Schizophrenia and Error Processing: A Meta Analysis

David Rackham
Scott Baldwin
Michael Larson

Follow this and additional works at: https://scholarsarchive.byu.edu/fhssconference_studentpub

Part of the Psychology Commons

The Annual Mary Lou Fulton Mentored Research Conference showcases some of the best student research from the College of Family, Home, and Social Sciences. The mentored learning program encourages undergraduate students to participate in hands-on and practical research under the direction of a faculty member. Students create these posters as an aide in presenting the results of their research to the public, faculty, and their peers.

BYU ScholarsArchive Citation
Rackham, David; Baldwin, Scott; and Larson, Michael, "Schizophrenia and Error Processing: A Meta Analysis" (2010). FHSS Mentored Research Conference. 222.
https://scholarsarchive.byu.edu/fhssconference_studentpub/222

This is brought to you for free and open access by the Family, Home, and Social Sciences at BYU ScholarsArchive. It has been accepted for inclusion in FHSS Mentored Research Conference by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.
Schizophrenia and Error Processing: A Meta Analysis

David Rackham¹, Michael Larson Ph.D.¹,², Scott Baldwin Ph.D.¹

¹Department of Psychology, Brigham Young University  ²Department of Neuroscience, Brigham Young University

Introduction

The error-related negativity (ERN) is a response locked Event-Related Potential component that peaks approximately 50 ms after an incorrect response. (Gehring, 1993)

In a general sense the ERN seems to play a role in error detection and monitoring that occurs in the anterior cingulate cortex (ACC). The ERN is modulated by affective variables as well as by psychopathology.

It is thought that deficiencies in the internal monitoring systems of individuals with schizophrenia may be related to the expression of symptoms typical to schizophrenia. Studies of the ERN and individuals with schizophrenia have revealed significant results that support these assumptions. No work has been done to determine the overall effect of ERN amplitude and schizophrenia. This study determined the average effect size of ERN amplitude for patients with schizophrenia.

It was hypothesized that a large average effect size of ERN amplitude attenuation in participants with schizophrenia would be found.

Method

A comprehensive search of the literature on the ERN and schizophrenia resulted in the inclusion of eight studies.

Inclusion criteria were:

- Participants must have had a diagnosis of schizophrenia
- The study must have measured the ERN amplitude
- Studies of the ERN and individuals with schizophrenia have revealed significant results that support these assumptions
- No work has been done to determine the overall effect of ERN amplitude and schizophrenia
- It was hypothesized that a large average effect size of ERN amplitude attenuation in participants with schizophrenia would be found

Results

The average effect size was calculated using a random effects model. The random effects model was used to estimate the effect size using established methods (Shadish, W. R., Robinson, L., & Lu, C., 1999).

Inclusion criteria were:

- Participants must have had a diagnosis of schizophrenia
- Studies of the ERN and individuals with schizophrenia have revealed significant results that support these assumptions
- No work has been done to determine the overall effect of ERN amplitude and schizophrenia
- It was hypothesized that a large average effect size of ERN amplitude attenuation in participants with schizophrenia would be found

Discussion

As hypothesized, a large average effect of ERN amplitude attenuation was found in individuals with schizophrenia.

According to prevailing theories, ERN amplitude attenuation reflects a deficiency in error processing.

The results of the influence plot suggest that several of the studies had a substantial impact on the average effect size.

The influence plot reveals that the removal of the Bates 2004 study substantially decreases the average effect size. This study had a very large effect size (d = 1.94) with a very small sample size (n = 18). It is likely that the small sample size is contributing to this finding.

The influence plot also reveals that the Morris 2016 (speed) study is influencing the average effect size. The participants in this condition were told to respond as quickly and as accurately as possible. The exclusion of this study yields a much larger average effect size (d = 0.74). This is likely a result of the affective variables which modulate ERN amplitude. Under a speeded condition accuracy is of less importance and therefore errors are less salient.

As a result of this study it is clear that schizophrenic symptoms are likely influenced by a deficiency of error processing.

References


Acknowledgements

We also thank Joshua Kirton, Kevin Voisin, Sierra Debenham, and Alexander Gray for their assistance with coding.

Supported by Brigham Young University College of Family, Home, and Social Sciences Mentored Research Environment Grant.

Large (Cohen, 1988) average effect size (d = 0.64) had a very large effect size (d = 1.94) with a very small sample size (n = 18). It is likely that the small sample size is contributing to this finding.

Further research evaluating the effect of subtype of schizophrenia would likely provide greater insight to the processes which modulate ERN amplitude.