Electrophysiological evidence that own-race faces are recognized more automatically

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Context

The Other-Race Effect (ORE) refers to a set of phenomena in which own-race faces are processed differently from other-race faces, resulting in a robust recognition disadvantage for other-race faces [1]. Despite numerous perceptual and social-motivational models, the role of attentional resources in the ORE is not well understood [2, 3]. Yet, these can play an important role in assessing perceptual and higher-level social-motivational factors [4]. Recently, we suggested that the own-race recognition advantage arises because of the relative inefficiency with which other race faces are perceptually processed, leading to greater input from higher level executive (i.e., decisional) processes for other- compared to own-race faces [5]. In this study, we aimed to replicate these findings and explore potential electrophysiological correlates of these effects.

Method

- Scalp electroencephalography (EEG; 64 channels) of twenty White participants (one excl.) was measured while they each performed 960 trials (20 blocks, 48 trials/block) of a dual task paradigm.
- **Dual-task paradigm (Fig. 1)**
  - ***Auditory Task (T1).*** Tone Categorization
  - ***Visual Task (T2)***. Recognition, with either a White (own-race) or Eastern Asian (EA, other-race) face.
    - Variation of the Stimulus Onset Asynchrony (SOA) between T1 and T2 onsets to modulate the ***overlap*** (and conflict for central attention resources) between the two tasks, (150, 300, 600, 1200ms; shorter SOA equals more conflict).
    - Variation in the ambiguity of facial identity using face morphing to modulate T2 processing **difficulty** (easy, hard).

