

# **The effect of ADHD symptoms on Working Memory, Processing Speed, and Fluid Intelligence**

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Researchers: Krista Ozolnieks

Supervisor: Dr Christopher Brydges

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## **Defining ADHD, Working Memory, Processing Speed, Fluid Intelligence, and Aims of Research**

Attention deficit/hyperactivity disorder (ADHD) is a psychological disorder characterised by inattention and hyperactivity. ADHD has been estimated to be observed in 5.9-7.1% of children, and has been found to persist into adulthood in 30-50% of cases. Cognitive deficits are commonly observed in ADHD patients, including impaired working memory (the ability to store, manipulate, and update incoming information or stimuli), processing speed (the speed at which individuals can perform cognitive tasks), and fluid intelligence (the ability to solve novel problems, independently of any previously acquired knowledge), the three of which are theorised to be closely associated with one another. In this study, we aimed to determine if decreased fluid intelligence was associated with ADHD, and was mediated by deficits in working memory and processing speed.

## **Methodology**

A total of 142 young adults took part in the study. All participants spoke English and had normal or corrected-to-normal vision. Participants first completed the Cattell Culture Fair Intelligence Test, a 46 item measure of fluid intelligence, before completing three working memory measures (backward digit span, Corsi block task, and a memory span task), three processing speed measures (simple reaction time, two-choice reaction time, and four-choice reaction time), and the Adult ADHD Self-Report Scale (ASRS). Participants were then debriefed after testing was completed. The entire procedure took approximately 1.5 hours to complete.

## **Findings**

Our study aimed to examine relationships between ADHD symptoms, working memory, processing speed, and fluid intelligence. As expected, we found significant correlations between working memory, fluid intelligence, and ADHD symptoms. Also, processing speed correlated significantly with working memory and fluid intelligence, but surprisingly not with ADHD symptoms. When we tested whether working memory and/or processing speed mediated the relationship between ADHD symptoms and fluid intelligence, we found that working memory fully accounted for this relationship. That is, although increased ADHD symptoms are associated with lower fluid intelligence, this is only due to

ADHD symptoms being associated working memory deficits, which in turn are associated with lower levels of fluid intelligence.

## **Conclusions**

The study shown that working memory, but not processing speed, fully mediates deficits in fluid intelligence that are associated with ADHD symptoms. Although not tested in this study, this is likely due to the compromised integrity of the prefrontal cortex of the brain, as activation of this region is associated with performance on both working memory and fluid intelligence tasks. It is possible that processing speed was not associated with ADHD symptoms due to different neuropsychological profiles of subtypes of ADHD. That is, inattentive-type ADHD patients may have displayed slower processing speed, but hyperactive-type patients may have displayed faster processing speed, essentially cancelling the effects of each other out.