) = 1.01, p > 0.05$. The above results indicate that subjects showed high recognition advantages for high social status faces when recognizing own-race faces with different social statuses, but they did not show the recognition advantages for high social status faces when recognizing other-race faces with different social statuses.

Table 2. Average hit rate, misrepresentation rate, d' , and C in Study 2

Faces	Background color							
	Yellow		Green					
	hit rate	misrepresentation rate	d'	C	hit rate	misrepresentation rate	d'	C
Other-race	0.30	-0.14	0.44	0.23	-0.09	-0.39	0.30	-0.28
	(0.79)	(0.73)	(0.61)	(1.08)		(0.77)	(0.69)	(1.02)
Own-race	0.29	-0.53	0.83	0.02	0.24	0.12	0.11	0.31
	(0.88)	(0.84)	(0.97)	(1.11)	(0.8)	(0.93)	(0.93)	(1.18)

Reporting Criteria C : Subjects' reporting criteria for faces of different social status did not differ significantly, $F(1, 43) = 1.04, p > 0.05$. Subjects' reporting criteria for pictures of faces of different races did not differ significantly, $F(1, 43) = 1.47, p > 0.05$. The interaction between racial faces and social status was significant, $F(1, 43) = 23.39, p < 0.01, \eta_p^2 = 0.35$. A subsequent simple effects analysis of the interaction found that subjects reported significantly higher criteria C ($M = 0.08, SD = 0.10$) for high social status faces when racial face was other-race face, than for low social status faces ($M = -0.24, SD = 0.10$), $F(1, 43) = 16.01, p < 0.001, \eta_p^2 = 0.27$. When the racial face was an own-race face, subjects reported criteria C ($M = -0.12, SD = 0.10$) more leniently for high social status faces, than for faces with low social occupational status ($M = 0.18, SD = 0.11$), $F(1, 43) = 6.61, p < 0.01, \eta_p^2 = 0.13$.

Discussion

Study 2 focused on the impact of motivation on the ORE in the opposite direction by attenuating subjects' perceptions of the social status of other-race faces and, in turn, attenuating subjects' motivation to individualize the processing of other-race faces through the principles of paired presentation and priming paradigms. The results showed that subjects had a reduced advantage in recognizing other-race faces with high social status, suggesting that attenuated motivation reduced subjects' recognition performance in identifying high social status other-race faces. It was also found that individuals' recognition scores for high social status own-race faces were significantly higher and better than those for low social status own-race faces, suggesting that the priming stimuli and paired presentation manipulations increased subjects' motivation to individualize and process own-race faces, which further confirms the important role of motivation in the ORE.

General Discussion

The current study found that perceivers' lack of motivation toward individualizing the processing of other-race faces was one of the main reasons for the ORE. That is, subjects' recognition processes of other-race faces were influenced by motivation, both from the perspective of increasing subjects' motivation to individualize other-race faces (Study 1) and from the perspective of attenuating subjects' motivation to individualize other-race faces (Study 2). The current study further validated Hugenberg et al.'s findings with social status as the operational variable and provided support for the CIM¹³.

The CIM suggests that more contact experience with members of one's own racial group does not automatically moderate the ORE (Study 1). Results of the present study are not consistent with the contact experience theory, where individuals who have been in contact with members of their own racial group for a long time, develop more perceptual experience in distinguishing and recognizing faces of their own racial group, resulting in recognition advantages for own-race faces. Furthermore, the theory suggests that if there is only contact with members of one's own racial group, there is no motivation to individualize the processing of other-race faces (Study 2) and it does not impact the ORE. This result is consistent with Young et al.²¹.

The increased performance in recognition of other-race faces with high social status may be because other-race faces with high social status satisfy the individual's need to be respected and admired by others, which in turn triggers a motivation for subjects to individualize the processing of other-race faces. This is consistent with the CIM. The theory suggests that an other-race face that is relevant to the perceiver and satisfies some need of the perceiver, is likely to motivate the perceiver to individualize processing. The reduced performance of subjects in Study 2 in recognizing other-race faces with high social status, may be due to the weakened motivation of subjects to individualize the processing of other-race faces with high social status. This is a possibility, because the presentation of scene pictures from a Chinese context during the experiment, initiated subjects' perception of the social status of their own faces and reduced their perceptions of the social status of other-race faces. This did not satisfy the needs of individuals when they are racial identities, thus leading to lower motivation, which is consistent with Becker and Leininger's study where they found that a higher congruence of the priming stimulus with the face picture, led to more attention and allocation of cognitive resources to congruent faces by the subjects²⁸.

