Can people ignore unusual flankers?

The brain is sensitive to events which violate its explicit and implicit predictions about forthcoming sensory stimuli. One result of this sensitivity is the automatic allocation of attention to unexpected events. Further, individuals differ in their ability to control attentional focus, and in their tendency to react to sensory stimuli.

We modified the Flanker Task so that the distractors had either a common or an uncommon (Oddball) form, and measured reaction times and accuracy while people performed the task. We also recorded scalp EEG to investigate the neural correlates of Oddball flankers. Finally, we used temperament scores to assess whether self-reported reactivity predicted vMMN magnitude.

Frequency-Manipulated Flanker Task

Stimuli: Sets of 5 arrowheads, 1 central and 4 flankers, presented for 50 ms.

Task: Report direction of central arrowhead within 2 seconds of presentation.

Feedback: Keeping accuracy between 75% and 90%. Subjects were instructed to increase either speed or accuracy.

Flanker direction: 90% of trials had Standard flanker direction, 10% had Oddball.

Central arrowhead was equiprobably left/right, congruent/incongruent.

Flanker direction was counterbalanced within subjects.

N = 20; 1920 trials per subject.

Temperament measured via Adult Temperament Questionnaire (ATQ, Evans & Rothbart, 2007). Scores on two temperament factors, attentional control and orienting sensitivity, were selected a priori as relevant predictors.

Oddballs Enhance Congruency Effects

Reaction time and accuracy for each decile of trials, binned within subjects. People were faster and more accurate on Congruent than on Incongruent trials. This effect was substantially larger for Oddball flankers than for Standard flankers.

EEG Recording and Analysis Details

High-density scalp EEG was recorded while subjects performed the flanker task. We computed ERPs timedelock to stimulus onset for Oddball and Standard flankers.

Clustering and permutation-testing (Maris & Oostenveld, 2007) allowed us to identify time windows and electrodes that dissociated conditions.

N200 peak amplitude was the strongest predictor of vMMN magnitude; we partialed out peak amplitude on Standard trials before examining individual-differences effects.

vMMN to Oddball Flankers

The visual mismatch negativity (vMMN) occurs in response to occasional deviant elements in a regular sequence (Crigger, 2007).

We found a significant difference between Oddball and Standard trials at 16 posterior electrodes, from 180–320 ms after stimulus onset.

Multiple regression showed that individual differences in vMMN magnitude are predicted by two components of temperament. Attentional control predicts larger vMMN; sensitivity predicts smaller.

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