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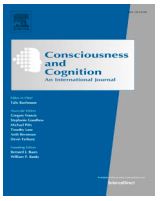

Full Length Article

The self can be associated with novel faces of in-group and out-group members: A cross-cultural study

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ABSTRACT

The self can be associated with arbitrary images, such as geometric figures or unknown faces. By adopting a cross-cultural perspective, we explored in two experiments whether the self can be associated with faces of unknown people from different ethnic groups. In Experiment 1, Asian Japanese participants completed a perceptual matching task, associating Asian or White faces with themselves. The same task was used in Experiment 2 with White Italians. Both experiments showed a reliable association between the self and facial stimuli. Importantly, this association was similar for both Asian and White faces. Additionally, no correlations were found between the strength of this association and an index of implicit bias towards Asian and White individuals. These results suggest that the self is malleable and can incorporate social stimuli from different groups.

1. Introduction

A wide body of research within various psychology domains has focused on the concept of the self, penetrating its nature and boundaries (e.g., Gillihan & Farah, 2005). These studies collectively highlight our exceptional sensitivity to self-related information, illustrating how, for instance, stimuli intrinsically linked to our identity, such as our names or faces, are identified more promptly than similar stimuli associated with others (e.g., Tacikowski & Nowicka, 2010). This bias towards self-referential stimuli is a fundamental aspect of human psychology, profoundly influencing our cognitive processing (e.g., Cunningham & Turk, 2017). It reveals an innate tendency to prioritise information connected to our identity, thus affecting how we interact within social environments. Furthermore, at the core of this research topic is the understanding that the self is not a static entity but a dynamic and multifaceted construct that adapts and evolves in response to internal and external stimuli (e.g., Tsakiris, 2017).

Recent works have particularly underscored the capacity of the self to form associations with a broad spectrum of arbitrary stimuli. From an experimental point of view, this tendency has been extensively explored by adopting a behavioural paradigm composed of two phases (Sui et al., 2012). First, participants are typically asked to associate their identity, as well as the identities of a friend and a stranger, with different arbitrary stimuli (in the original work of Sui et al., 2012, these stimuli were simple geometrical shapes; e.g., the identity ‘you’ was associated with a circle, a ‘friend’ with a square, a ‘stranger’ with a triangle). Then, participants are asked to complete a behavioural matching task in which one of the stimuli appears on the screen alongside a label denoting one of the three identities (e.g., the label ‘you’ and the picture of a circle, or the label ‘stranger’ and the picture of a square). The task consists of

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providing a manual response to decide whether the association between the stimulus and the label matches the previously learned association. The main results show that when a correct match between the stimulus and the label occurs, responses are faster and more accurate for the self-related condition (e.g., the label 'you' and the picture of a circle) than all others (e.g., the label 'stranger' and the picture of a square). This evidence suggests a self-prioritisation effect and further emphasises the dynamic nature of the self.

The paradigms pushed forward by Sui et al. (2012) generated flourishing literature aimed at assessing the mechanisms through which the associations between the self and a stimulus are formed, examining the conditions under which the self can extend its boundaries to incorporate external elements of different nature (e.g., Frings & Wentura, 2014; Macrae et al., 2017; Schäfer et al., 2015, 2016; Sel et al., 2019; Stein et al., 2016; Vicovaro et al., 2024). In this regard, some works showed that the valence of a given category of stimuli can shape the self-prioritisation effect, with stimuli associated with a more positive valence capable of eliciting a stronger effect. For instance, Moradi et al. (2015) asked football supporters to associate the badges of different football teams (including both the participants' favourite one and other rivals) with geometrical shapes. When a correct match between the badge and the shape occurred, faster responses emerged for the favourite team badge. In addition, the magnitude of this association was positively correlated with an index of group satisfaction. Golubickis et al. (2021) observed that participants' identities associated with desirable (positive valence) objects elicited a reliable self-prioritisation, whereas self-prioritisation was absent when participants' identities were associated with undesirable (negative valence) objects. In a similar vein, Vicovaro et al. (2022) found a robust self-prioritisation effect when the self was associated with symmetrical visual stimuli, which are generally associated with a positive valence, whereas no self-prioritisation effect emerged when the self was associated with asymmetrical stimuli, which are generally associated with a negative valence. These findings collectively suggest that self-associations with negative categories can weaken or even nullify the self-prioritisation effect.

A few papers have also documented the possibility of linking – through the experimental procedure described by Sui et al. (2012) – the self to facial stimuli of unknown people (Constable et al., 2021; Payne et al., 2017; Woźniak et al., 2018, 2023; Wozniak & Hohwy, 2020; Woźniak & Knoblich, 2019). This reinforces the idea that the self can incorporate stimuli that – by definition – only belong to other identities, not one's own. Of particular interest to our work, two studies have examined how certain facial features might influence the self-prioritisation effect. Constable et al. (2021) found that participants who associated themselves with happy faces, as opposed to sad faces, demonstrated a stronger self-prioritisation effect. This further confirms the relevant role of valence in shaping this phenomenon. Woźniak et al. (2023) assessed the potential impact of gender membership on the strength of self-prioritisation and found the same pattern of results regardless of whether participants were asked to associate themselves with a same-gender versus a different-gender face.

A further social characteristic of faces, which, like emotions or gender, conveys fundamental information of social and biological relevance, is ethnic group membership (e.g., Young & Burton, 2018). In this context, it is interesting to note that within the literature concerning the self-prioritisation effect as operationalised by Sui et al. (2012), the consideration given to this social variable is absent. One study (Wozniak & Hohwy, 2020) reported that participants, who were half Asian and half White, were presented with faces of their ethnicity. In all other studies, clear information about ethnic membership was not provided, leaving the potential impact of ethnic membership on the self-prioritisation effect unknown. The main aim of our work was to address this gap. Exploring the influence of ethnic group membership on the self-prioritisation effect is highly relevant, given the well-documented tendency to express a positive bias towards the in-group and a negative bias towards the out-group (see, e.g., Allport, 1954; Brewer, 1999; Greenwald & Pettigrew, 2014). This, in turn, would indicate a preference for attributing more positive valence to one's own ethnic group compared to others. Our study investigated whether the valence typically associated with one's own versus another ethnic group can modulate the self-prioritisation effect, similar to the modulation observed with emotional faces (Constable et al., 2021), or with stimuli lacking strong social connotations, such as symmetric/asymmetric shapes (Vicovaro et al., 2022) or desirable/undesirable symbols and items (Golubickis et al., 2021; Moradi et al., 2015).

