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RESEARCH ARTICLE

Shared surname enhances our preference to famous people: multimodal EEG evidence

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Abstract

Multimodal Electroencephalography techniques were used to determine whether the name of famous people undergoes self-relevant processing due to a shared surname with participants. During a three-stimulus oddball task, brain activity was recorded when participants suddenly saw their own names (self-name [SN]), a famous name with the same surname (FNS), or a famous name with a different surname (FND). While familiarity ratings were kept similar across the three kinds of name, behavioral analysis showed a higher rating on self-relevance for SN than for FNS, which, in turn, received a higher rating than FND. P2 amplitudes demonstrated a similar enhancement in response to SN and FNS compared to FND while P3 amplitudes and power of theta band (3.5–6 Hz) oscillation were more pronounced in response to SN than to FNS, which in turn elicited larger P3 and theta activities than FND. These findings, excluding the influence of familiarity, revealed that famous people sharing same surname with us could elicit a reliable self-relevant effect, despite lack of real social connection. This self-relevant processing may be embodied by the P3 amplitude and theta band neural oscillation in EEG.

Keywords Self-relevant effect · Surname · Event-related Potentials · P3 amplitude · Theta oscillation

Introduction

Imaging a social situation, in which you need to pick someone to cooperate with to complete a task, or you are asked to vote for some guy, whereas you have not even involved any social interactions with them before, what you can reference is just a list with their names on it. How could you make this hard decision, would you prefer to some guy just because of their name? It has been established that people react more quickly and accurately to self-relevant information than to self-irrelevant information (Bower and Gilligan 1979; Bargh 1982; Fischler et al. 1987; Sui et al. 2006; Miyakoshi et al. 2007; Tacikowski et al. 2013; Pfabigan et al. 2020), even in sleep (Blume et al. 2017). For example, Zhu and Zhang (2002) reported that items encoded in terms of self-reference are associated with significantly higher recall performance relative to items encoded in other ways, including semantic encoding. Self-face, compared to other faces, has an advantage in cognitive processing which can be seen in both behavioral and neural responses (i.e., shorter reaction times [RTs] and enhanced P300) (Tacikowski and Nowicka 2010; Woźniak et al. 2018). Self-name, which is a typical symbol of self-concept, has also been shown to lead to increased activation in the medial prefrontal cortex (Tacikowski et al. 2013) and enhanced P3 amplitude (Berlad and Pratt 1995) compared to self-irrelevant names. Furthermore, names of intimate others such as family members (Fan et al. 2013) or friends (Tacikowski et al. 2011) may evoke self-referential processing, due to their psychological salience and social relevance to us.

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However, it is unclear whether the name of someone who has no social interaction with us can also undergo self-preferential processing due to a shared feature in name (e.g., same surname), and this will help us better understand human behaviors in some specific social situations like raised in the beginning, Names consist of a surname and a first name (Chen et al. 2013). The surname (or family name) is a collective self-concept, which is the most fundamental social role one identifies with during early development and the source of one's early sense of belonging (Brewer 1991; Sedikides and Brewer 2002; Chen et al. 2013). Specifically, surname is a typical in-group sign for a group of individuals initially related to the same ancestor (Bond and Hwang 1986; Brewer 1991). Chen and his colleagues (2013) also found that a separately presented surname could elicit self-referential processing in brain potentials (Chen et al. 2013). However, little evidence to date has shown that a full name sharing the same surname with participants may evoke self-reference effect. Although in our previous study, the results showed that a stranger's name with same surname can get more attention in both earlier and later attention orienting stages due to self-relevant processing (Zhu et al. 2018), familiarity of these names was a confounding factor since we are obviously more familiar with own name than a stranger's name, and an unfamiliar name as a novel stimulus may also bias our attention as well (Johnston et al. 1990; Daffner et al. 1998). Therefore, in the current study, we adopted a famous name sharing surname with participants to expand our previous finding, by testing whether people may do prefer some guys with no real social connections before but share surname with us.

Self-relevant compared to self-irrelevant stimuli can be distinguished at distinct information processing steps (Bargh 1982; Chen et al. 2011; Fan et al. 2013), and even self-relevant stimuli with different degree of self-relevance can also produce a significant difference in the early involuntary, automatic processing (i.e., P2 stage) and late controlled, cognitive processing (i.e., P3 stage) (Chen et al. 2011; Zhu et al. 2018). Considering this, we used electroencephalography (EEG) to explore time course of how famous name with shared surname was processed in the brain. We set social irrelevant full names (first and last name of a particular person) with the same or different surnames in comparison with the self-name. These two kinds of social irrelevant names were all of individuals who are famous in China, in order to equate familiarity between self and other names and consequently, to attribute the resulting effects exclusively to self-relevance. Name stimuli, which included self-name (SN), famous name with the same surname (FNS), and famous name with a different surname (FND), were presented unpredictably as task-irrelevant distractors in a three-stimulus oddball task.

