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Gene–environment interactions in early life cognitive development

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ABSTRACT:

Differences in early life cognitive development are widely thought to result from the interplay of genetic and environmental factors, yet no replicable gene-environment interactions (GxE) have been identified. Here, we predicted differences in children’s cognitive skills from 2 to 4 years of age by testing interactions between family- and neighborhood-level environments and the genome-wide polygenic score (GPS) for years in education. We addressed 3 research questions: (1) Do GxE effects exist in the prediction on cognitive development? (2) If they exist, to what extent do GxE effects account for children’s differences in cognitive development, independent of the main effects of GPS and environmental variables? (3) Which environmental variables, if any, are particularly relevant to the observation of GxE effects? Data came from the Twins Early Development Study (TEDS) in the United Kingdom. Lasso penalized linear regression results revealed a significant main effect of the GPS for years in education on children’s general cognitive ability, after controlling for twin age, twin sex, the first ten principal components, and genotyping array, $\beta = .05$, $SE = .01$, $p < .05$. Independent of confounders, the GPS for years in education explained .3 percent of the variance in children’s general cognitive ability, while environmental measures explained 18.5 percent of the variance. No significant interactions were observed. This research has potential implications for improving children’s developmental and educational outcomes in early life.

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