1.1. *The present work*

In two experiments, we tested whether ethnic membership could impact the self-prioritisation effect. We adopted a cross-cultural perspective, involving Asian Japanese individuals (Experiment 1) and White Italian individuals (Experiment 2), who were presented with Asian and White facial stimuli.

All participants were recruited and tested within their respective countries to maximise the cultural identity representation of the two groups. The experimental structure, consisting of two phases, was identical for both groups. In the first phase, participants completed a version of the Implicit Association Task (IAT; Greenwald et al., 1998), where they had to manually discriminate between Asian and White faces and positive and negative words. This widely used task collected data on the participants' implicit biases toward the two social groups. Consistent with the results of previous studies (e.g., Cunningham et al., 2001; Dunham et al., 2006; Greenwald et al., 1998), we anticipated a positive bias toward the participant's own ethnic group. In the second phase, participants completed a task inspired by the classic matching task proposed by Sui et al. (2012), where they identified themselves as belonging to one group (i.e., Asian or White) and a hypothetical stranger as belonging to the other group. They then performed a matching task to determine whether a face (i.e., an Asian or a White face) and a label (i.e., 'You' or 'Other') were correctly matched based on previously learned association. The association between identity (i.e., self and stranger) and group (i.e., Asian and White) was counterbalanced across two blocks within the same participants. Overall, we hypothesised a stronger self-prioritisation effect when participants were asked to associate themselves with their ethnic group rather than with the other, in line with previous research showing a link between valence and self-prioritisation (Constable et al., 2021; Golubickis et al., 2021; Moradi et al., 2015; Vicovaro et al., 2022).

2. Experiment 1: Asian Japanese participants

Participants

We tested 40 naïve Asian Japanese individuals residing in Japan (*Mean age* = 21 years, *SD* = 1.49, 19 males). The study received approval from the Institutional Review Board of Waseda University and was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants.

The sample size is similar to (or slightly larger than) that of previous studies exploring the relationship between stimulus valence and self-prioritization (Golubickis et al., 2021, Moradi et al., 2015; Vicovaro et al., 2022, Experiment 1). We provide a reasoned justification of sample size adequacy. In Sui et al. (2012), the magnitude of the self-prioritisation effect was assessed by comparing latencies and errors for self- and other-related matched trials. In the current study, for matched trials only, the η_p^2 for the two-way interaction between condition (i.e., associating the self with positive vs. negative stimuli) and trial type (i.e., self- vs. other-related stimuli) served as a measure of the strength of the modulation effect of condition on self-prioritisation. Our simulations using the Superpower R package (Lakens & Caldwell, 2021) suggested that a sample size of 40 ensured a power of 0.80 for an effect size of the interaction corresponding to $\eta_p^2 = 0.175$ (with power exceeding 0.80 for larger η_p^2 values). This η_p^2 value can be compared with Vicovaro et al.'s (2022, Experiment 1, $N = 30$) results, which closely resembled the present experimental design (with symmetric/asymmetric shapes as stimuli instead of faces of different ethnic groups). In that experiment, the size of the interaction was $\eta_p^2 = 0.65$. This suggests that if the modulatory role of valence remains similar in this work, then the power of this study would be larger than 0.99.[1]

Apparatus, materials, and procedure

The experimenter was an Asian Japanese individual residing in Japan, and all textual stimuli were presented in Japanese. The experiment comprised two main parts, as illustrated in Fig. 1. Initially, participants undertook the IAT, based on the OpenIAT code for PsychoPy (https://gitlab.pavlovia.org/demos/openiat). Briefly, a central black cross (0.1 height units) was displayed for 500 ms, followed by words (0.05 height units) and faces (0.5 × 0.5 height units) presented at the centre. Participants were instructed to categorise these stimuli as positive/negative and Asian/White using keypresses (i.e., the 'A' and 'L' keys). The 'A' key was consistently associated with 'positive' valence, and the 'L' key with 'negative' valence. The association between the key and the face type was counterbalanced within blocks. Text boxes in the left-bottom and right-bottom screen corners reminded participants of the key-valence/face associations. There were no time limits for responses, but participants were encouraged to respond as quickly and accurately as possible. Incorrect responses were indicated by visual feedback, with the word 'oops' displayed at the screen's centre for 500 ms. Faces were extracted from a database containing Asian and White faces (Nakamura et al., 2019; see also Dalmaso et al., 2023b) and were matched for luminance and spatial frequency using the MATLAB toolbox 'SHINE_color' (Dal Ben, 2021). We selected five Asian females, five White females, five Asian males, and five White males. Only same-gender faces were shown to participants.

The IAT consisted of five blocks. The first block (10 trials) involved categorising five positive (i.e., good, happiness, fun, love, joy) and five negative (i.e., bad, pain, fear, nightmare, terrible) words. The second block (10 trials) required categorising five Asian and five White faces. The third block (20 trials) combined words and faces categorisation. The fourth block (10 trials) was identical to the second but reversed the key-face associations. The fifth and final block (20 trials) was akin to the third, maintaining the key-face associations from the fourth block. The IAT scores were derived from the third and fifth blocks, where participants associated Asian and White faces with keys used for positive and negative word categorisation. A block was labelled 'congruent' when the same key was used for Asian (versus White) and positive (versus negative) words, and 'incongruent' for the opposite associations. The sequence of 'congruent' and 'incongruent' blocks was counterbalanced across participants.