We conducted both event-related potential (ERP) analysis and time–frequency analysis of EEG data to seek converging evidence. On the one hand, ERP is adept in depicting the time course of cognitive processing but restricted to phase-locked averaging (Luck 2014). On the other hand, time–frequency analysis is able to provide non-phase-locked indexes of cognition, such as event-related spectral perturbation (ERSP; (Makeig et al. 2004)). ERSP is a temporally sensitive index of the relative increase or decrease in mean EEG power from the baseline that is associated with stimulus presentation or response execution, termed as event-related synchronization and desynchronization (Makeig et al. 2004). In addition, frontal theta oscillations reflect the activation of attentional networks including the anterior cingulate cortex (ACC) (Kubota et al. 2001; Missonnier et al. 2006). Further, increases in frontal theta activity have been shown to be associated with enhanced cognitive control and allocation of attention, such as memory load during a working memory task (Jensen and Tesche 2002) and attention distribution in an oddball detection task (Missonnier et al. 2006). We thus speculate that frontal theta activity, just like P3 component, can also be a sensitive electrophysiological index of attention that may be modulated by the self-relevance or salience (e.g., emotional relevance) of stimulus.

Methods

Participants

We conducted a within-subject design in the current study to investigate self-relevant processing for FNS. A total of twenty-eight Chinese University students were enrolled for the experiment (11 males, 21.5 ± 1.25 years old), and a priori statistical power analysis via G-power for repeated ANOVA indicated this sample size was large enough to obtain a satisfactory statistical power (observed power $>$ 0.8, $\alpha = 0.05$, effect size = 0.25). All subjects were right-handed, with normal or corrected-to-normal vision, and reported no neurological or psychiatric history. Ethical approval for this study was provided by the ethical committee of the Institute of Brain and Psychological Sciences, Sichuan Normal University. Procedures were in accordance with the latest revision of the declaration of Helsinki. All participants provided written informed consent and compensated for their participation.

Materials

Five categories of stimuli were used in the three-stimulus oddball paradigm. A small circle was used as the target stimulus and a large circle was used as the standard

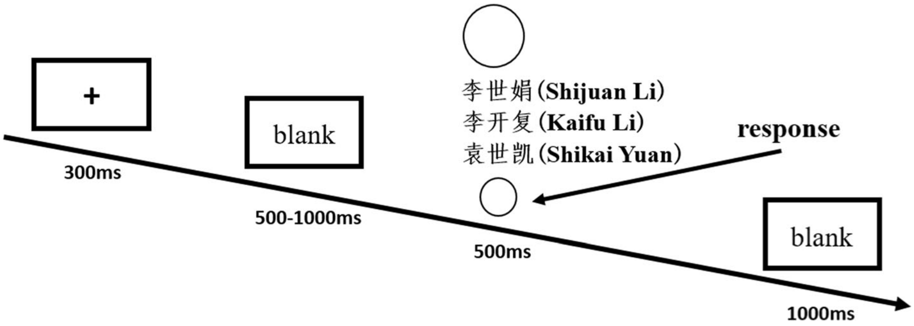

Fig. 1 The sequence of events in the experimental trial and an example of name stimuli presented for one participant (i.e., Shijuan Li). SN: Shijuan Li; FNS: Kaifu Li; FND: Shikai Yuan

stimulus. The name stimuli (SN, FNS, and FND) were used as distractors. All names presented as a full name (family name combined with first name), and consisted of three Chinese characters. All participants shared the same FND (i.e., Shikai Yuan, see Fig. 1). Furthermore, the valence (positive or negative) and age (historical or contemporary) properties of FNS were counterbalanced between subjects, and mixed design measures analysis of variance (ANOVA) after the experiment showed that the variation in these two dimensions of FNS made no contribution to our main findings.

Task design and procedures

In the three-stimulus oddball task, large circle as standard stimulus was presented 630 times (71.43%), and small circle as deviant stimulus was presented 63 times (7.14%), while three kinds of distractor names (SN, FNS, and FND) were each presented 63 times (7.14%) as well. The entire experiment was divided into nine blocks, and the onset sequence of the stimuli was randomized across conditions in each block.

