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Neuropsychologists

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The main aim of this study was to explore the latent structure and genetic basis of cognitive processes involved in the Wisconsin Card Sorting Task (WCST) within phenotypic, behavioral genetic, and molecular genetic research paradigms.

The sample used in phenotypic and behavioral genetic analyses comprised 468 twins (154 monozygotic and 80 dizygotic twin pairs), and 404 twins from the same sample for molecular genetic analyses. The zygosity was determined via DNA analysis of buccal swabs. Trained researchers administered the Wisconsin Card Sorting Test (WCST; Heaton et al., 1993) to the entire sample.

A phenotypic factor analysis of WCST variables suggested a single-factor solution. Overall heritability ranged from 0.19 to 0.23 across different measures of the WCST. The presence of a single general genetic factor, which could be identified from different measures of the WCST, indicated the unity of various WCST indicators and the existence of a common basic ability.

In addition to the existence of a single general genetic WCST factor, as suggested by the phenotypic factor analysis and supported by behavioral genetic analyses, the main results of our study include the low heritability of WCST measures. Performance on the WCST did not reveal significant differences between the three genotypes on catechol-O-methyltransferase (COMT) and dopamine receptor D2 (DRD2). Carriers of the brain-derived neurotrophic factor (BDNF) Met + genotype exhibited better performance in cognitive functions in comparison to the BDNF Met – genotype. This study highlighted similarities in the phenotypic and genetic structures of the WCST, suggesting one general factor underlying different cognitive functions, and showed significant common main effects of the BDNF Met + genotype on different WCST measures.



The main implications of the results point to the existence of a general genetic factor, supporting the thesis on the unity of executive functions (EFs) measured by the WCST and the existence of a common ability that underlies them, while indicating that the standard WCST performance scores might be insufficient to concurrently assess the distinct cognitive/executive processes required for performing the WCST in healthy adults. It is paramount for future research directions to include examinations of the ethology of individual differences in EFs in clinical population samples as well as explorations of the developmental dynamics of genetic and environmental influences on the ethology of individual differences in executive abilities.