After the IAT, participants completed a version of the perceptual matching task originally proposed by Sui et al. (2012). At the beginning of the experiment, they were asked to associate themselves with either an Asian or a White individual. This association was induced by displaying one of the following sentences for 40 s at the centre of the screen: 'In this experiment, you are an Asian individual, and another person is a White individual', or 'In this experiment, you are a White individual, and another person is an Asian individual'. Subsequently, the experimental task started. Each trial began with a black fixation cross (0.05 height units) appearing at the centre for 400 ms (Fig. 1). Then, 180 pixels above the centre, an Asian or White face (300 × 300 pixels) was shown for 200 ms, accompanied by one of two words, 'YOU' or 'OTHER' (0.04 height units), positioned 50 pixels below the fixation cross. For this task, four novel faces (one Asian female, one White female, one Asian male, and one White male) were employed. They were extracted from the same database used in the IAT task and matched the participant's gender. Participants were instructed to press, as quickly and accurately as possible, one of two buttons ('A' or 'L', counterbalanced across participants) to indicate whether the face-label association was correct or incorrect, according to the initial association (e.g., if an Asian face appeared with the word 'YOU' and participants were instructed to associate themselves with an Asian individual, they had to respond 'correct'). They had a maximum of 1000 ms to respond, during which a blank screen was displayed. Correct responses were indicated with the word 'OK', while incorrect and missed responses were marked with '!!!'. This visual feedback (0.04 height units) appeared at the centre of the screen for 500 ms. Participants completed two experimental blocks of trials, one in which the participant's self was associated with an Asian individual, and the other in which the participant's self was associated with a White individual. Therefore, the type of association (i.e., with an

[1] Power remains appropriate even when compared to results from studies employing different methods than those utilised here. Specifically, in the second experiment by Vicovaro et al.'s (2022; $N = 104$), where the condition (i.e., association of the self with symmetric or asymmetric shapes) was manipulated between participants, the η_p^2 was 0.257. Additionally, Golubickis et al. (2021) reported $\eta_p^2 = 0.354$. Although their task differed from that used in the present study, the underlying concept was akin to testing whether the magnitude of self-prioritisation is modulated by the condition (i.e., association of the self with desirable or undesirable items, manipulated within participants, $N = 40$).

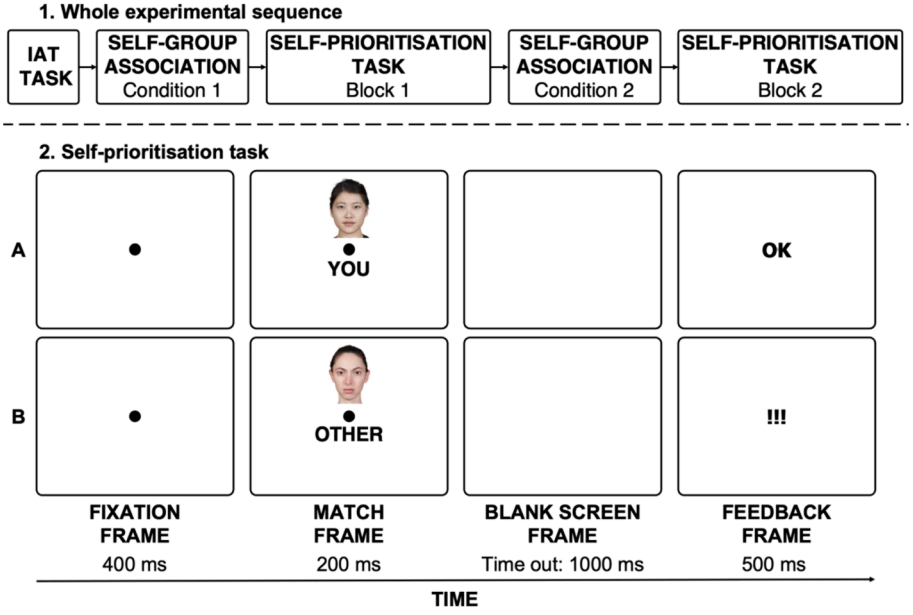

Fig. 1. The upper part of the figure illustrates all the phases that comprised the experiment. The lower part of the figure illustrates examples of the trials that made up the perceptual matching task. Panel A displays an Asian female face with the word 'YOU' and the feedback following a correct response (i.e., the word 'OK'). In contrast, panel B shows a White female face with the word 'OTHER' and the feedback for incorrect and missed responses (i.e., the symbols '!!!'). Please note that, for illustrative purposes, the depicted faces are sourced from the free-access MR2 database (Strohminger et al., 2016). In Experiment 1, the labels 'YOU' and 'OTHER' were presented in Japanese, while in Experiment 2, they were presented in Italian.

Asian or with a White individual) was manipulated within participants (for previous studies featuring within-participant manipulations of self-other associations, see Vicovaro et al., 2022, Experiment 1; Wang et al., 2016). A new sentence was displayed for 40 s between the two experimental blocks to induce the new self-group association. Each experimental block consisted of 180 trials (360 trials in total), resulting from 45 repetitions of each combination of face type (Asian or White) and label ('YOU' or 'OTHER'). A practice block of 20 trials preceded each experimental block. Stimuli were presented in a random order in the experimental and practice blocks. The order of the blocks and the association between the response key and the type of response were counterbalanced across participants.

2.1. Results and discussion

Data were analysed with JAMOVI software (https://www.jamovi.org) within frequentist and Bayesian frameworks.

Perceptual matching task

Trials with a missing response were rare (3.24 % of trials), so they were discarded and no longer analysed. Trials where participants responded incorrectly (18.68 % of trials) were also discarded and analysed separately. Trials in which participants provided a correct response, with a Reaction Time (RT) smaller than 200 ms (1.56 % of trials), were eliminated (see also Sui et al., 2012). RTs and the percentage of errors were analysed with two separate repeated-measures ANOVA including the factors identity (2: you vs. other), matching judgement (2: matched vs. nonmatching), and condition (2: self_Asian vs. self_White).