The participants were seated in a quiet room approximately 120 cm away from a computer screen with horizontal and vertical visual angles below 5°. To familiarize the participants with the task, the experiment began with 30 practice trials. In our main experiment, as shown in Fig. 1, each trial was initiated by a 300 ms presentation of a small white fixation cross presented on the center of a black background of a 21-inch LCD monitor at a resolution of 1024 × 768 pixels (60 Hz) for precise visual stimulation (Zhang et al. 2018). Subsequently, a blank screen appeared in a duration of 500 to 1000 ms. Afterwards one of five types of stimulus was presented for 500 ms. Participants were instructed to detect the small circle interspersed in a sequence of large circles and to press the “J” key using the right index finger if the small circle was presented. No response was required for any other stimuli. Each trial ended by a presentation of blank screen (1000 ms). One-minute rest was allowed between blocks so as to avoid fatigue.

Participants were required to rate the three kinds of names using a self-report 7-point scale in terms of perceived self-relevance (1 = ‘not self-related at all’ to 7 = ‘extremely self-related’) and familiarity (1 = ‘not familiar at all’ to 7 = ‘extremely familiar’) after they finished oddball task. The order of these two rating tasks was counterbalanced across participants.

EEG recording

Electroencephalography (EEG) was performed from 64 scalp sites using tin electrodes mounted in an elastic cap (Brain Products; Munich, Germany) according to the extended 10–20 system, each referenced online to FCz. Eye blinks and vertical eye movement were monitored using electrodes located below the right eye, and horizontal electrooculograms (EOGs) were recorded from the right side of the right eye. EEGs and EOGs were amplified using a DC ~ 100-Hz band-pass filter and continuously sampled at 500 Hz/channel for offline analysis. The interelectrode impedances were maintained at less than 5 kΩ.

Data analysis

Behavioral analyses

Rating scores of familiarity and self-relevance for names were recorded. One-way repeated measures analysis of variance (ANOVA) with name type as a within-subject factor was performed for familiarity and self-relevance rating scores respectively.

Preprocessing of EEG data

EEG data were preprocessed using EEGLAB v13.5.4b (Delorme and Makeig 2004), which is an open source toolbox running in the MATLAB 2013a (MathWorks, Natick, MA, USA) environment. First, the data were down-sampled at 250 Hz and filtered using a high-pass filter at 1 Hz (FIR filter using pop_eegnewfilt and default parameters, 0.5 Hz cut-off frequency, -6 dB) and re-referenced to the algebraic average of the electrodes at the left and right mastoids to better detect signals from areas along the midline, which were most explored in oddball paradigm (Luck 2014). The continuous data were then segmented starting at 1000 ms prior to the onset of the stimulus to 2000 ms after stimulus onset. The baseline was corrected using whole epochs to improve the reliability of the independent components (Groppe et al. 2009). Epochs with nonstereotyped artifacts were rejected, and 181 epochs (95% CI = [176.47, 184.58]) per dataset remained for further independent components analysis (ICA). As for the remaining epochs (i.e., valid trials), no significant main effect of name type, F(1, 27) = 0.693, $p = 0.505$, $BF_{10} < 1/3$ was found (SN: N = 60.18, 95% CI = [58.70, 61.66]; FNS: N = 60.75, 95%CI = [58.94, 62.57]; FND: N = 60.21, 95%CI = [58.82,61.61]). Epoched data were decomposed into maximally independent component processes using temporal independent component analysis (ICA) decomposition and an extended infomax algorithm with default parameters for the runica() function. After ICA, we also calculated a single-equivalent current dipole model for each IC scalp topography using the DIPFIT plugin in EEGLAB (http://sccn.ucsd.edu/wiki/A08:_DIPFIT). A 4-shell spherical model was used for dipole localization. We excluded independent components with RVs > 15% (low amplitude ICs and noisy scalp maps) and dipoles outside of the brain (cannot be attributed to a cortical source), as well as manually rejected remaining artifactual components related to eye blinks and lateral eye movements.

ERP analysis

The artifact-free data were re-segmented to 1200 ms epochs time-locked to the stimulus onset, including 1000 ms post stimulus as analyzing epoch and 200 ms prior to stimulus as baseline. The data were then low-pass filtered at 30 Hz. The extracted average waveforms for each participant and condition were used to calculate grand average waveforms (see Fig. 2 for ERPs). Nine scalp regions of interest (SROIs) were defined[1] to depict distribution differences for regional averaging (Dien and Santuzzi, 2004; Chen et al., 2015; Zhu et al., 2018). Based on visual inspection of grand-averaged ERPs and the existing literature (Chen et al. 2011; Fan et al. 2013), the following time windows were used to calculate mean amplitudes: 150–210 ms (P2) and 320-500 ms (P3). Peak latencies (from stimulus onset to the peak of each component) of P2 and P3 were measured and analyzed at corresponding intervals.