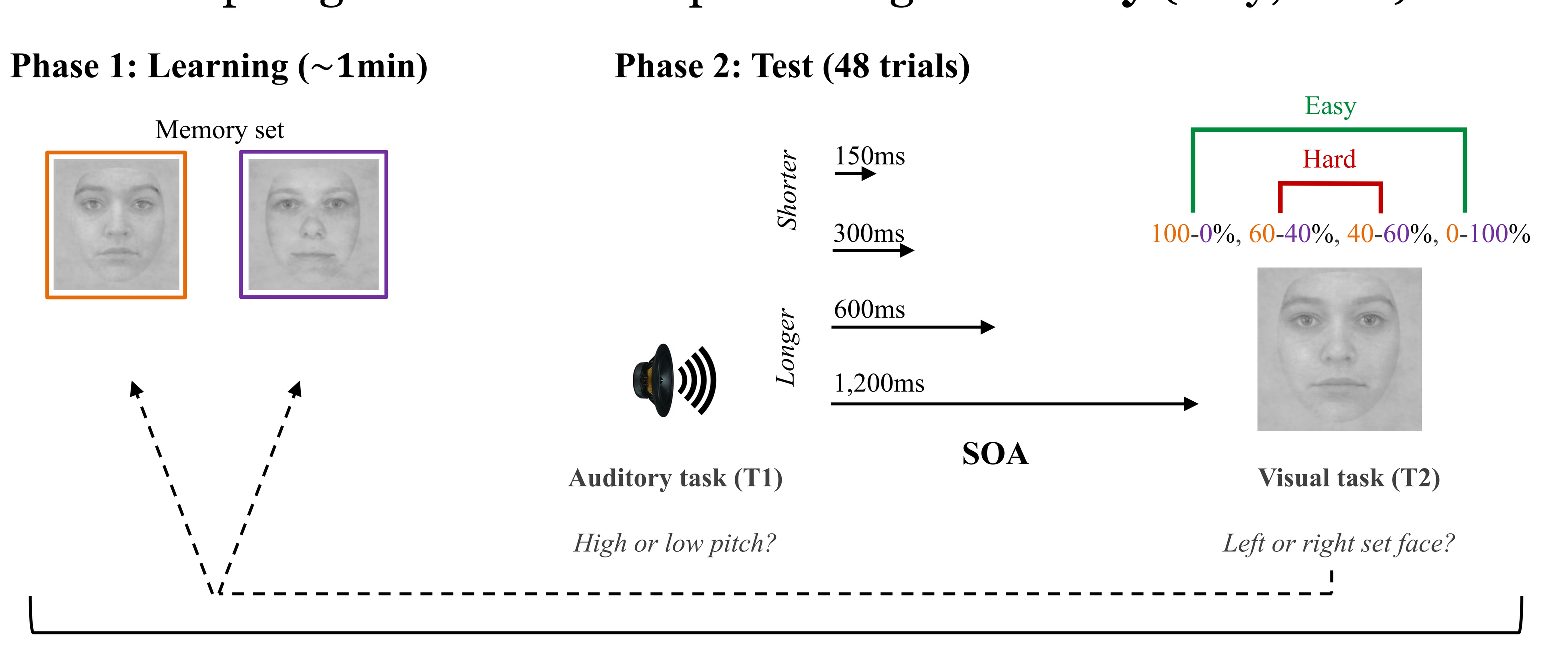

Figure 1. Experimental procedure. Participants had to learn a memory set of either two EA or White faces [Phase 1]. Then, they sequentially categorize a sound (T1, 150ms) as high or low pitch and matched a test face (T2, 200ms) to the appropriate set face [Phase 2]. Instructions emphasized participants performed both tasks online (i.e., without postponement).

Analyses and Results

Behavioral data (Fig. 2)

- RT2 were submitted to a 2 (Race) by 2 (Difficulty) by 4 (SOA) repeated measures (RM) ANOVA. The results replicated previous findings [5].
- For **EA faces**, the 58ms effect of difficulty was statistically constant across SOAs, $F(2, 37.5) = 1.3$, $p = 0.3$, showing postperceptual handling of this increased difficulty [4].
- For **White faces**, the effect of difficulty marginally decreased as SOA got shorter, from 84ms at longest SOA, $t(19) = 5.2$, $p < 0.001$, to 14ms at shortest SOA, $t(19) = 0.6$, $p = 0.53$, showing a typical locus-of-slack effect, $F(2,2, 4.6) = 2$, $p = 0.09$, and hinting at a perceptual handling of this difficulty [4].

EEG data (Fig. 3)

- ERP amplitudes were submitted to a 2 (Race) by 3 (SOA: 300ms, 600ms, 1,200ms) RM ANOVA.
- ***N170*** (sites P7, P8, PO7, PO8; 140-200ms) amplitudes were **larger for EA vs. White faces**, $F(1, 18) = 31.44$, $p < 0.001$, $\eta_p^2 = 0.64$, but also generally decreased as a function of SOA, $F(1.45, 26.09) = 13.82$, $p < 0.001$, $\eta_p^2 = 0.43$.
- ***N250*** (250-330ms) amplitudes were also **larger for EA vs. White faces**, $F(1, 18) = 75.36$, $p < 0.001$, $\eta_p^2 = 0.81$, and generally decreased along with SOA, $F(1.40, 25.13) = 13.71$, $p < 0.001$, $\eta_p^2 = 0.43$. Interestingly, these factors interacted. Specifically, the effect of race increased as SOA decreased, $F(1.95, 35.04) = 3.39$, $p < 0.05$, $\eta_p^2 = 0.16$ (see also **Fig. 4**).
- ***N200*** (sites FC1, FC2, and FCz; 300-380ms) amplitudes showed no effect of race ($F < 1$, $p > 0.2$), but did show an effect of SOA, $F(1.49, 26.77) = 14.86$, $p < 0.001$, $\eta_p^2 = 0.45$.
- ***P300*** (POz, and Oz; 300-400ms) amplitudes were **larger for White vs. EA faces**, $F(1, 18) = 9.52$, $p < 0.01$, $\eta_p^2 = 0.35$, and increased as SOA decreased, $F(1.52, 27.40) = 8.67$, $p < 0.01$, $\eta_p^2 = 0.33$.

