

## Enhancing the Gene-Environment Interaction Framework: Evidence from differential responses to September 11<sup>th</sup>

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### Extended Abstract

The importance of gene-environment interactions (GxE) in research in the social and medical sciences has grown rapidly since several landmark papers in the early 2000s. GxE has been implicated in explaining the heterogeneity in response to treatments as well as differential response to a host of environmental stressors and exposures. However, while the idea of GxE is persuasive, empirically examining this phenomenon has been hampered by both data and methodological issues. Many data sets do not contain sufficient information on both genetic variation and environmental variation. Additionally, a growing number of researchers have called attention to the importance and ubiquity of gene-environmental correlation in these analyses, which could mask true causal effects as well as produce evidence of GxE when the true effects are in fact gene-gene interactions. In order to circumvent these issues, richer empirical specifications and the use of quasi-experimental variation in “E” (environment exposures) are needed. This paper moves in this direction by utilizing the coincidental survey window of Wave III of the Add Health surrounding the 9/11 terrorist attack combined with the molecular DNA information now available in the data to examine differential response to the attack by genotype. Methodologically, this paper contributes to the literature by incorporating a regression discontinuity design within a standard GxE analysis.

This paper shows that, since interview timing is unrelated to genotype, the “E” appears to be quasi-experimental. Several results emerge from this analysis. First, as shown in previous work, individuals interviewed shortly after 9/11 report much higher levels of sadness and other depressive symptoms. The results from the GxE analysis suggest important interactive effects with the DRD4 gene. Earlier evidence has suggested that individuals with the longer 7 repeat version of DRD4 are more likely to report being exploratory and excitable, which is consistent with the findings from this analysis, though additional analyses are needed to replicate these results and explore additional genes. Overall, this evidence suggests that genetic endowments are an important source of variation in response to a stressful event in producing poor mental health.