Event-related spectral perturbation analysis

Epoched data were applied to Morlet wavelet transformed, implemented using the EEGLAB newtimef() function. Changes in event-related spectral power response (in dB) were computed using the event-related spectral perturbation (ERSP) index (Delorme and Makeig 2004) (1),

$$\mathrm{ERSP}(f,t) = \frac{1}{n}\sum_{k-1}^{n}(F_k(f,t))^2 \tag{1}$$

where for n trials,$F_k(f,t)$ is the spectral estimate of trial k at frequency f and time t. Power values were normalized with respect to a 200 ms pre-stimulus baseline and transformed into the decibel scale (10_log10 of the signal). ERSPs were averaged over trials for each condition and transformed into time–frequency plots (see Fig. 3 for ERSP). For conciseness, only the data of interest (3-30 Hz during -200 to 1000 ms) are presented. Prominent synchronization of theta oscillations is seen in the grand-averaged time–frequency image illustrated in Fig. 3. The time frequency window of interest (3.5-6 Hz, 50-500 ms) was selected by visual inspection according to the maximal strength of event-related synchronization (ERS) in the theta band averaged across all channels, participants, and conditions to avoid potential problems of double dipping (Kriegeskorte et al. 2009). This time–frequency window of interest is commonly assessed in self-referential studies (Mu and Han 2010) as well.

Statistical analysis

We performed a two-way repeated measures ANOVA with condition (SN, FNS, and FND) and SROIs (nine scalp regions, average amplitude of specific electrodes in each scalp region were used for statistical analysis) as two within-subject factors on ERP (mean amplitudes and peak latency of P2 and P3 component) and ERSP (averaged power of theta band) data respectively under SPSS 21.0. The degrees of freedom of the F-ratio were corrected according to the Greenhouse–Geisser method. Bonferroni correction was applied to all post-hoc tests.

Furthermore, we computed Bayes factors using JASP with default prior width (Wagenmakers et al. 2018) and interpreted BF_{10} of < 3 as anecdotal, 3–10 as substantial, and > 10 as strong evidence for accepting H_1; we also interpreted BF_{10} of $> 1/3$ as anecdotal, 1/3–1/10 as moderate, and $< 1/10$ as strong evidence for accepting H_0 (Jeffreys, 1998).

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[1] Left anterior: F3, F5, FC3, and FC5; middle anterior: F1, Fz, F2, FC1, FCz, and FC2; right anterior: F4, F6, FC4, and FC6; left central: C3, C5, CP3, and CP5; middle central: C1, Cz, C2, CP1, CPz, and CP2; right central: C4, C6, CP4, and CP6; left posterior: P3, P5, and PO3; middle posterior: P1, Pz, P2, and POz; right posterior: P4, P6, and PO4.