The re-perception scores of high social status faces are significantly higher than those of low social status faces because high social status increases individuals' expectations of being respected, admired, and obeyed by others in their social environment, which leads to a strong motivation in individuals to pursue higher social status. Thus, individuals increase their feelings of being respected and obeyed by others, by changing their behaviors to improve or maintain their social status from being threatened. For example, choosing jobs with a higher social status, making friends of higher social status, volunteering to take on more tasks at work, behaving positively, being more generous to others, and trying to maintain their public image^{29,30}. There is a need to further validate the relationship between social status and social motivation through eye-movement techniques, EEG, and other brain imaging techniques, to gain more insight into the mechanisms underlying social status that influence individual behaviors.

However, there are some limitations of the current study. First, the sample size of the present study may be underpowered. Second, our study was only based on signal detection theory and did not measure response time, which may be a potential variable worth further exploration in the future.

Previous research has shown that the ORE exists not only across races³¹, but also between groups that can be visually distinguished (e.g., age, gender, religion) and even arbitrarily differentiated groups (e.g., universities and corporations)^{14,32,33}. These ways of group differentiation were involved in a variety of scenarios in everyday life. Future research could examine the relationship between motivation and ORE across groups of different natures, to more comprehensively explore the causes of the ORE and attempt to reduce prejudice among different groups. All subjects in this study were from China, but studies have suggested that there may be differences in individuals' individualized experiences and individualized motivations among different cultures, which in turn may produce different cognitive processing mechanisms for face recognition³⁴. Therefore, it is necessary to include cultural differences in the independent variables for further investigation.

Conclusion

Motivation plays an important role in the generation of ORE. When increasing an individual's motivation to process other-race faces, the individual's recognition performance of other-race faces with high social status improves significantly, which in turn attenuates the ORE. However, this recognition advantage disappears as motivation attenuates.

Declarations

Consent to participate All participants signed an informed consent form agreeing to participate in the study and the publication of the results and identifiable images.

