

Behavioral and ERP Characteristics Under Facial Emotion Working Memory Task in Relation to Social Psychophysiology in Healthy University Students

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Abstract

Previous studies have suggested that the processing of facial expression plays a critical role in shaping one's social psychological traits. This study aimed to explore the relationship of behavioral and event-related potential (ERP) characteristics during a facial emotion working memory task with social psychological traits. Fifty-eight healthy university students were recruited. Their social psychological traits were assessed using the Social Anxiety Scale and the Simplified Coping Style Questionnaire. All participants completed a delayed matching task for facial emotions, during which 64-channel electroencephalographic signals were recorded. The task consisted of 40 trials. At the beginning of each trial, 2–5 memory faces were sequentially presented, interleaved with 0–2 distractor faces. The presentation time (1050, 600, 400, 250 ms) was randomized across trials but fixed within each trial. At the end of each trial, three sequential free-response matching faces were presented for retrieval. Retrieval reaction time (RT) and accuracy (ACC) were recorded; ERP characteristics (latency and amplitude of P1 onset, P1, N170, and N170 offset) were extracted from ERPs over averaged bilateral posterior-lateral electrodes (O1, O2, PO7, PO8, P7, P8). Correlation and regression analyses were conducted to examine the relationships among these behavioral and ERP measures and social psychological traits. Greater social anxiety was associated with longer RT and shorter N170 offset latency under distractor conditions, across all temporal constraints. Linear regression showed that shorter N170 offset latency under distractor conditions predicted social anxiety ($\beta = -0.403$, $p = 0.002$). Binary logistic regression further indicated that this measure distinguished high versus low anxiety individuals (based on normative criteria), with 77.6% accuracy ($p = 0.012$). Less positive coping score was associated with reduced N170 offset amplitude under distractor conditions across all temporal constraints. Linear regression showed that greater N170 offset amplitude under distractor conditions predicted positive coping scores ($\beta = 0.416$, $p = 0.002$). Binary logistic regression further demonstrated that this measure distinguished individuals with higher versus lower positive coping scores (based on normative criteria) ($p = 0.041$). These results indicate that maladaptive traits (e.g., high social anxiety or low positive coping) are associated with prolonged reaction times and altered distractor processing (earlier N170 offset and reduced amplitude), suggesting difficulties in decision-making during retrieval and altered neural resource allocation to emotional distractors.

Keywords

Social Anxiety, Positive Coping, Facial Emotion, Working Memory, ERP

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