

¹Department of Psychology and Population Research Center, University of Texas at Austin; ²Department of Psychology, University of Houston



Understanding Child Genetic Effects on Parental Educational Expectations: Explanation through Child Individual Differences

Daniel A. Briley¹, Jennifer L. Tackett², K. Paige Harden¹, & Elliot M. Tucker-Drob¹

Abstract

Success in school is tied to factors such as expectations of academic achievement and value placed on education. Parental educational expectations (i.e., how far a parent thinks their child will go in school) are thought to play a key role in socializing child beliefs. However, parents base their expectations, in part, on characteristics of their children. Using the strengths of a genetically informative family study, we document evidence of evocative gene-environment correlation. We explain this correlation through child characteristics including cognitive ability, need for cognition, Big Five personality traits, and academic beliefs.

Background

- The expectancy-value model of academic motivation (Eccles & Wigfield, 2002; Nagengast et al., 2012) argues that successful learning occurs when students both believe in their competence to complete a task and in the value of task completion.
- Traditionally, parents are thought to play a primary role in socializing such beliefs for their children. One commonly used indicator of this process is parental expectations for how much schooling their children will complete.
- Numerous high quality, longitudinal studies have supported the association between parental expectations and child achievement (e.g., Jacob & Linkow, 2011).
- However, these studies typically do not consider or assess possible transactional processes between children and their parents. For example, child behavior may actively change parent beliefs or behavior (Bell, 1968). Put differently, parents may form their beliefs on the basis of child characteristics, rather than the other way around.
- Gene-environment correlation occurs when there is some genetic control over the types of environments that are experienced. Due to this process, more genetically similar individuals will also tend to receive more similar environmental experiences.
- Indeed, a recent meta-analysis found that 23% of the variance in parenting could be attributable to child genetic differences influencing parent behavior (Avinum & Knafo, 2013).
- In concert with parental socialization of academic beliefs, children may also elicit differing levels of academic support from their parents on the basis of their characteristics. This transactional model for educational expectations remains largely untested in the literature, with most theories assuming unidirectional transmission of values.

Goals

We aimed to test for gene-environment correlation for the parenting measure of educational expectations. To explain such genetic control over received parenting, we evaluated the ability of a number of genetically influenced child characteristics to explain genetic influences on parenting.

- **Are parental educational expectations based, in part, on genetic differences between children?**
- **Can genetic influences on child ability, personality, and school beliefs explain genetic influences on parenting?**

Methods

Participants

- We recruited adolescent twin pairs and their parents to participate in the Texas Twin Project (Harden, Tucker-Drob, & Tackett, 2013). The current sample included 91 monozygotic pairs, 234 dizygotic pairs, and one parent for each pair. The average child age was 14.55 years with a range from 8 to 21 years.

Measures

- Parents independently reported how far in school they expect their children to go for each twin. The child participants were assessed for cognitive ability (Wechsler, 2003), need for cognition (Gacioppo, Petty, & Kao, 1984), the Big Five personality traits (John, Naumann, & Soto, 2008), and academic beliefs taken from the Patterns of Adaptive Learning Scales (Midgley, 2000).

Analytic Approach

Behavioral Genetic Analysis

- Twin models use the differences in genetic similarity between monozygotic and dizygotic twins to estimate genetic influences, shared environmental influences, and nonshared environmental influences. When performed on an environmental measure, significant heritability indicates gene-environment correlation or child to parent effects.

Correlated Factors Model

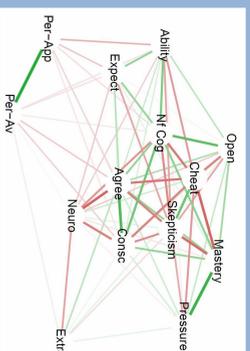
- We fit a correlated factors model to evaluate correlations between the genetic and environmental influences on all study variables.

Cholesky Decomposition

- We fit a cholesky decomposition with parental educational expectations as the target variable. This approach is the behavioral genetic extension of regression analysis. Genetic and environmental influences on predictor variables (i.e., child characteristics) are used to explain variance in an outcome (i.e., parental educational expectations).