The frequentist analyses of RTs revealed that the main effect of identity was significant, $F(1, 39) = 35.705$, $p < 0.001$, $\eta_p^2 = 0.478$, due to smaller RTs for the 'you' trials ($M = 637$ ms, $SE = 17.50$) than for the 'other' trials ($M = 668$ ms, $SE = 18.26$). The main effect of matching judgement was also significant, $F(1, 39) = 40.851$, $p < 0.001$, $\eta_p^2 = 0.512$, due to smaller RTs on matched trials ($M = 636$ ms, $SE = 17.27$) than on nonmatching trials ($M = 669$ ms, $SE = 18.46$). The main effect of condition was non-significant, $F(1, 39) = 2.683$, $p = 0.109$, $\eta_p^2 = 0.064$. The interaction between identity and matching judgement was significant, $F(1, 39) = 89.544$, $p < 0.001$, $\eta_p^2 = 0.697$. Further comparisons showed that, on matched trials, the RTs were significantly smaller for 'you' trials ($M = 595$ ms, $SE = 16.47$) than for 'other' trials ($M = 678$ ms, $SE = 19.12$), $t(39) = 9.327$, $p < 0.001$, which is a hallmark of the self-prioritisation effect. Instead, on nonmatching trials, the RTs were significantly larger for 'you' trials ($M = 679$ ms, $SE = 19.37$) than for 'other' trials ($M = 659$ ms, $SE = 18.00$), $t(39) = -3.471$, $p = 0.001$. The theoretically irrelevant interaction between matching judgement and condition was also significant, $F(1, 39) = 4.925$, $p = 0.032$, $\eta_p^2 = 0.112$, whereas the interaction between identity and condition was non-significant, $F(1, 39) = 2.434$, $p = 0.127$, $\eta_p^2 = 0.059$. Importantly, the theoretically relevant three-way interaction was non-significant, $F(1, 39) = 0.176$, $p = 0.677$, $\eta_p^2 = 0.005$ (see also Fig. 2A). In relation to our initial hypothesis, it is notable that, on matched trials, the interaction between condition and identity was not statistically significant, $F(1, 39) = 0.522$, $p = 0.474$, $\eta_p^2 = 0.013$. In essence, contrary to our anticipations, a pronounced self-prioritisation effect manifested regardless of the ethnicity of self-related faces (see also the nearly

parallel trends depicted in the leftmost panel of Fig. 2A).

The Bayesian analysis of RTs revealed that the best-fitting model included the three main effects and the identity × match and match × condition interactions. This model was about ten times more preferable ($BF_{01} = 9.091$) than the saturated model including the three-way interaction.

The frequentist analyses of errors showed that the main effect of identity was significant, $F(1, 39) = 37.633$, $p < 0.001$, $\eta_p^2 = 0.491$, due to fewer errors on the 'you' trials ($M = 15.79$ %, $SE = 1.879$) than on the 'other' trials ($M = 21.57$ %, $SE = 1.854$). The main effect of matching judgment was non-significant, $F(1, 39) = 0.164$, $p = 0.687$, $\eta_p^2 = 0.004$, as well as the main effect of condition, $F(1, 39) = 0.100$, $p = 0.753$, $\eta_p^2 = 0.003$. The interactions between identity and condition, and matching judgement and condition, were both non-significant, with $F(1, 39) = 0.727$, $p = 0.399$, $\eta_p^2 = 0.018$, and $F(1, 39) = 1.153$, $p = 0.290$, $\eta_p^2 = 0.029$, respectively. More importantly, the interaction between identity and matching judgement, $F(1, 39) = 58.099$, $p < 0.001$, $\eta_p^2 = 0.598$, and the three-way interaction, $F(1, 39) = 6.635$, $p = 0.014$, $\eta_p^2 = 0.145$, were both significant. This latter interaction was further analysed with two additional ANOVAs, including the factors identity and condition, conducted separately for each level of the factor matching judgement. As for matched trials, the main effect of identity was significant, $F(1, 39) = 76.586$, $p < 0.001$, $\eta_p^2 = 0.663$, due to a smaller percentage of errors for 'you' trials ($M = 11.8$ %, $SE = 2.01$) than for 'other' trials ($M = 25.1$ %, $SE = 1.98$), in line with the self-prioritisation effect. Neither the main effect of condition, $F(1, 39) = 0.572$, $p = 0.454$, $\eta_p^2 = 0.014$, nor the interaction, $F(1, 39) = 2.248$, $p = 0.142$, $\eta_p^2 = 0.054$, were significant. This confirms the lack of evidence for a possible modulation of condition on self-prioritisation. The statistically significant three-way interaction in the main ANOVA appears to be due to a cross-over interaction between identity and condition in nonmatching trials (see the right panel in Fig. 2B), which did not emerge in matching trials. However, this crossover interaction was not explored further because it lacks theoretical significance.

The Bayesian analysis of errors revealed that the best-fitting model included the main effects of identity and match and the identity × match interaction. This model was about 1.5 times as preferable ($BF_{01} = 1.515$) as the saturated model that included the three-way interaction.

IAT scores and their correlation with the self-prioritisation effect

Data were analysed using the algorithm proposed by Nosek et al. (2013). The IAT scores, analysed with a one-sample *t*-test against zero, showed a slight implicit bias towards Asian individuals ($M = -0.124$, $SE = 0.077$), but the mean was not significantly different from zero, $t(39) = -1.605$, $p = 0.117$, $d = -0.254$, $BF_{10} = 0.553$. This suggests that, contrary to expectations, Japanese individuals did not show a consistent positive bias towards their own group.