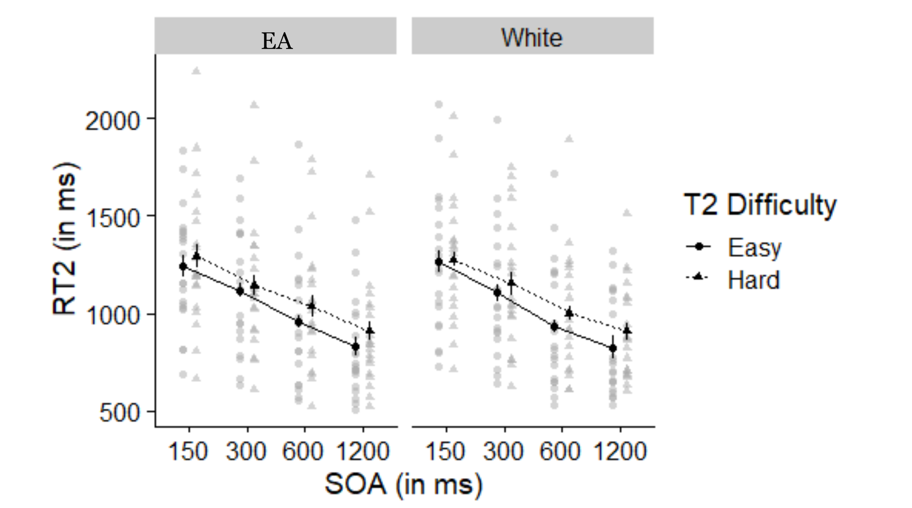

Figure 2. Behavioral performance (RT2). For EA (other-race) faces, the effect of difficulty is constant across SOA, indicative of postperceptual resolution. For White (own-race) faces, the effect decreases along with SOA, indicative of perceptual resolution.

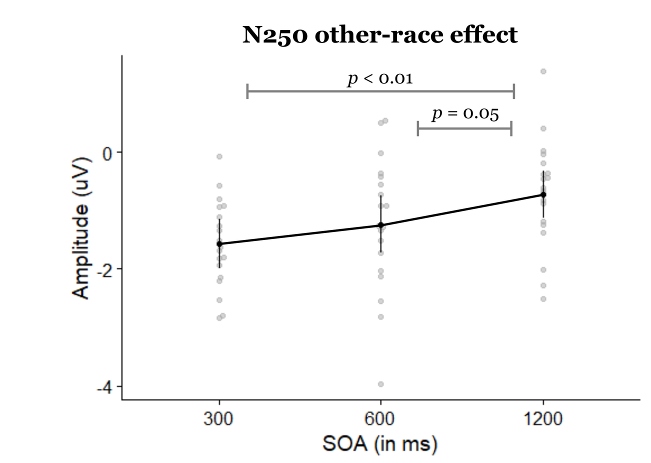

Figure 4. N250 other race effect. This effect increases as SOA decreases, and thus, T1-T2 processing overlap increases.

