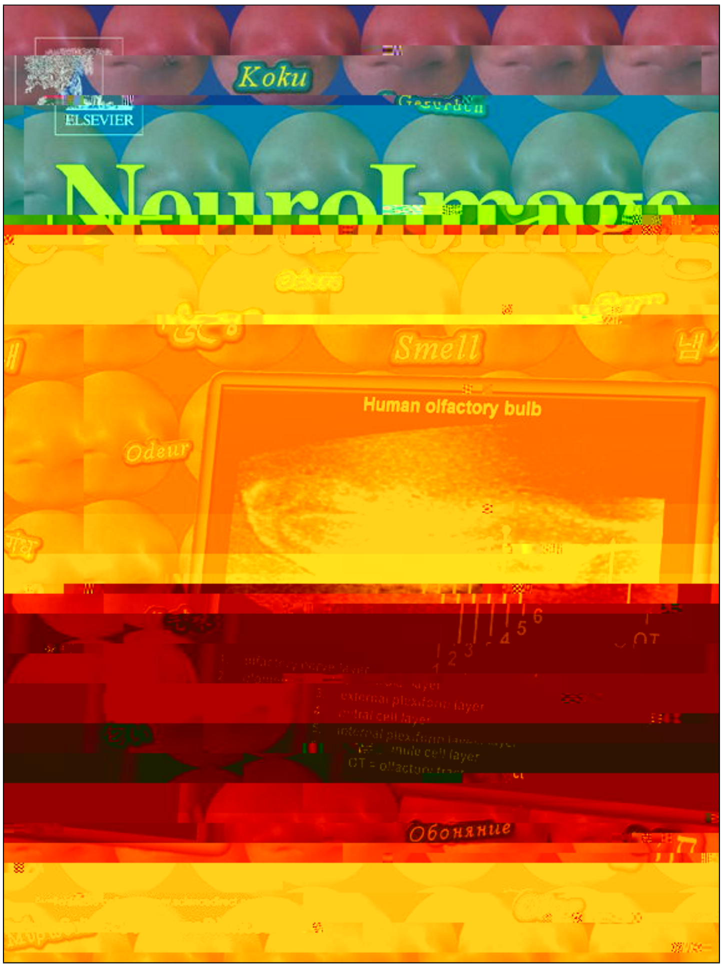
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Обоняние

Neural oscillations dissociate between self-related attentional orientation versus evaluation

Yan Mu, Shihui Han

a r t i c l e   i n f o

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EEG
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a b s t r a c t

To investigate whether self-reflection on personality traits engages distinct neural mechanisms of self-related attentional orientation and self-related evaluation, we recorded electroencephalograms from adults while they made trait judgments about themselves and an age- and gender-matched friend, or judgments of word valence. Each trial consisted of a cue word that indicated a target person for trait judgment or instructed valence judgment, followed by a trait adjective to be evaluated. Using a wavelet analysis, we calculated time–frequency power at each electrode and phase synchrony between electrode pairs associated with self-, friend- or valence-cues and with trait adjectives during trait or valence judgments. Relative to friend- and valence-cues, self-cues elicited increased synchronous activity in delta (2–4 Hz), theta (5–7 Hz), alpha (8–13 Hz), beta (14–26 Hz), and gamma (28–40 Hz) bands, and increased large-scale phase synchrony in these frequency bands. Self-related evaluation compared to friend-related evaluation during trait judgments induced stronger desynchronization in alpha, beta and gamma band activities, and decreased phase synchrony in alpha and gamma band activities. Our findings suggest that self-related attentional orientation and self-related evaluation engage distinct neural mechanisms that are -mechanzesrlyhasms20(-)itie-rysalltin a226(ge)26(nd)27(ed)-17(l)(z)yesmrl

Electroencephalogram (EEG) has a temporal resolution of a millisecond and has been used in recent studies of neural activity underlying self-referential processing (e.g., Fields and Kuperberg, 2012; Magno and Allan, 2007; Mu and Han, 2010; Shestyuk and Deldin, 2010; Watson and Dritschel, 2007). Using a block design, Mu and Han (2010) found that phase-locked event-related potentials (ERPs) showed an increased positivity at 200–400 ms after stimulus onset over the frontal area (P2) and an enlarged positivity at 400–1000 ms over the frontal/central areas (P3) during trait judgments on the self compared to a celebrity. Shestyuk and Deldin (2010) also used a block design to investigate ERPs sensitive to the valence of self-referential words and found that positive versus negative words evoked larger amplitudes of the P2 and a late positive component. Magno and Allan (2007) used an event-related design to examine the neural activity associated with autobiographical memory. On each trial, the cue “self between cue words that induce self-related attentional orientation and trait adjectives that initiate self-related evaluative processing. Thus we tested whether ERS and ERD in multiple frequency bands are respectively induced by self-cue (relative to friend-cue) and self-judgments (relative to friend-judgments).