To further explore the possible influence of an implicit bias towards the in-group on self-prioritisation, we first calculated a general index of the individual magnitude of the self-prioritisation effect (hereafter named 'SPEi'), as in Sui et al. (2013). Specifically, for each participant, we computed the difference between 'you' and 'other' trials (i.e., 'you' minus 'other') on matching trials, by combining RTs and errors to create a single measure using the following formula: RT/Proportion of correct responses. Two separate SPE_is were obtained, one for Asian faces ($SPEa_i$) and the other for White faces ($SPEw_i$). Then, a ΔSPEi was obtained according to the following formula: $SPEw_i - SPEa_i$. A positive ΔSPEi denotes a greater self-prioritisation effect when the self is linked to an Asian individual and the other identity to a White individual, in contrast to the condition where this association is reversed.[2]

Then, we computed the correlation between ΔSPEi and individual IAT scores. Here, a negative correlation would suggest that individuals who exhibit a relatively strong implicit positive bias toward Asian individuals also exhibit a stronger self-prioritisation effect when their identity is linked to an Asian individual, in contrast to when it is linked to a White individual. A very small, non-significant negative correlation emerged, $r(38) = -0.125$, $p = 0.444$, $BF_{10} = 0.261$ (see also Fig. 2C).

Discussion

The primary findings of Experiment 1 are summarised as follows: First, the analysis of the IAT scores showed no significant effects, indicating no implicit bias favouring either of the two groups. Secondly, the perceptual matching task clearly showed that participants associated themselves with the faces of unknown people – in line with previous studies (e.g., Constable et al., 2021; Payne et al., 2017; Woźniak et al., 2018). Indeed, a significant two-way interaction between identity and judgment in matching tasks emerged. This interaction showed that, for matched trials only, the performance was better in the 'you' trials than the 'other' trials (also see Sui et al., 2012). Third, the extent of the self-prioritisation effect remained consistent regardless of whether Japanese participants associated themselves with an Asian or a White individual. Fourth, our results did not reveal a robust correlation between IAT scores and a preference for linking the self to an Asian individual.

Despite the inconsistency of the perceptual matching task results with our predictions, these results do not allow us to reject the hypothesis that the valence associated with social groups is reflected in the self-prioritisation effect. Indeed, the lack of a modulatory role of the condition factor aligns with the absence of a bias towards in-group and out-group members, as revealed by the IAT test. However, the lack of a significant correlation between individual IAT and ΔSPEi scores warrants caution in proposing any link between these two domains. Experiment 2 will help clarify and contextualise the results observed in this first experiment.

3. Experiment 2: White Italian participants

Participants

[2] A two-tailed independent-sample *t*-test revealed that the ΔSPEi did not significantly deviate from zero ($M = -34.1$, $SE = 37.3$; $t(39) = -0.915$, $p = 0.366$, $BF_{10} = 0.252$), thereby confirming the absence, at a group level, of evidence supporting a modulation effect of the group associated with the self on the magnitude of self-prioritisation.

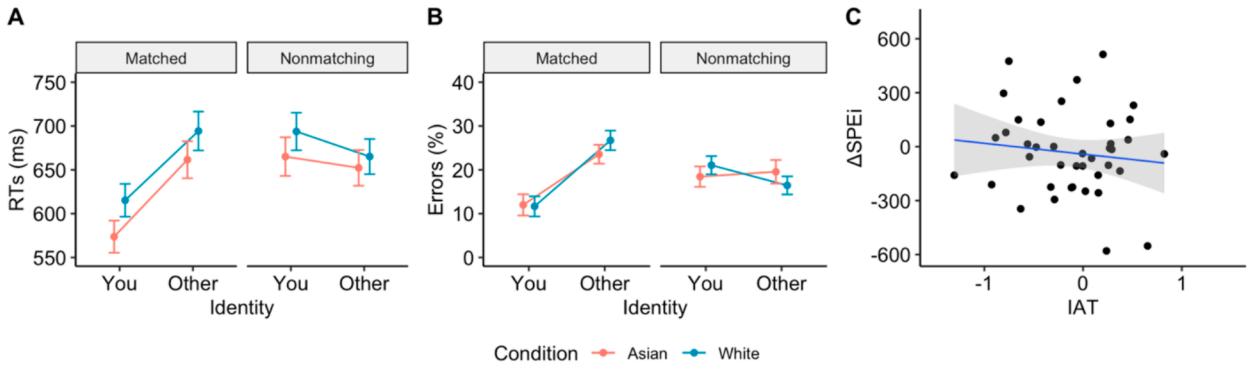

Fig. 2. Mean RTs (Panel A) and percentage of errors (Panel B) observed in the perceptual matching task of Experiment 1. Error bars are SEM. Panel C depicts the correlation between the IAT scores and the ΔSPEi; a linear model with a 95% confidence interval is fitted.

We aimed to test the same number of participants as were enrolled in Experiment 1. Therefore, a sample of 40 naïve individuals was tested (*Mean age* = 23 years, *SD* = 2.57, 16 males). All were White Italian individuals residing in Italy. The study received approval from the Ethics Committee for Psychological Research at the University of Padova and was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants.

Apparatus, materials, and procedure

In Experiment 2, everything was identical to Experiment 1, except for the following differences: The experimenter was a White Italian residing in Italy, and all textual stimuli were presented in Italian.

3.1. Results and discussion

Perceptual matching task

Data were analysed as in Experiment 1. Trials with a missing response were rare (4.15 % of trials), so they were discarded and no longer analysed. Trials where participants responded incorrectly (20.51 % of trials) were also discarded and analysed separately. Trials in which participants provided a correct response, with an RT smaller than 200 ms (0.83 % of trials), were eliminated.