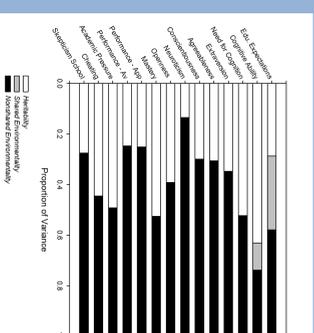
Results

Network Map of Phenotypic Correlations



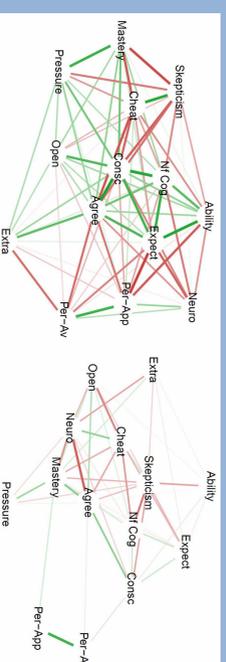
Significant phenotypic correlations between parental expectations and cognitive ability, need for cognition, conscientiousness, neuroticism, openness, mastery orientation, cheating behavior, and skepticism about the value of school.

Genetic and Environmental Influences on Study Variables



Significant child genetic influences on parental expectations. Significant genetic influences for remaining child variables.

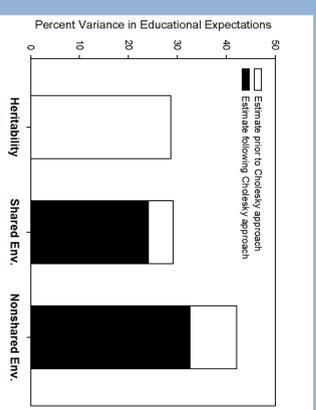
Genetic Correlations



Environmental Correlations

Significant genetic correlations between parental expectations and cognitive ability, need for cognition, agreeableness, conscientiousness, neuroticism, and mastery orientation.

Cholesky Decomposition



Child variables that significantly correlated with expectations at the phenotypic level fully explain the genetic influences on parental expectations

Discussion

We found evidence for transactional relations between parental educational expectations and child characteristics. Traditional theories of academic socialization view parents as primary, exogenous influences on child beliefs. However, we found that parents form educational beliefs, in part, based on genetic differences between their children. We documented one potential mechanism that may allow this to occur. Genetically influenced characteristics of children may inform parental expectations. At the phenotypic level, we found that expectations were associated with known predictors of academic achievement, such as cognitive ability, personality traits, and academic beliefs. Our behavioral genetic results indicated that each of these child characteristics were significantly heritable. Using a correlated factors model, we found that the child genetic influences on educational expectations were partially shared with the child genetic influences on cognitive ability, need for cognition, agreeableness, conscientiousness, and mastery orientation. Using a cholesky decomposition, an approach similar to multiple regression, we found that the child characteristics that were significantly correlated with expectations at the phenotypic level were sufficient to account for all of the child genetic influences on expectations. Parents do not solely transmit academic beliefs, but instead, actively interact and base their parenting on children with unique characteristics.

References

Avinum, R., & Knafo, A. (2014). Parenting as a reaction evoked by children's genotype: A meta-analysis of children-as-twins studies. *Personality and Social Psychology Review*, *18*, 87-102.

Bell, R. Q. (1968). A reinterpretation of the direction of effects in studies of socialization. *Psychological Review*, *75*, 81-95.

Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment*, *43*, 306-307.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*, 109-132.

Harden, K. P., Tucker-Drob, E. M., & Tackett, J. L. (2013). The Texas Twin Project. *Twin Research and Human Genetics*, *16*, 385-390.

Jacob, B. A. & Linkow, T. W. (2011). Educational expectations and attainment. In G. J. Duncan, & R. J. Murnane (Eds.), *Wither opportunity?* (pp. 133-162). New York: Russell Sage Foundation.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin, (Eds.), *Handbook of personality* (pp. 114-158). New York: Guilford Press.

Midgley, C., Maehr, M. L., Hruda, L. Z., Freeman, K. E., Gheen, M., Kaplan, A., ... Urdan, T. (2000). Manual for the Patterns of Adaptive Learning Scales (PALS). Ann Arbor: University of Michigan.

Nagengast, G., Marsh, H. W., Scalias, L. F., Xu, M. K., Hau, K., & Trautwein, U. (2011). Who's to blame? "x" out of expectancy-value theory? A psychological mystery, a substantive-methodological synergy, and a cross-national generalization. *Psychological Science*, *22*, 1058-1066.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children-WISC-IV*. Psychological Corp.