In addition, since fMRI studies have shown that self-referential processing activates multiple brain regions including the MPFC and PCC and leads to enhanced functional connectivity between the MPFC and the occipital cortex (e.g., Ma and Han, 2011), the current study also investigated whether self-related attentional orientation and self-related evaluation are characterized by distinct patterns of functional integra-

With the linearly increased NCW used in our study, the wavelet duration was 119.7 ms and the spectral bandwidth was 1.3 Hz at 2 Hz. The wavelet duration was 19.9 ms and the spectral bandwidth was 8.0 Hz at 80 Hz.

The TF representation of each condition was first calculated by averaging the non-phase-locked neural oscillations to the trials in each condition for each subject. The TF value used for further statistical analyses was the percentage increase or decrease of spectral power in specific time windows relative to the baseline power from −200 to 0 ms before the stimulus onset (Pfurtscheller and Aranibar, 1979). Considering temporal resolutions of both low and high frequency bands, we chose 50 ms as a time unit and this resulted in 20 time intervals from 0 to 1000 ms. The TF representations around 50 Hz was excluded from data analysis due to the 50 Hz electricity system in China. The remaining frequencies were divided into seven successive sub bands: delta (2–4 Hz), theta (5–7 Hz), alpha1 (8–10 Hz), alpha2 (11–13 Hz), beta (14–26 Hz), gamma1 (28–40 Hz), and gamma2 (60–80 Hz), similar to our previous study (Mu and Han, 2010). To investigate the modulations of TF power varying across different regions of the scalp, electrodes over the scalp were divided into four regions based on their anterior–posterior and middle-peripheral locations: the midline region with three clusters (frontal: FZ, FCZ; central: CZ, CPZ; parietal: PZ, POZ), the anterior region with two clusters (left: F1, F3, F5, FC1, FC3, FC5; right: F2, F4, F6, FC2, FC4, FC6), the central region with two clusters (left: C1, C3, C5, CP1, CP3, CP5; right: C2, C4, C6, CP2, CP4, CP6), and the posterior region with two clusters (left: P1, P3, P5, PO3, PO5, O1; right: P2, P4, P6, PO4, PO6, O2).

To examine the differences in TF powers between self- and friend-cues, we conducted a repeated-measures analysis (ANOVA) with Cue (self-cue vs. friend-cue) and Region (frontal, central, parietal for electrodes along the midline) or Hemisphere (left and right for lateral electrodes) as within-subjects variables. To investigate the difference between general person processing and semantic processing, we performed the ANOVAs with Cue (friend-cue vs. valence-cue) and

Significant interactions of Cue × Region were observed in alpha1 band activity at 300–400 ms over the central region (F (2, 50) = 9.53, $P<.01$, ^{2} = .28) and in beta band at 50–100 ms at the midline electrodes (F (2, 50) = 5.783, $P<.05$, ^{2} = .19). Post-hoc analyses showed that increased activity was observed with self-cues relative to friend-cues in the left central region in alpha1 band (F (1, 25) = 5.32, $P<.05$, ^{2} = .18) and .05, in the frontal sites in beta band (F (1, Relative to valence-judgments, friend-judgments only showed increased gamma1 band activity in the anterior (300–400 ms, F (1, 25) = 5.69, $P < .05$, ^{2} = .19; 700–800 ms, F (1, 25) = 14.80, $P < .01$, ^{2} = .37) and the posterior regions (300–400 ms, F (1, 25) = 6.64, $P < .05$, ^{2} = .21). Neither the main effect of Judgment nor its interaction with Hemisphere was significant ($Ps > .05$).

induced greater phase synchronization between the midline and posterior regions at 400–

$P<.01$, $^2 = .33$) regions, whereas friend-cue induced decreased theta

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