The frequentist analyses of RTs revealed that the main effect of identity was significant, $F(1, 39) = 69.433$, $p < 0.001$, $\eta_p^2 = 0.640$, due to smaller RTs for the 'you' trials ($M = 648$ ms, $SE = 12.96$) than for the 'other' trials ($M = 687$ ms, $SE = 15.07$), as well as the main effect of matching judgement, $F(1, 39) = 81.642$, $p < 0.001$, $\eta_p^2 = 0.677$, due to smaller RTs on matched trials ($M = 642$ ms, $SE = 14.06$) than on nonmatching trials ($M = 692$ ms, $SE = 14.21$). The main effect of condition was non-significant, $F(1, 39) = 1.763$, $p = 0.192$, $\eta_p^2 = 0.043$. The interaction between identity and matching judgement was significant, $F(1, 39) = 47.031$, $p < 0.001$, $\eta_p^2 = 0.547$. Further comparisons showed that the difference between 'you' and 'other' trials was significant on matched trials, $t(39) = 8.10$, $p < 0.001$, due to smaller RTs on 'you' trials ($M = 598$ ms, $SE = 11.88$) than on 'other' trials ($M = 686$ ms, $SE = 17.69$), but not on nonmatching trials, $t(39) = -1.887$, $p = 0.067$. This pattern of results is consistent with the self-prioritisation effect. The interactions between identity and condition, $F(1, 39) = 0.004$, $p = 0.947$, $\eta_p^2 \approx 0.0$ and between matching judgement and condition, $F(1, 39) = 0.058$, $p = 0811$, $\eta_p^2 = 0.001$ were non-significant. The three-way interaction was significant, $F(1, 39) = 4.274$, $p = 0.045$, $\eta_p^2 = 0.099$. This latter interaction was further analysed with two additional ANOVAs including the factors identity and condition, conducted separately for each level of the factor matching judgement. As for matched trials, the main effect of identity was significant, $F(1, 39) = 65.61$, $p < 0.001$, $\eta_p^2 = 0.627$, due to smaller RTs for 'you' trials ($M = 648$ ms, $SE = 13.0$) than for 'other' trials ($M = 687$ ms, $SE = 15.1$), in line with the self-prioritisation effect. Neither the main effect of condition, $F(1, 39) = 1.50$, $p = 0.229$, $\eta_p^2 = 0.037$, nor the interaction, $F(1, 39) = 1.22$, $p = 0.276$, $\eta_p^2 = 0.030$, were significant. Once again, this indicates the lack of evidence for a possible modulation of condition on self-prioritisation. It is worth noting that, contrary to expectations, the difference in RTs between 'you' trials and 'other' trials was slightly more prominent when participants associated themselves with an Asian individual rather than with a White individual (see the left panel in Fig. 3A). As for nonmatchig trials, all the results were non-significant (*Fs* ≤ 3.56, ps ≥ 0.067, $\eta_p^2 \leq 0.084$).

The Bayesian analysis of RTs revealed that the best-fitting model included the main effects of identity and match and the identity × match interaction. This model was nearly ten times more preferable ($BF_{01} = 9.346$) than the saturated model including the three-way interaction.

The frequentist analyses of errors showed that the main effect of identity was significant, $F(1, 39) = 106.139$, $p < 0.001$, $\eta_p^2 = 0.731$, due to fewer errors on the 'you' trials ($M = 14.65$ %, $SE = 1.606$) than on the 'other' trials ($M = 26.38$ %, $SE = 1.564$), as well as the main effect of matching judgement, $F(1, 39) = 4.652$, $p = 0.037$, $\eta_p^2 = 0.107$, due to fewer errors on nonmatching trials ($M = 19.33$ %, $SE = 1.621$) than on matched trials ($M = 21.69$ %, $SE = 1.534$). The main effect of condition was non-significant $F(1, 39) = 0.073$, $p = 0.788$, $\eta_p^2 = 0.002$. The interaction between identity and matching judgement was significant, $F(1, 39) = 113.208$, $p < 0.001$, $\eta_p^2 = 0.744$. Further comparisons showed that the difference between 'you' and 'other' trials was significant on matched trials, $t(39) = 11.91$, $p < 0.001$, due to fewer errors on 'you' trials ($M = 10.61$ %, $SE = 1.712$) than on 'other' trials ($M = 32.78$ %, $SE = 1.872$), but not on nonmatching trials, $t(39) = -1.24$, $p = 0.221$. The interactions between identity and condition, $F(1, 39) = 0.30$, $p = 0.587$, $\eta_p^2 = 0.008$, and matching judgement and condition, $F(1, 39) = 0.298$, $p = 0.589$, $\eta_p^2 = 0.008$, were both non-significant, as well as the three-

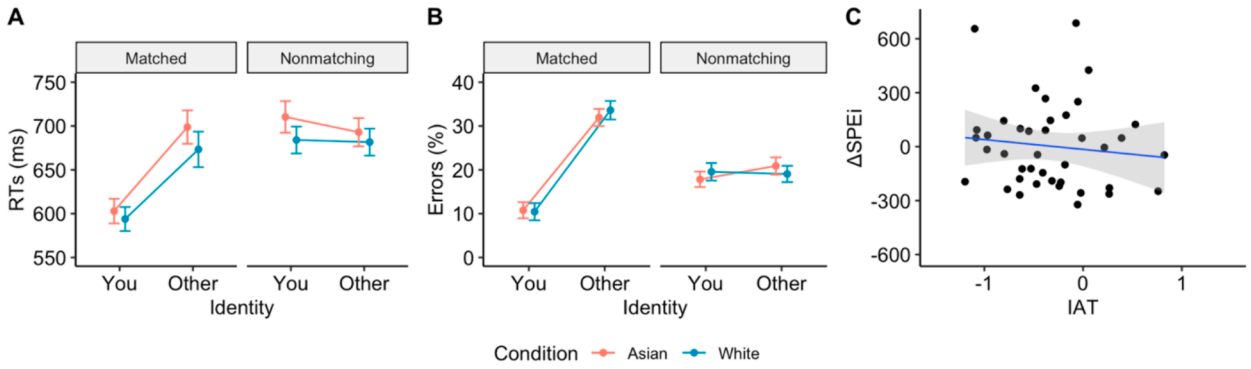

Fig. 3. Mean RTs (Panel A) and percentage of errors (Panel B) observed in the perceptual matching task of Experiment 2. Error bars are SEM. Panel C depicts the correlation between the IAT scores and the ΔSPEi; a linear model with a 95% confidence interval is fitted.

way interaction, $F(1, 39) = 3.045$, $p = 0.089$, $\eta_p^2 = 0.072$ (see also Fig. 3B).

