

NAME OF PRESENTING AUTHOR: Samantha M Freis

EMAIL ADDRESS OF PRESENTING AUTHOR: safr7809@colorado.edu

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TITLE: Genetic Correlations Between Executive Functions and Intelligence in the Adolescent Brain Cognitive Development (ABCD) Study

FULL AUTHOR LIST: Samantha M. Freis^{1,2}, Claire L. Morrison^{1,2}, Jeffrey M. Lessem¹,
John K. Hewitt^{1,2}, Naomi P. Friedman^{1,2}.

AFFILIATIONS: 1. Institute for Behavioral Genetics, University of Colorado Boulder
2. Department of Psychology and Neuroscience, University of Colorado Boulder

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ABSTRACT:

Executive functions (EFs), higher-order cognitive processes that enable control over thoughts and actions during goal-directed behavior, are phenotypically related to intelligence (IQ), and both are heritable across the lifespan. Existing research from twin studies has demonstrated genetic correlations between EFs and IQ. However, the magnitude of these correlations varies across samples, particularly between age groups, which suggests that the genetic correlations between these cognitive abilities may be more robust in childhood than in adulthood. We analyzed data from the large and representative Adolescent Brain Cognitive Development (ABCD) study, which comprised 11,875 children, including 749 twin pairs (M age = 9.91, SD = .62, 48% female), to examine the phenotypic and genetic relationships between EFs and IQ in middle childhood. We identified two EF factors – Common EF and Updating-Specific. Both EFs are strongly related to IQ (r_s = .64-.81), and both Common EF and IQ are heritable (53-67%). We found a genetic correlation for Common EF and IQ (r_G = .86) that was not significantly different from 1, but we did not find a significant genetic correlation for Updating-Specific ability and IQ.

Overall, these results suggest that in middle childhood, EFs and IQ are phenotypically distinguishable; however, Common EF and IQ are closely related at the genetic level.

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Data used in the preparation of this presentation were obtained from the Adolescent Brain Cognitive Development (ABCD) Study (<https://abcdstudy.org>), held in the NIMH Data Archive (NDA). This is a multisite, longitudinal study designed to recruit more than 10,000 children age 9-10 and follow them over 10 years into early adulthood. The ABCD Study is supported by the National Institutes of Health and additional federal partners under award numbers U01DA041022, U01DA041028, U01DA041048, U01DA041089, U01DA041106, U01DA041117, U01DA041120, U01DA041134, U01DA041148, U01DA041156, U01DA041174, U24DA041123, U24DA041147, U01DA041093, and U01DA041025. A full list of supporters is available at <https://abcdstudy.org/federal-partners.html>. A listing of participating sites and a complete listing of the study investigators can be found at <https://abcdstudy.org/scientists/workgroups/>. ABCD consortium investigators designed and implemented the study and/or provided data but did not necessarily participate in analysis or writing of this report. This manuscript reflects the views of the authors and may not reflect the opinions or views of the NIH or ABCD consortium investigators.

The ABCD data repository grows and changes over time. The ABCD data used in this report came from *ABCD release 2.0* (DOI: 10.15154/1503209).