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Figures

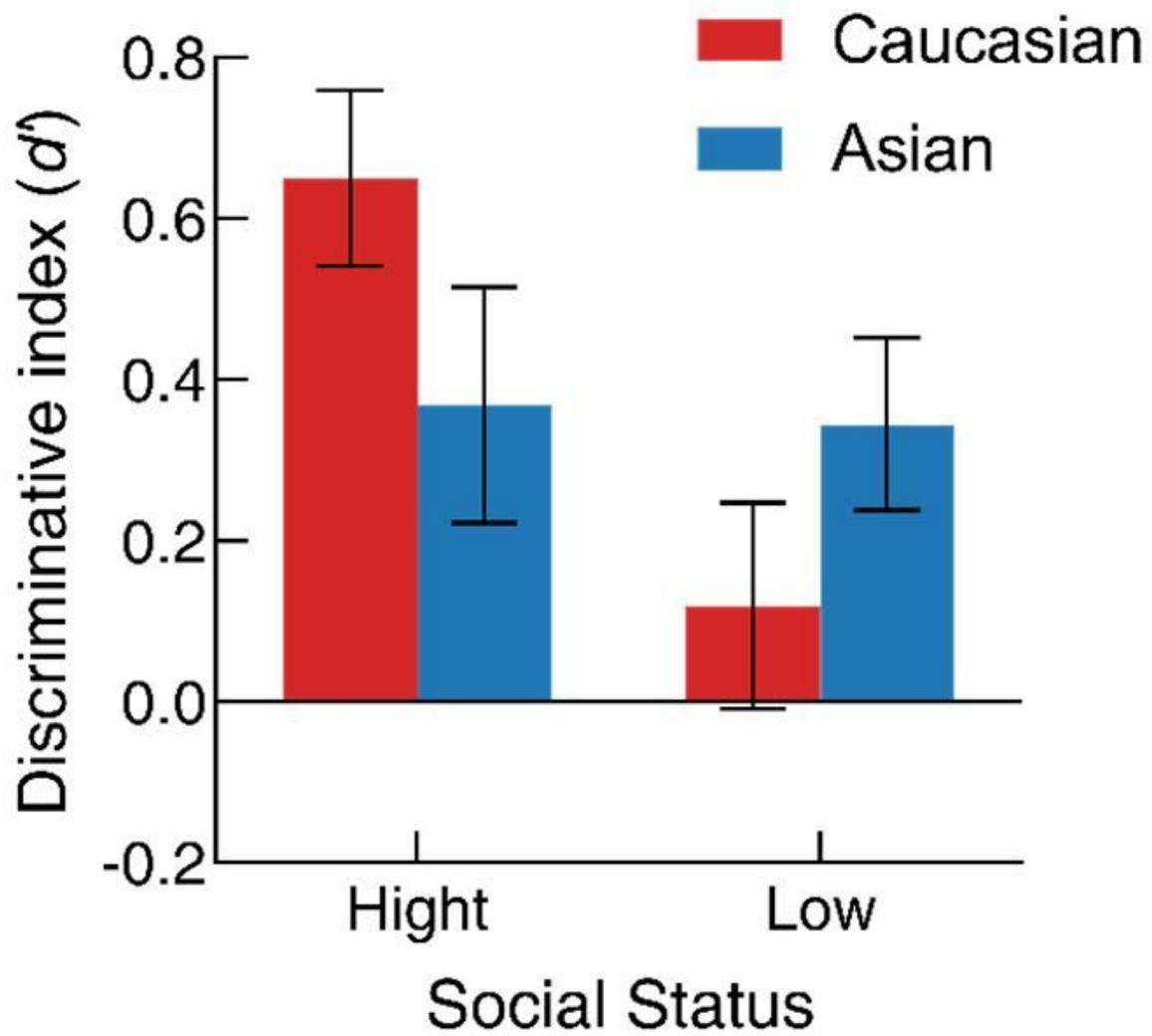


Figure 1

Histogram of the interaction between racial faces and the mean discriminative index (d') of social status in Study 1. Error bars: \pm SEM.

