



# OBSESSED, WORRIED, OR ANXIOUS ABOUT MISTAKES: AN ERROR-RELATED NEGATIVITY STUDY



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## Abstract

### Background

- ❑ Error-monitoring activity is increased among those with anxiety and negative affect.
- ❑ Enhanced ERN in individuals with OCD.
- ❑ OCD is characterized by future-oriented worrisome cognitions that are associated with behavioral compensations and anxious arousal.
- ❑ To date, research has not investigated if this effect is specific to OCD or also characteristic of worry and anxiety in general.

### Purpose

- ❑ To look at the differences in ERN amplitude across three experimental groups (high OC, high anxiety, and high worry) and a control group to attempt to better characterize the enhanced ERN observed in OCD.

### Methods

- ❑ EEG data were recorded while participants completed a Flankers Letter task. Data were collected from 63 participants.

### Hypotheses

- ❑ It was predicted that for the high OC group, an enhanced ERN relative to the control group would be observed.
- ❑ High worry and high anxiety groups were also hypothesized to exhibit a larger ERN relative to the control group.

### Results

- ❑ Contrary to predictions, the OC group in fact had the lowest response-locked amplitudes, across both correct and error responses, with other clinical groups showing elevated scores relative to the OC group.

### Conclusion

- ❑ Because these high OC participants were screened specifically to be lower on anxiety and worry, these findings suggest that heightened ERN in OCD may reflect anxiety and negative affect as opposed to OC symptoms specifically.

## Method

### Participants

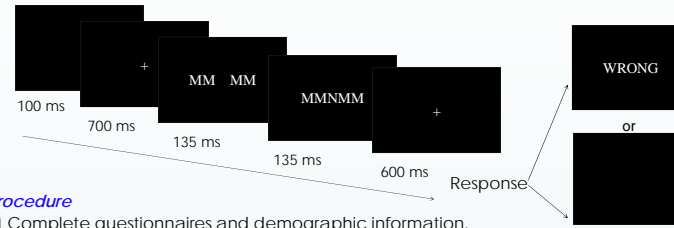
- ❑ 63 college students (36 females) at the University of Arizona; data from 60 were included in the analysis, as 3 participants had fewer than 10 errors.
- ❑ Participants were recruited through a survey in their introduction to psychology course.
- ❑ If their scores made them eligible to participate they were asked to complete a webscreen with the same questionnaire to ensure consistency in scores. They were invited to participate if they met criteria for one the groups:

	OCI-R	TAI	PSWQ
High OC (12)	Greater than clinical cutoff	Below median	Below median
High Worry (13)	Below clinical cutoff	Below clinical cutoff	Greater than clinical cutoff
High Anxiety (12)	Below clinical cutoff	Greater than clinical cutoff	Below clinical cutoff
Control (23)	Below median	Below median	Below median

## Method (Cont'd)

### Tasks

- ❑ Modified Flankers Erikson Task



### Procedure

- ❑ Complete questionnaires and demographic information.
- ❑ EEG cap was applied and participants rested quietly for six minutes while resting EEG was recorded.
- ❑ EEG data were recorded while they completed the Flankers task.

### Electrophysiological Recording and Processing

- ❑ EEG was recorded continuously using 64-channel EEG cap referenced to computer-averaged-mastoids.
- ❑ Independent component analysis (ICA) was used for eye-blink correction.
- ❑ The trough peak measure was derived by finding the most negative value in the window 0-120 msec following the response, and then finding the preceding positive peak within a 100 msec window.
- ❑ Larger trough-to-peak values reflected larger negative voltage potentials.
- ❑ Response locked ERPs for correct and error trials were compared.

### Analyses

- ❑ A MLM was used testing response (correct, error), group (high OC, high worry, high anxiety, control), and electrode site (Fz, FCz, Cz, CPz, Pz), with ERN amplitude as the dependent variable.

## Results

- ❑ Main effects for response (larger ERN amplitude for error trials;  $F(1, 373.4) = 189.9, p < .001$ ) and group (smaller trial amplitudes (collapsed across error and correct trials) for OC group relative to control and experimental groups;  $F(3, 373.4) = 3.85, p < .001$ ).
- ❑ Marginally significant interaction of sites by response ( $F(4, 170.1) = 2.01, p < .095$ ).

Figure 1. Error and correct trial amplitudes by group

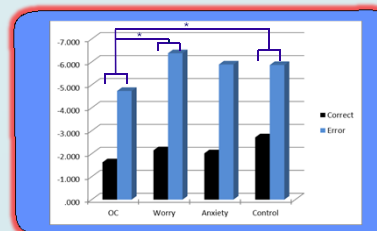
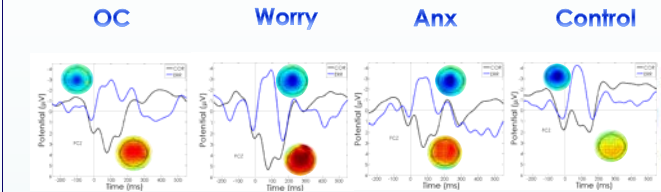


Figure 1. ERP amplitudes for error and correct trials in each group. The amplitudes observed in this bar graph are the average amplitude of 5 central electrode sites.

There was a significant difference ( $p < .05$ ) between amplitudes in the OC group and those of the worry and control group, with the amplitudes in the OC group being significantly smaller.

## Results (Cont'd)

Figure 2. ERP amplitudes of correct and error trials by group at FCz, with headmaps depicting the topography at the time of maximal negativity



## Discussion

- ❑ Contrary to expectation and to previous findings, our results showed no enhanced ERN in the OC group relative to the control group.
- ❑ Instead the control and worry group had the largest amplitudes, with the OC having the smallest amplitudes observed.
- ❑ Because the OC group was selected specifically in this study to be relatively low in worry and anxiety, our findings suggest that the heightened ERN often observed in OCD reflects anxiety and negative affect as opposed to OC symptoms specifically.
- ❑ Another possibility is that by providing feedback following the error trials may have altered the extent to which OC participants internally monitored these errors, perhaps instead relying on external feedback.
- ❑ However, the task parameters used in this study are essentially identical to those of Gründler and colleagues (2009), who also included feedback, and where an enhanced ERN was found in the OC group relative to the control group.
- ❑ So now what? Future directions
  - ❑ It would be instructive to include another group in the study where anxiety and worry are not controlled, thus providing an OC group that is more representative of the population typically used in ERN studies.

## References

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Handouts available at: [www.psychofiz.org](http://www.psychofiz.org)

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