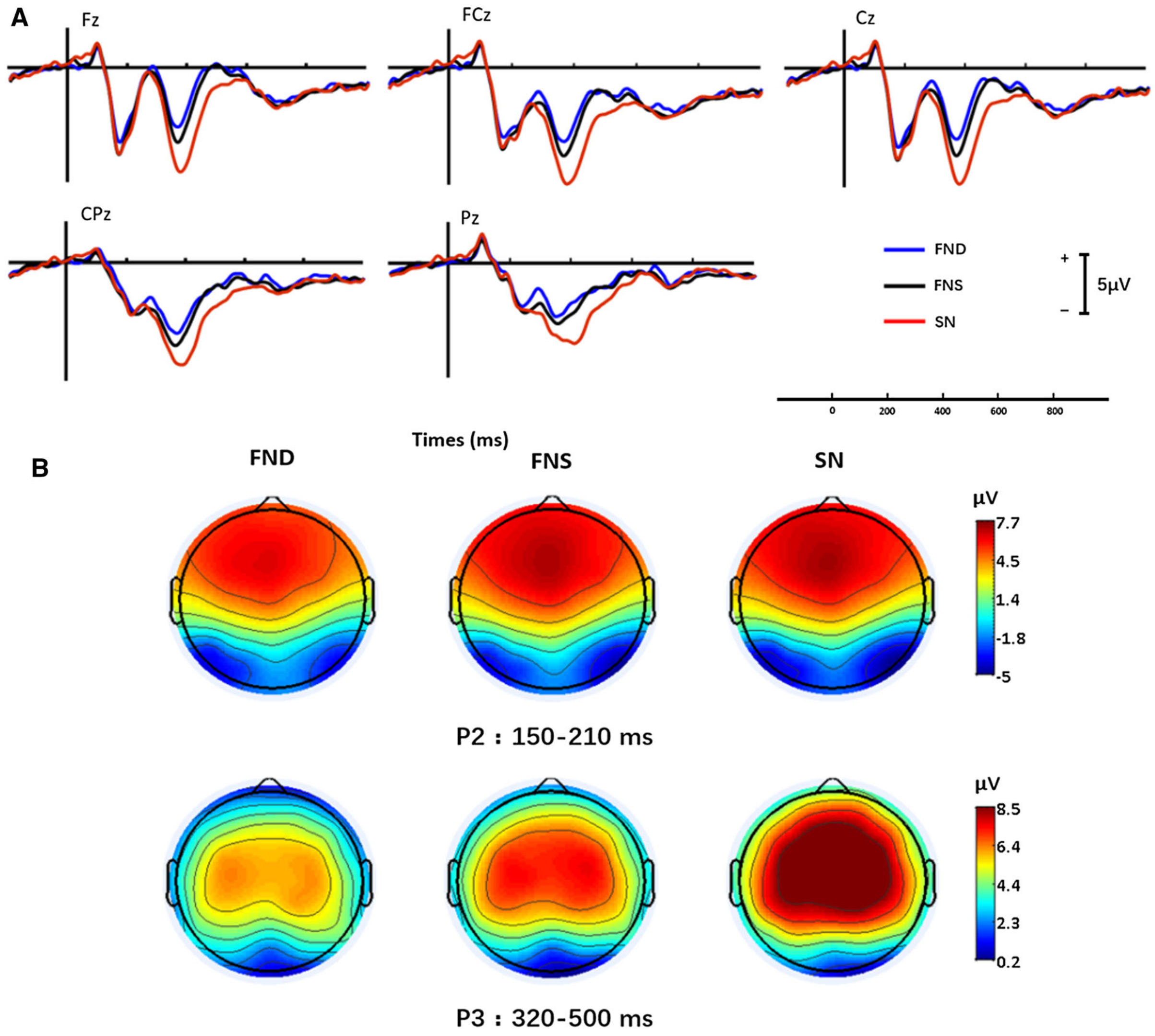

Fig. 2 Group-averaged ERP voltage waveforms and scalp topography for P2 and P3 as a function of condition. (A) Exemplary waveforms from Fz, FCz, Cz, CPz and Pz are displayed for FND, FNS, and SN. (B) The ERP topography (top view shown) for P2 and P3 components as a function of name. [1] Left anterior: F3, F5, FC3, and FC5; middle anterior: F1, Fz, F2, FC1, FCz, and FC2; right anterior: F4, F6, FC4, and FC6; left central: C3, C5, CP3, and CP5; middle central: C1, Cz, C2, CP1, CPz, and CP2; right central: C4, C6, CP4, and CP6; left posterior: P3, P5, and PO3; middle posterior: P1, Pz, P2, and POz; right posterior: P4, P6, and PO4

Results

Behavioral analysis

Rating scores for name stimuli on perceived self-relevance and familiarity are shown in Table 1. We found a significant main effect of name on self-relevance ($F_{(2,\ 54)} = 71.706$, $p < 0.001$, $\eta_p^2 = 0.73$, $\mathrm{BF}_{10} > 100$). The subsequent post hoc test revealed that the self-relevance score for SN was significantly higher than that for FNS ($p < 0.001$, $\mathrm{BF}_{10} > 100$) which, in turn, was rated more self-relevant than FND ($p < 0.001$, $\mathrm{BF}_{10} > 100$). In contrast, analysis of the familiarity ratings revealed no significant differences across the three kinds of name stimuli ($F_{(2,\ 54)} = 2.40$, $p = 0.101$, $\mathrm{BF}_{10} < 1$). These results are shown in Fig. 4.

Electrophysiological results

ERP data

Analysis of P2 amplitudes revealed a significant condition × SROI interaction ($F_{(16,\ 432)} = 3.38$, $p = 0.006$, $\eta_p^2 = 0.11$, $\mathrm{BF}_{10} > 30$). The follow-up analyses demonstrated that SN and FNS names both elicited larger positive deflections than FND names over the anterior, left-central, and middle-central areas, although there was no significant difference between SN and FNS names (see Table 2 for details of these and the following results).

