

2010 Russell Ackoff Doctoral Student Fellowship Proposal

The heritability of cognitive and non-cognitive skills, their genetic overlap, and
environmental moderation

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Descriptive Summary

A longstanding question in the social sciences has been to what extent government interventions aimed at helping underprivileged children actually improve their subsequent life outcomes, and relatedly, to what degree do differences in childhood environment contribute to the intergenerational transmission of poverty. These questions have spawned a large and diverse body of literature.

Initial findings from the psychology literature indicated that 1) cognitive skills were highly heritable (whereas shared environmental factors appeared to exert little to no influence) and 2) interventions with underprivileged children (e.g. head start) only temporarily boosted their cognitive skills; once enrollment in the programs ended, the gain in cognitive ability dissipated. In a similar way, economists typically treated ability as a one dimensional latent variable, which could perhaps be proxied by IQ.

More recently however, research in both psychology and economics have provided advancements over this mode of thinking. Psychologists have found that the heritability of cognitive skills is moderated by environment, namely, as one goes down the income ladder, the heritability of cognitive skills declines while the impact of shared environment increases. Economists and psychologists have found that while interventions may not create long lasting benefits in cognition, they likely still improve some later outcomes such as education and wages, leading to the hypothesis that the programs might improve what has been termed non-cognitive skills. This has led to a recent emphasis in both psychology and economics on non-cognitive skills, with the main finding that non-cognitive skills are in fact correlated with positive outcomes.

I will be applying for access to the National Longitudinal Study of Adolescent Health (Add Health) in order to exploit its oversampling of twins and other siblings. This would provide genetically informative data that can shed light on the nature of the association between ability/personality and life outcomes. The ADD Health survey, in addition to its oversampling of twins, has a wide range of data on life outcomes, cognitive ability, and socio-emotional traits such as self-esteem, impulsivity, conscientiousness, and openness to experience. With this data, I will attempt to make three contributions to the literature.

First, while the literature on the heritability of intelligence is quite extensive, there is much less on the heritability of non-cognitive skills. Using the rich set of non-cognitive measures available from ADD Health, I will estimate their genetic and environmental influences using conventional variance decomposition methods.

Second, in a multivariate model, I will decompose the variance/covariance of cognitive and non-cognitive measures into genetic and environmental sources. This will permit me to estimate the amount of genetic overlap between them (or among, depending on how non-cognitive skills are modeled, vis-a-vis factor analysis). Cognitive and non-cognitive traits are typically treated as conceptually different skills, yet it is not clear to what extent they should be treated as such.

Last, I will estimate the extent to which the family-wide environment moderates the heritability of cognitive skills as compared to non-cognitive skills, by carrying out the decomposition by socio-economic status. Such an analysis will suggest which set of skills might be more influenced by environmental factors, and consequently, which child anti-poverty interventions should receive the most emphasis.