Abstract

ERN trait have been hypothesized to be a marker for anxiety disorders.

Larger ERNs linked to: High general anxiety and worry (Hajcak et al., 2004; Luu et al., 2000). Lable personality traits (Palling & Ségalowitz, 2004)

The relationship between these personality traits and the underlying neurobiology of the ERN has not been well-defined.

ERN reflects mediofrontal theta band power enhancement and phase consistency.

ERN and FRN have been shown to reflect a degree of theta phase consistency and power enhancement over the medial frontal cortex (Cavanagh et al., 2009)

Purpose: To characterize the relationship between anxiety-related personality traits (neuroticism, punishment sensitivity, negative affect, and worry) and midline frontal theta responses as well as ERN amplitudes.

Method: Participants completed three different tasks, each with varying degrees of stimulus and response conflict: perceptual oddball and simple motor responses, probabilistic reinforcement learning, and cued conflict performance on a Simon task.

Hypothesis: It was predicted that only motivationally relevant events would yield a relationship between theta and personality traits, specifically responses to incongruent, error, suboptimal, high conflict and error trials.

Results:

Direct correlations between the aggregated z score personality measures and ERN amplitudes for sub-optimal choices (r = 0.27) but not errors or high conflict trials.

No direct correlations between theta values and z-score of personality measures.

Permutation tests revealed that pre-response theta power on cued high conflict trials, incongruent trials and error trials, as well as high conflict conditions on the PL task were significantly related to negative affective personality traits.

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Questions:

Are negative affect and anxiety-related personality traits associated with ERN amplitudes and midline frontal theta responses?

Method

Participants

40 college students (7 females) at the University of Arizona

Age 18-22 (M=19.18, SD=1.13)

Free of past head trauma or seizures and current psychoactive medication use.

EEG was recorded continuously using 64-channel EEG cap referenced to computer-averaged mastoids.

Questions:

Aggregated measure of negative and anxious affect (BIS, PSWQ, NEO-N, PANAS-NA) which were all significantly intercorrelated (r's .73-.83, p's <.01).

Tasks

Perception and Motor Tasks: Oddball with novelty

Conflict Performance: Cued Simon Task

Probabilistic: Reinforcement Learning

Table 1. ERN, Theta, and Zaggregated Negative Affect Correlations

<table>
<thead>
<tr>
<th>Aggregate NA</th>
<th>Suboptimal</th>
<th>High Conflict</th>
<th>Error</th>
<th>Incongruent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suboptimal</td>
<td>0.236</td>
<td>-0.77</td>
<td>-163</td>
<td>-077</td>
</tr>
<tr>
<td>High Conflict</td>
<td>0.178</td>
<td>-0.202</td>
<td>147</td>
<td>0.204</td>
</tr>
<tr>
<td>Error</td>
<td>-0.116</td>
<td>-0.393</td>
<td>-133</td>
<td>0.406**</td>
</tr>
<tr>
<td>Incongruent</td>
<td>0.318</td>
<td>-0.204</td>
<td>0.617*</td>
<td>0.411</td>
</tr>
</tbody>
</table>

Results

ERNs and Theta

The correlations suggest that the ERN has a stronger relationship than theta to negative affect and anxiety-related personality traits.

Electrophysiological Recording and Processing

ERPs were created for standard (.5-15 Hz) and theta (4-8 Hz) frequency bands.

Trough-to-peak measurements were used. Larger trough-to-peak values reflecting larger negative voltage potentials.

ERP: Cue locked (ERN) were measured at 200-320 ms.

Response-locked (ERN) were measured at 0-120 ms.

Table. 1 ERN, Theta, and Zagged Negative Affect Correlations

References