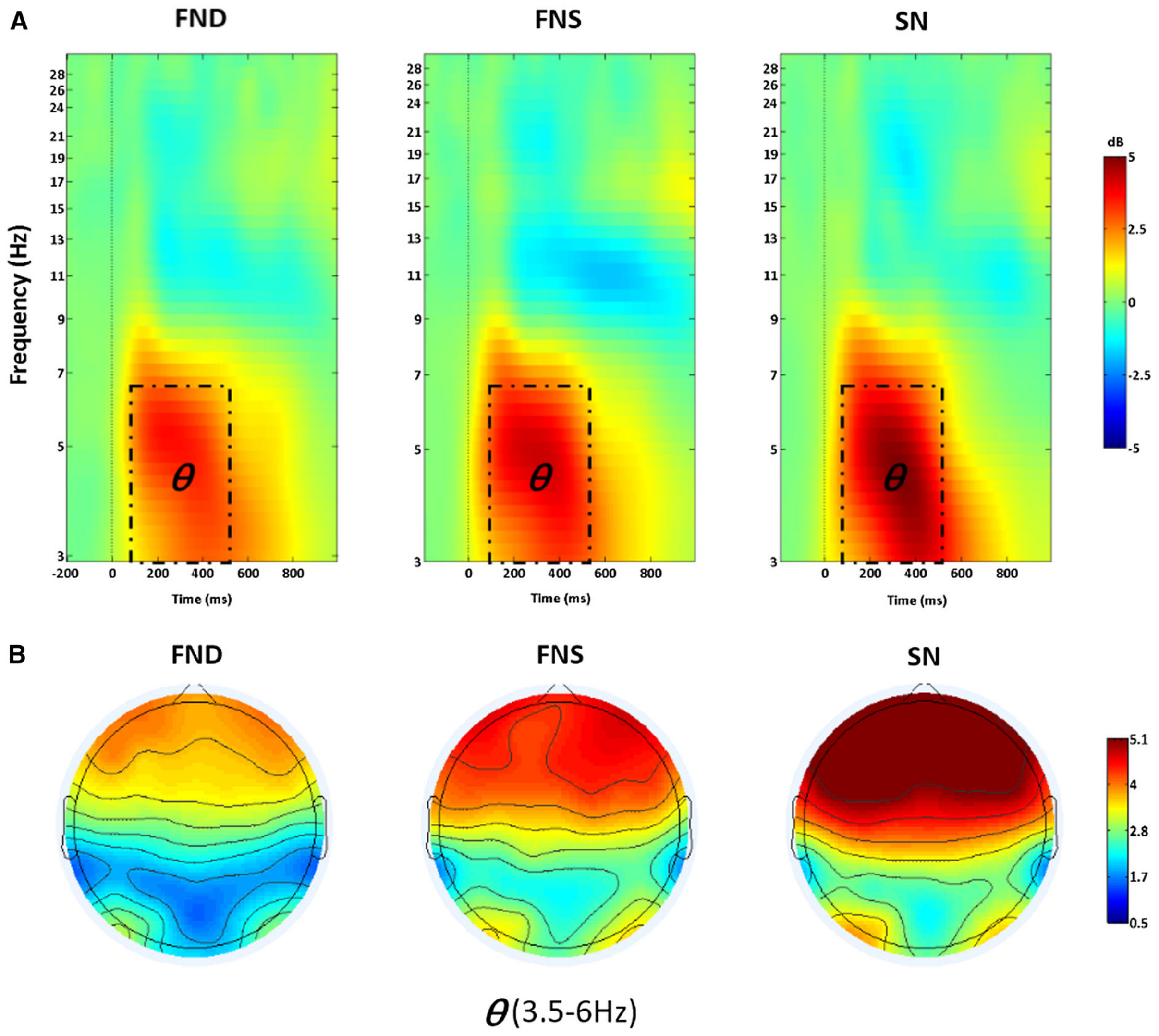

Fig. 3 Group-Averaged ERSPs and scalp topography for theta as a function of name. **A** Exemplary spectral maps at FCz are displayed for theta band as a function of the name condition. **B** ERSP topography (top view shown) for theta band as a function of name

Table 1 Results of behavioral analysis

Type of assessment	SN	FNS	FND
Self-relevance	6.64(*0.10*)^{a}	4.17(*0.16*)^{b}	2.04(*0.25*)^{c}
Familiarity	6.54(*0.09*)^{a}	6.29(*0.30*)^{a}	6.00(*0.34*)^{a}

Mean rating scores (*SEM*) for SN, FNS and FND conditions on perceived self-relevance and familiarity. ^{abc} Within each index, cells that do not share a superscript are significantly different from each other at $p < .05$