The Bayesian analysis of errors revealed that the best-fitting model included the main effects of identity and match and the identity × match interaction. This model was more than fifty times more preferable ($BF_{01} = 55.556$) than the saturated model including the three-way interaction.

IAT scores and their correlation with the self-prioritisation effect

Data were analysed as in Experiment 1, keeping in mind that here in the 'congruent' block the same key was used for White (versus Asian) and positive (versus negative) words, whereas in the 'incongruent' block the opposite association was used. The IAT scores showed a statistically significant implicit bias, $t(39) = -4.195$, $p < 0.001$, $d = -0.663$, $BF_{10} > 150$, towards White individuals ($M = -0.334$, $SE = 0.08$). The ΔSPEi was calculated as in Experiment 1, with a positive value indicating a stronger tendency to associate the self with an Asian rather than a White individual.[3] As for Experiment 1, a very small non-significant correlation between the ΔSPEi and the IAT scores emerged, $r(38) = -0.114$, $p = 0.482$, $BF_{10} = 0.250$ (see also Fig. 3C).

Discussion

The results of Experiment 2 closely matched the main patterns observed in Experiment 1. The only important exception was that the IAT revealed a positive bias towards White individuals. Apart from that, the factor condition did not significantly affect the self-prioritisation effect, which has been confirmed by the two-way interaction between identity and matching judgments. This indicates that Italian participants, like Japanese, associated themselves equally with Asian and White faces. Additionally, there was no significant correlation between the IAT scores and the magnitude of the self-prioritisation effect.

These findings support the notion that unfamiliar faces from different groups can be associated with oneself. Notably, Italian participants, unlike their Japanese counterparts, conformed to the expectation of an implicit bias toward the in-group. Therefore, the absence of an effect of condition on the magnitude of self-prioritisation, and the lack of a correlation between individual IAT and ΔSPEi scores, support the idea that the self-prioritisation effect elicited by facial stimuli is unrelated (or relatively resistant) to implicit intergroup biases.

4. Comparisons between experiments 1 and 2

For completeness, exploratory analyses were also performed to compare the two groups. The same omnibus ANOVA used in Experiments 1 and 2 was computed, with the additional factor group (2: Asian Japanese vs. White Italian). The frequentist analyses of RTs revealed that the factor group interacted with matching judgment, $F(1, 78) = 5.155$, $p = 0.026$, $\eta_p^2 = 0.062$, as the difference between matched and nonmatching trials were smaller among Japanese than Italians. Group also interacted with condition $F(1, 78) = 4.443$, $p = 0.038$, $\eta_p^2 = 0.062$, as there was a tendency for Japanese and Italians to respond faster in the self_Asian and in the self_White condition, respectively, but none of the comparisons reached statistical significance. All other interactions involving the factor group were non-significant ($ps > 0.093$), and the main effect of group was non-significant as well, $F(1, 78) = 0.423$, $p = 0.517$, $\eta_p^2 = 0.005$.

The Bayesian analysis of RTs indicated that the best-fitting model included only the group × condition interaction. This model was highly preferable ($BF_{01} > 150$) compared to the saturated model that included the four-way interaction.

As for errors, the frequentist analyses revealed that the factor group interacted with identity, $F(1, 78) = 16.197$, $p < 0.001$, $\eta_p^2 = 0.172$, and this was further qualified by the three-way interaction between group, identity, and matching judgement, $F(1, 78) = 4.387$, $p = 0.039$, $\eta_p^2 = 0.053$. In the matched condition, the difference between 'you' and 'other' trials was significant in both groups ($ps < 0.001$), but smaller among Japanese (mean difference = 13.31 %, $SE = 1.71$) than Italians (mean difference = 22.17 %, $SE = 1.70$); in the nonmatching condition, the difference was non-significant in both groups ($ps > 0.119$). All other interactions involving the factor

[3] A two-tailed independent-sample *t*-test revealed that the ΔSPEi did not significantly deviate from zero ($M = 2.95$, $SE = 37.9$; $t(39) = 0.078$, $p = 0.938$, $BF_{10} = 0.171$), thereby confirming the absence, at a group level, of evidence supporting a modulation effect of the group associated with the self on the magnitude of self-prioritisation.

group were non-significant (*ps* > 0.063), and the main effect of group was non-significant as well, $F(1, 78) = 0.616$, $p = 0.435$, $\eta_p^2 = 0.008$.

The Bayesian analysis of errors indicated that the best-fitting model included only the group × identity interaction. This model was highly preferable ($BF_{01} > 150$) compared to the saturated model that included the four-way interaction.

Finally, the comparisons between the Japanese and Italian groups regarding the IAT scores, $t(78) = -1.89$, $p = 0.062$, $d = -0.42$, $BF_{10} = 1.084$, and the ΔSPEi, $t(78) = 0.70$, $p = 0.487$, $d = 0.156$, $BF_{10} = 0.287$, were non-significant, as well as the correlation between these two measures when the data of the two groups were merged, $r(78) = -0.133$, $p = 0.240$, $BF_{10} = 0.275$.

Discussion

The analyses did not reveal any relevant differences in the performance of the two groups. The only exception occurred in the analysis of errors made during the perceptual matching task, where a smaller difference was observed when comparing the 'you' and 'other' trials in the matching condition among Japanese participants compared to Italian participants.