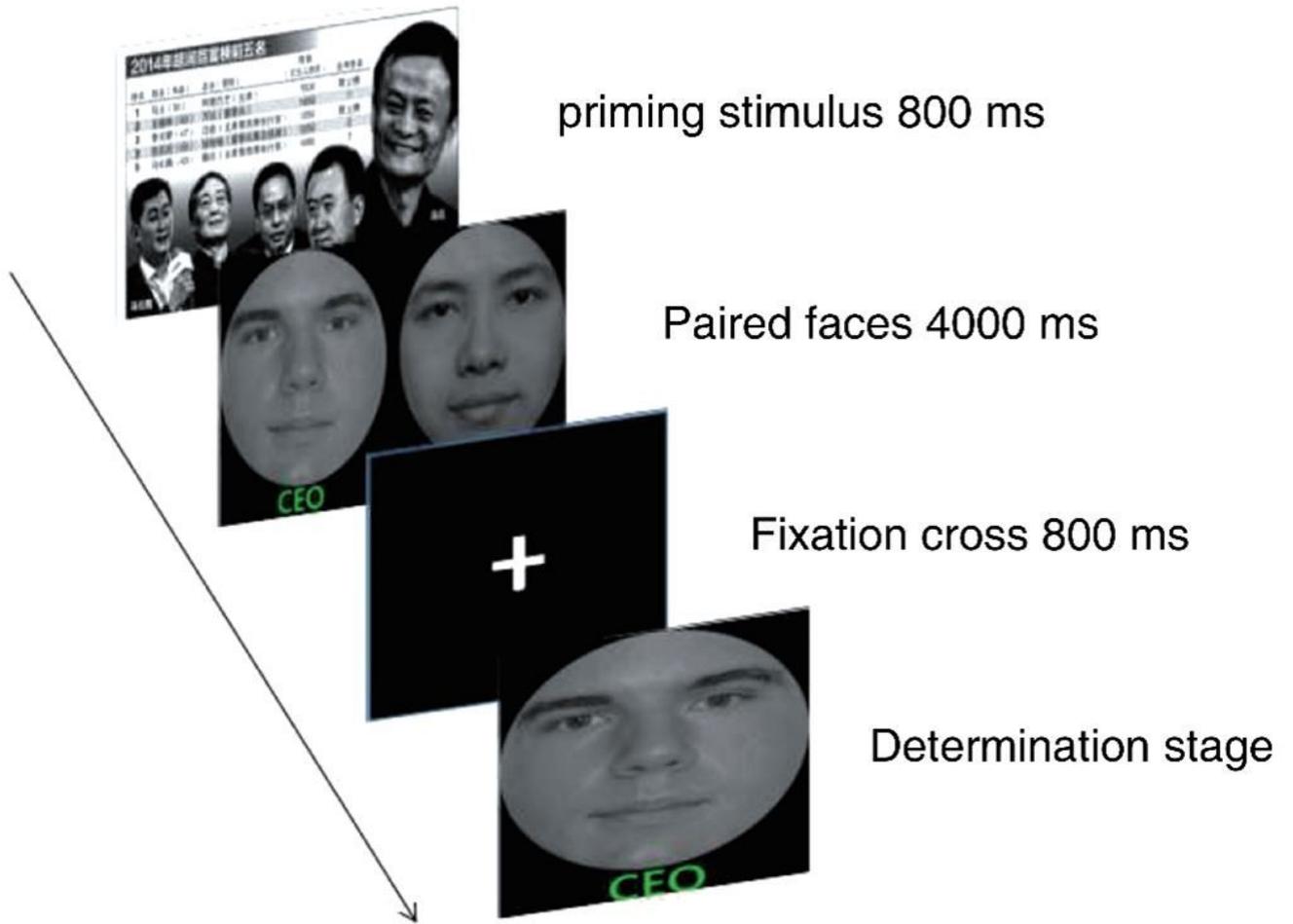


Figure 2

Flow chart of the experiment in Study 2.

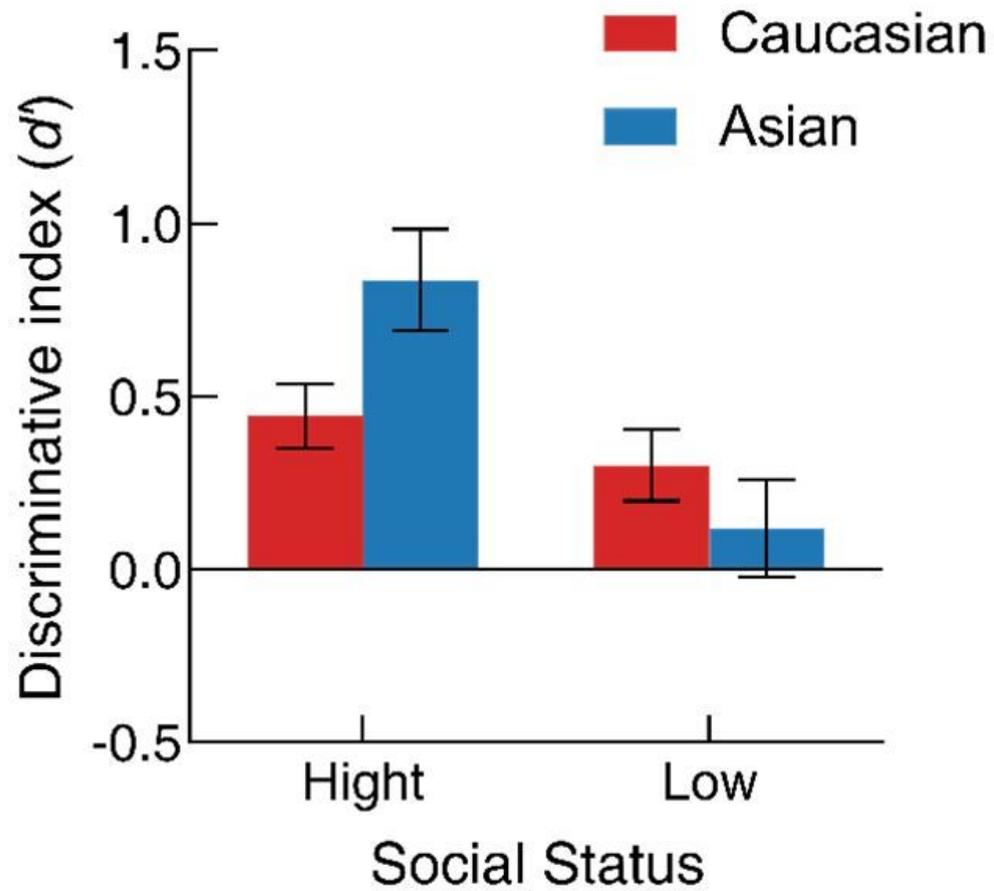


Figure 3

Histogram of the interaction between racial faces and the mean discriminative index (d') of social status in Study 2. Error bars: \pm SEM.