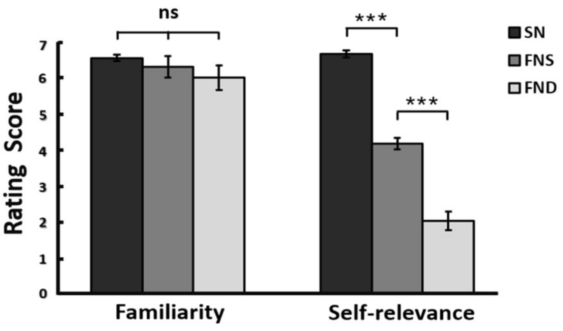

Fig. 4 Familiarity and self-relevance ratings for the SN, FNS, and FND conditions. Error bars represent SEM. "***" indicates that the difference is significant at the 0.001 level and "ns" indicates no significant difference

A repeated measures ANOVA on P3 amplitudes demonstrated a significant main effect of condition ($F_{(2,\ 54)} = 32.20$, $p < 0.001$, $\eta_p^2 = 0.54$, $\mathrm{BF}_{10} > 100$) and a significant condition × SROI interaction ($F_{(16,\ 432)} = 6.28$, $p < 0.001$, $\eta_p^2 = 0.19$, $\mathrm{BF}_{10} > 100$). Simple effect analysis found that the P3 amplitudes were significantly larger for SN than for FNS, which, in turn, elicited larger P3 amplitudes than FND over the middle-anterior, right-anterior, left-central, and right-central areas.

Table 2 Results of follow-up analysis on electrophysiological activities

	Index	SROI	SN	FNS	FND
ERP (μV)	P2	Anterior & MC	7.30(*0.52*)^{a}	7.29(*0.59*)^{a}	6.37(*0.50*)^{b}
	P3	MA/RA/LC/RC	6.91(*0.80*)^{a}	5.07(*0.68*)^{b}	4.39(*0.65*)^{c}
ERSP (dB)	θ	LA&MA	4.05(*0.32*)^{a}	3.40(*0.24*)^{b}	2.80(*0.21*)^{c}

Mean electrophysiological activities (SEM) for SN, FNS and FND conditions

MA, RA, LC, MC and RC are short for middle-anterior, right-anterior, left-central, middle-central and right-central area, respectively. ^{abc} Within each index, cells that do not share a superscript are significantly different from each other at $p < .05$

Moreover, we found no significant effect associated with name type among the analysis for P2 ($F_{(2,\ 54)} = 0.495$, $p = 0.612$, $BF_{10} < 1/3$) and P3 ($F_{(2,\ 54)} = 0.818$, $p = 0.420$, $BF_{10} < 1/3$) latencies.

ERSP results

A repeated measures ANOVA for theta power revealed a significant main effect of condition ($F_{(2,\ 54)} = 10.56$, $p < 0.001$, $\eta_p^2 = 0.28$, $BF_{10} > 100$). Further analysis revealed enhanced theta synchronization for SN when compared to FNS, which, in turn, elicited larger theta activities than FND names over the left- and middle-anterior areas (see Table 2 for details of these and the following results).

Exploratory timing analysis

To compare the timing dynamics of the self-relevant effect between the SN and FNS conditions, we compared the sizes of the self-relevant effects of SN (Mean [SN-FND]) and FNS (Mean [FNS-FND]) conditions between P2 and P3, which are the two components representing different timing stages. A two-way repeated ANOVA with timing stage (P2 and P3) and name (SN and FNS) as the two within-subject factors revealed a significant timing and name interaction ($F_{(1,\ 27)} = 20.15$, $p < 0.001$, $\eta_p^2 = 0.430$, $BF_{10} > 100$). The decomposition of this interaction indicated a significant increase of self-relevant processing for SN from early involuntary stage (P2) to late volitional processing stage (P3) (P2 = 0.93, P3 = 2.52, $p < 0.001$, $BF_{10} > 100$). In contrast, the self-relevant processing for FNS names did not vary significantly between P2 and P3 (P2 = 0.92, P3 = 0.68, $p = 0.304$, $BF_{10} < 1/3$) stages (Fig. 5), indicating that the self-relevant effect for a surname may be dominant in the early involuntary processing stage.

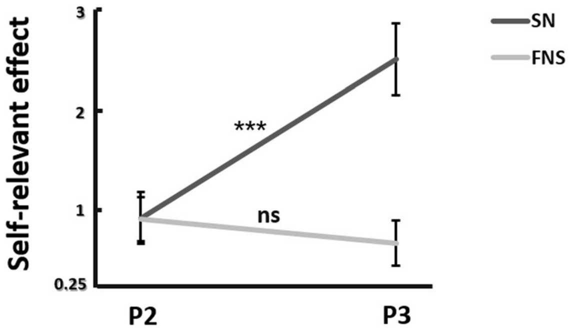

Fig. 5 Self-relevant effect for the SN and FNS conditions during P2 and P3. Error bars indicate SEM. "***" indicates that the difference is significant at the 0.001 level and "ns" indicates no significant difference

Discussion

In the current study, a self-relevant processing elicited by FNS has been found both in P2 and P3 event-related potential amplitude and power of theta band.

