Transient Phase-locking of Parietal Responses to Repeated Faces: Neuroimage Evidence of Subliminal Mere Exposure

Ruei-Jyun Hung[1], Li-Fen Chen[12], Yong-Sheng Chen[3]

[1] Institute of Brain Science, National Yang-Ming University, Taiwan
[2] Department of Medical Research and Education, Taipei Veterans General Hospital, Taiwan
[3] Department of Computer Science, National Chiao Tung University, Taiwan

Introduction

- Numerous studies have demonstrated that mere exposure effect (MEE), which is repeatedly presenting a stimulus to an individual increases her/his positive emotion or preference for that stimulus.
- Previous studies demonstrated that the formation of MEE was caused by familiarity.
- Previous studies found that repeated stimuli reduced neural activity of experience-related cortex.
- This study aimed at elucidating temporal dynamics of cortical representation for formation of MEE, which may correlate with personalities.

Materials and Methods

Subjects

- Thirty-three healthy subjects (16 female) aged 21-35 (M = 24.3) were recruited.
- The basic personality of each subject was assessed by using Chinese version of Basic Personality Inventory (CBPI).

Stimuli

- Seventy-two happy and neutral faces were selected from Taiwanese Facial Expression Image Database (TFEID).
- Thirty-six neutral images were selected from IAPS (valence: 4.5-5.5).
- Eight scrambled faces.

Procedure

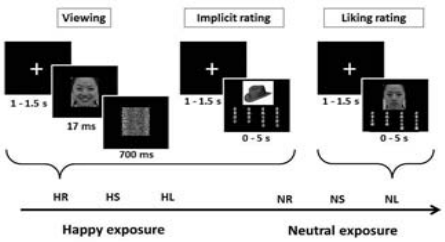

Figure 1. Paradigm design. A 2 × 2 within-subjects factorial design was employed. The two factors were exposure (repeated vs. single) and facial expression (happy vs. neutral).

Data acquisition

- MEG signals (Vectorview, Elekta Neuromag, Helsinki, Finland)
- T1-weighted magnetic resonance images (Siemens MAGNETOM A Tim System 3T)

Data analysis

- Dividing subjects into three groups based on their implicit rating (NR minus NS)
- Choosing the last 9 trials at exposure phase in NR and NS conditions
- Phase-locking factor (PLF)
  1. NR>NS 2. High group: NR>NS 3. NR: High group>Low group
- Spatial-temporal mapping
  - Maximum contrast beamformer (MCB) (Chen et al., 2006) • MRI: T1
- Statistical analysis
  - Two-way ANOVA (Behavioural data) • Paired-t test (Imaging data)
  - Two-sample t-test (Imaging data) • Correlation (Imaging data and CBPI)

Results

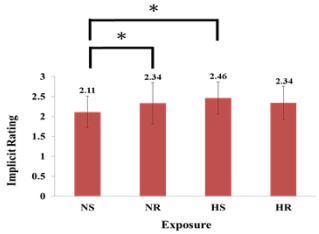

Figure 2. Repeated exposure effect on self pleasantness. Participants had higher pleasant feeling in NR condition than NS condition.

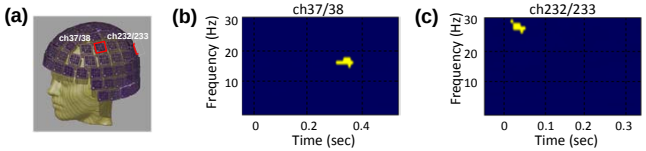

Figure 3. Comparison of phase-locking factors. **(a)** Sensor array. The time-frequency map of significant differences of value of PLF. **(b)** The self pleasantness elicited the beta oscillation at temporal-parietal sensor cites (NR: High group>Low group; $p < .01$). **(c)** Repeated exposures elicited the beta oscillation at parietal-occipital sensor cites (High group: NR>NS; $p < .01$).

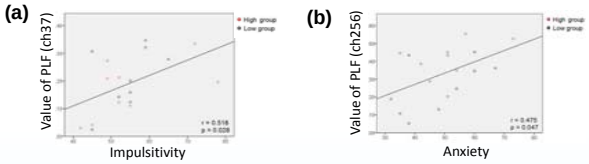

Figure 4. (a) The correlations between the scores of impulsivity and the values of PLF (17 Hz; 370-400 ms; temporal-parietal region). **(b)** The correlations between the scores of anxiety and the values of PLF (8 Hz; 190-240 ms; parietal region).

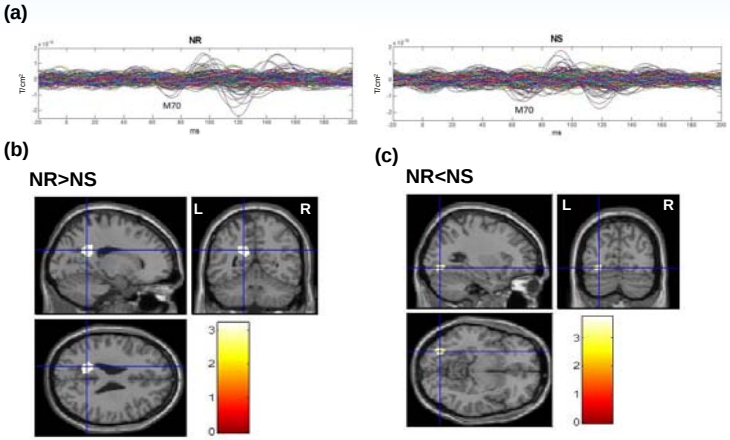

Figure 5. The source analysis of beta activity (14-30 Hz) of high group. **(a)** Signals of 306 MEG channels in NR and NS conditions. Activations of **(b)** the left precuneus increased under NR condition and **(c)** the left inferior occipital lobe decreased under NR condition around 70 ms ($p < .05$; cluster > 5; N = 9).

Discussion

- Behavioural results showed that repeated exposure to stimuli significantly increased positive emotion feeling.
- The results of PLF and MCB demonstrated that repeated exposures enhanced neural activity of the left precuneus, which was seen as an area correlated with familiarity.
- The decreased activity of the left inferior occipital lobe may due to the representation of repetition suppression.
- Our results showed that the individual difference of formation of MEE is probably resulted from the modulation of temporal-parietal and parietal regions, which correlated with level of impulsivity and anxiety.

References

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