5. General discussion

In the current work, we explored whether Asian and White individuals could associate themselves with novel faces belonging to both in-group and out-group members. We adopted the perceptual matching task proposed by Sui et al. (2012) and presented Asian Japanese participants residing in Japan (Experiment 1) and White Italian participants residing in Italy (Experiment 2) with Asian and White faces along with the label 'you' or 'other'. The task consisted of classifying the face-label pair as matching or not the initial information provided at the beginning of the task. A version of the IAT task was also delivered to collect a measure of implicit bias towards the two ethnic groups.

We observed that participants could associate themselves equally well with in-group and out-group faces. Notably, this pattern of results emerged in both Asian Japanese and White Italian individuals. This finding confirms that self-representations are highly flexible and can integrate various facial stimuli independently of the ethnic membership of the observer. Our research confirms previous studies where unfamiliar faces were successfully associated with the self (Constable et al., 2021; Payne et al., 2017; Woźniak et al., 2018, 2023; Wozniak & Hohwy, 2020; Woźniak & Knoblich, 2019), but it also goes further by demonstrating that ethnic identity does not limit this type of association. Although the explorative analyses conducted to compare the two groups revealed that their overall performances were similar, the error analyses indicated a difference that may stem from cultural backgrounds. Specifically, we observed that among Asian Japanese participants, the distinction between 'you' and 'other' matched trials was less pronounced compared to the White Italian sample. This finding aligns with previous studies that noted decreased self-referential effects among Asians (e.g., Jiang et al., 2019; Sparks et al., 2016) and could be tentatively interpreted as a reflection of collectivistic tendencies that would weaken the self-centred view of the individual in favour of a more inclusive and collective perspective (see, e.g., Triandis, 1988).[4] However, this possibility requires further investigation, and the fact that this pattern was only observed in the error analysis limits its interpretability and theoretical implications.

Our findings are theoretically consistent with those of Woźniak et al. (2023), where male and female participants formed similar associations with novel male and female faces. Future research should consider exploring another critical characteristic of faces that significantly affects interpersonal relationships and can shape different perceptual and cognitive mechanisms: age (see, e.g., Dalmaso et al., 2023a; Dalmaso & Vicovaro, 2021; Rhodes & Anastasi, 2012). It would be intriguing to see if face age can transcend self-concept boundaries. This exploration could be even more compelling if cultural differences continue to be considered, given that Western and Eastern cultures would perceive and treat younger and older people, and the ageism process in general, differently (see, e.g., Löckenhoff et al., 2009; North & Fiske, 2015).

The analysis of IAT scores between the two groups revealed distinct outcomes: No implicit bias was evident among the Asian Japanese participants, whereas the White Italian participants showed a significant implicit bias favouring their in-group. This finding among White Italians aligns with what is generally observed in IAT studies (e.g., Greenwald et al., 1998). In contrast, the absence of such bias in the Asian Japanese group was unexpected, considering previous findings suggesting that Japanese individuals also typically exhibit implicit in-group preferences (e.g., Dunham et al., 2006; Greenwald et al., 1998). However, it is also documented that Asian individuals sometimes exhibit a positive bias toward White individuals (e.g., Calanchini et al., 2022; Nosek et al., 2007), which could have potentially diminished the effectiveness of the IAT in our sample. Despite these variations in IAT scores, the self-prioritisation effects were consistent and similar between the two groups. Additionally, the correlational analyses between the IAT scores and the overall magnitude of the self-prioritisation effect yielded non-significant results, indicating that implicit biases toward or against certain ethnic groups did not affect the ability to associate faces from these groups with oneself. The pattern of results emerging from the IAT and the correlation analyses could imply that the mechanisms driving implicit ethnic bias differ from those governing the cognitive processes underlying the self-prioritisation effect. Alternatively, it could indicate the robustness of self-related processing, which may be less susceptible to subtle influences of implicit attitudes.

Overall, the main results emerging from this work starkly contrast with the robust modulation effects of stimulus valence observed in previous studies on the self-prioritisation effect that employed both facial (Constable et al., 2021) and symbols/items (Golubickis et al., 2021; Moradi et al., 2015; Vicovaro et al., 2022). One limitation of the current work is that only two ethnic groups were

[4] Various studies have suggested the potential role of culture in shaping cognition. For instance, a reviewer pointed out that some works observed an effect of cultural factors (and even religious beliefs) in the global–local and the attentional blink tasks (e.g., Davidoff et al., 2008; Hommel & Colzato, 2017).

considered. Expanding this research to include a broader range of cultural and ethnic backgrounds could improve the generalisability of the findings. Additionally, the lack of significant differences in the self-prioritisation effect between the two groups included here could be challenged when considering specific cultural contexts or social variables such as individual experiences with diversity. For instance, one might question whether our reported results would persist among ethnic groups with a history of increased tensions. In this regard, recent research demonstrated that some mechanisms underlying social attention – the tendency to orient attention toward the same location attended to by others (see, e.g., Dalmaso et al., 2020) – were reduced when the interacting pairs consisted of Israeli-Jewish and Muslim individuals (Nafcha et al., 2020). Furthermore, exploring the self-prioritisation effect using facial stimuli in more ecological, dynamic social interactions, where participants engage with live partners rather than static images, could provide deeper insights into how self-association with others develops in real-time social settings (for an example of a face-processing task with real a partner see, for instance, Hietanen et al., 2016).

In conclusion, these findings corroborate the view of the self-representation as a flexible and inclusive construct capable of integrating a broad range of facial stimuli. This flexibility could have profound implications for promoting social cohesion and understanding in increasingly multicultural societies. Further exploring these processes could also find implications in psychological interventions to reduce social biases (see also, e.g., Hong et al., 2024).

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CRediT authorship contribution statement

Mario Dalmaso: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Michele Vicovaro:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Akira Sarodo:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Project administration, Investigation. **Katsumi Watanabe:** Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data and experiment code can be found on OSF: https://doi.org/10.17605/OSF.IO/XA4H8.

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