Consistent with previous evidence (Mu and Han 2010; Chen et al. 2011; Fan et al. 2013), as distractors in the oddball task, SN, FNS, and FND all elicited positive waves in the anterior and middle-central regions at approximately 180 ms (P2), meanwhile a frontal-central P3 peaking about 350 ms post stimulus was evoked by the three names as well, which is comparable to P3a as reported in previous studies (Polich 2007; Chen et al. 2011). It has been established that novel stimulus could elicit orienting processing (Sokolov 1963; Öhman et al. 2000), which consists of two consecutive events. The first event is the capture of automatic attention. P2 is a typical component underlying this process (Carretié et al. 2001, 2004) and the second event, which is represented by novelty P3 or P3a, largely reflects a controlled processing phenomenon triggered by previous automatic processes (Polich and Kok 1995; Escera et al. 1998; Polich 2007). These three kinds of names adopted as distractors in the current oddball task are task-irrelevant and novel. Thus, it is reasonable that they could lead to prominent P2 and P3a activity. In addition, they were also found to induce enhanced theta synchronization in the anterior regions. Power of theta has been suggested to be associated with expectation violation (Tzur and Berger 2007; Cavanagh et al. 2010). Since the participants anticipated the target stimuli (small circles), the presentation of these task-irrelevant names may elicit expectation violation, thus increasing theta synchronization.

FNS led to P2 enhancements of the same size as those elicited by SN while SN compared to FNS elicited an increased neural activation in novelty P3 and theta band oscillation. Moreover, FNS in turn elicited more P3 and theta activity than FND. Since SN, FNS and FND showed a degree effect of perceived self-relevance on behavioral rating scores, our findings may suggest that P3 is an electrophysiological index of attention that is modulated by the self-relevance of these names, consistent with previous studies of self-relevant degree effect (Chen et al. 2011; Fan et al. 2013). We also observed an increased self-relevant effect for SN from P2 to P3 component in a separate timing analysis. This enhancement of self-relevant processing was not observed for FNS, thus resulting in larger P3 amplitudes for SN names than for FNS. One explanation is that the P2 component, which represents the early attention allocation phenomenon, can only distinguish the self-relevance associated with the surname, as the structure of Chinese name always presents surname before first name. By contrast, in the cognitive-controlled evaluation stage indexed by P3a, sufficient attentional resources were allocated to these name stimuli and the social meaning of them were fully understood (Polich 2007), the FNS can be recognized as social irrelevant stimuli at this stage so that the degree of self-relevance of SN and FNS can be differentiated, resulting in greater P3 amplitudes for SN than for FNS consequently.

We observed a pattern of linearly increasing self-relevant processing for FND, FNS to SN in both P3 amplitudes and theta band power. Prior studies have indicated that neural oscillations in the theta frequency band are heavily implicated in the generation of P3 activity (Yordanova and Kolev 1998; Jones et al. 2006) and that theta synchronization is associated with controlled conscious processes, such as cognitive control tasks and memory retrieval (Klimesch 1999; Sauseng et al. 2002). This is similar to the role of the P3 component in representing late evaluation processing with conscious awareness (Polich and Kok 1995). This most likely explains why theta synchronization shows the same pattern of self-relevant effects as that observed for the P3 component. It is worth noting that this neural self-relevance degree effects (depicted in P3, and theta activity) for these three kinds of names is consistent with behavioral self-report perceived self-relevance. All these measurements showed larger values for SN than for FNS, which, in turn, had larger values than those for FND, consistent with previous evidence showing increased neural activation from low, medium to high self-relevant stimuli (Chen et al. 2011; Fan et al. 2013). This suggests that P3 activity and frontal theta synchronization can be potential neural correlates of the perceived self-relevance of SN, FNS and FND in the current study.

In summary, we provide reliable evidence that people who have no explicit social relevance but share the same surname with us can elicit self-relevant effect and bias our attention, compared to other irrelevant people with a different surname. This indicates a priority of people who has a same surname with us in some specific social situations.

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Author contribution S.Z.: Conceptualization, Investigation, Formal analysis, Writing—original draft. J.Y.: Methodology, Funding acquisition. H.L.: Methodology. J.Y.: Conceptualization, Resources, Writing—review & editing, Supervision, Funding acquisition.

Declarations

Conflict of interest All authors declared no conflicts of interest with respect to the authorship or the publication of this article.

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