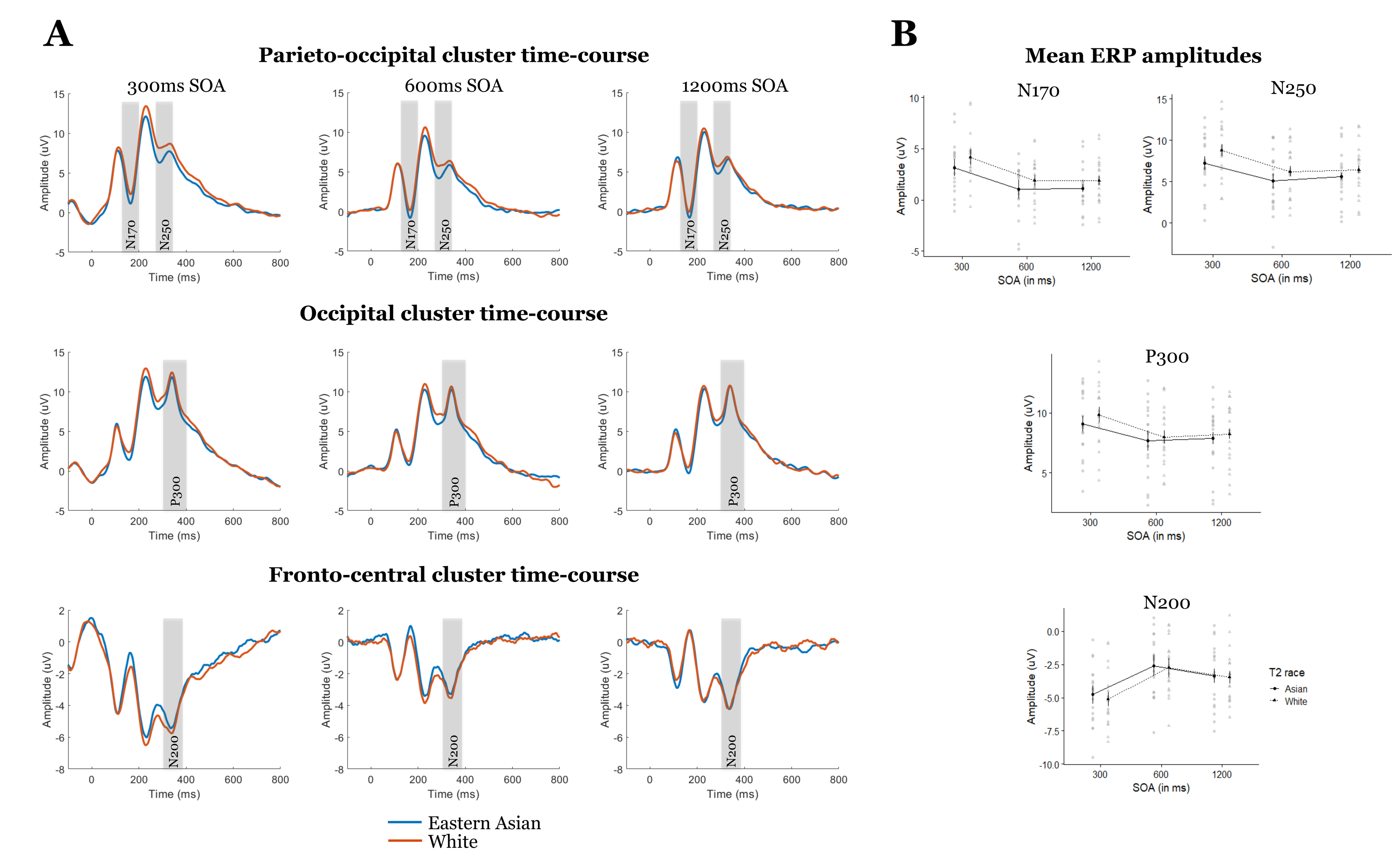

Figure 3. A. Mean ERP amplitudes as a function of SOA and stimulus race. B. EEG time-course from -100 to +800ms from T2 onset at parietooccipital sites (top), occipital sites (middle), and frontocentral sites (bottom) as a function of SOA (from left to right, 300ms, 600ms and 1200ms) and stimulus race.

Discussion

N170 (structural encoding) and N250 (matching percept to stored representations) both exhibited increased amplitudes for other-race faces, suggesting more sustained but also relatively inefficient perceptual processing, compared to own-race faces. That the N250 ORE increased as a function of central competition suggests this process might be more resilient to central attention scarcity when processing own race faces. Furthermore, subsequent P300 amplitudes were decreased for other-race faces, highlighting an increase in high-level (decision-making, working memory) resources expenditure [6,7,8]. Altogether, these results provide further support to our recent conclusions, namely that decreased perceptual efficiency with other race faces increases the need for higher-level resources when identifying other race faces, leading to the own race recognition advantage [5].

References
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