Annotated Bibliography: The Effect of ADHD on Working Memory

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Introduction

For the introduction to the paper, I am planning on using Faraone et al. (2015) **(non-empirical)** for an overview of ADHD. Then, I plan on giving an overview of how ADHD affects the different parts of cognition that we have talked about in class.

Body

For this section, I intend on separating the various studies into their own respective subsections. Each will deal with a relevant part of working memory, and I am hoping to have a conclusion that will link all the research together. This would be the take-home message.

1. The first is Fabio et al. (2020) **(empirical)**. This paper is an empirical study that investigates three hypotheses:

   (a) children with ADHD show higher levels of DD (Delayed discounting—paradigms used to study the process leading to a choice) than control subjects,

   (b) once the memory load increases, deferring a reward becomes harder for both children with ADHD and with TD (typical development), and

   (c) the performances of children with ADHD are significantly worsened by the addition of a memory load compared to the control group.

   The researchers operationalize studying these independent variables by involving goal-directed actions during distractions and dual task paradigms. In other words, the participants were to listen and repeat an assigned sequence of numbers, while also evaluating which amount of money to take—e.g., some now, or more later. The distraction was the digit recall. Though, the results of this study should be taken with a grain of salt: It has a small sample size ($N = 32$), and the study was conducted in Italy, where they used different tests like the ADHD Rating Scale for Teachers (SDAI).

2. The second is Raiker et al. (2019) **(empirical)**. Through the lens of levels of processing, the researchers discuss the importance of remedying the deficit that the orthographic to phonological encoding places upon the phonological loop.

3. The third is from Friedman et al. (2017) **(empirical)**. They have also found that the orthographic to phonological encoding is critical for reading. They found that children with ADHD have a deficit in this area.

4. The fourth is Kofler et al. (2020) **(empirical)**. Due to highly varied results in the literature, the authors employed both visuospatial and phonological working memory tasks (bifactor model) to assess the working memory of children with ADHD. They found that a significant number of children with ADHD ($d = 1.62$–2.03), whether exhibiting inattentive or hyperactive-impulsive symptoms, displayed high percentages of cognitive impairment (75%–81%).

An important point to see between both Raiker et al. (2019) and Kofler et al. (2020) is that while Kofler et al. (2020) did not think ADHD has an effect upon the phonological loop, Raiker et al. (2019) did. That is, Raiker et al. (2019) found that (visuospatial-based) orthographic to phonological recording was to blame for a deficit in phonological performance.

Butzbach et al. (2019) **(empirical)** provide supporting evidence that backs up the conclusion from Kofler et al. (2020): They cite that about 11% of patients show no cognitive impairment — similar to the 81% that Kofler et al. (2020) found. Anyway, they show that basic functions like distractibility and processing speed affect higher order cognitive functions. (Perhaps tie this in with Raiker et al., 2019 about LoP?)

Fried et al. (2016) **(empirical)** questions the link between ADHD and WM. Specifically, they question whether WM deficits are common with children that have ADHD, or if ADHD causes the WM deficits. They conclude that WM deficits have a much greater impact upon cognition for ADHD-afflicted students. Thus, WM-deficits could be a

precursor to ADHD, and looking for these deficits could be a way to diagnose ADHD.

Elosúa et al. (2017) **(empirical)** is similar to Fried et al. (2016). They are both interested in ADHD and WM, but Elosúa et al. (2017) "measures divided attention, updating, attentional shifting and inhibition, measuring through four tasks, the dual-task paradigm (digits and box-crossing), the N-back task, the Trail Making Test and the Stroop task, respectively." They found corroborating results with Fried et al. (2016) that children with ADHD have deficits in WM.

Drigas and Karyotaki (2019) **(non-empirical)** speak on how a bidirectional relationship exists between executive functioning and problem-solving. They argue that an enhancement in self-regulation would help in problem-solving. These results extend to both adults and children. These results could be extended with research conducted by Skalski et al. (2021) regarding motivation.

Mohamed et al. (2021) **(empirical)** found that foundational cognitive processes are critical for higher level processing. They mention that the lack of measuring motivation may have been a confounding variable in their study. This gives credence to Skalski et al. (2021). In general, this study is more of a critique of how future research should be conducted, but there are some interesting points that could be used in the paper.

Working Memory Model

A. D. Baddeley and Hitch (1994) **(non-empirical)** detail the three parts of working memory that is widely considered the norm today. Working memory consists of the phonological loop, the visuospatial sketchpad, and the central executive.

Motivation

The authors Skalski et al. (2021) **(empirical)** state that motivation may have a role in cognitive capacity. They—like many other reports—show that there is not an intellectual deficit in children with ADHD, but rather, they note a motivational deficit. This may imply that children with ADHD will attain stronger cognition if they are motivated.

While the link between motivation and the central executive is not entirely

understood, Engelmann showed that when motivation is elevated, there is a higher capacity for completing spatial tests.

Episodic Buffer

The episodic buffer is an important component of working memory. Work from Kolfer (2018) demonstrates that, given the deficits in other working memory components (phonological loop and visuospatial sketchpad), the episodic buffer in children with ADHD is not disproportionately impaired. While children with ADHD perform worse than those without ADHD on cross-modality tasks (requiring the binding of phonological and visuospatial information), their episodic buffer deficits are proportional to their general working memory impairments.

Tags

1. A. D. Baddeley and Hitch (1994) = Working Memory Model; Phonological Loop; Visuospatial Sketchpad; Central Executive
2. A. Baddeley (2012) = Central executive;
3. A. Baddeley (2020) = Manipulating information; Problem-solving; Learning; Reasoning;
4. Butzbach et al. (2019) = Basic Processes; Cognitive Impairment; Processing Speed; Distractibility
5. Caprì et al. (2019) = Small sample; Problem-solving; decision-making;
6. Drigas and Karyotaki (2019) = Executive Functioning; Problem-Solving; Self-Regulation; Bidirectional Relationship
7. Elosúa et al. (2017) = Executive Functioning; Working Memory; Divided Attention
8. Engelmann and Pessoa (2007) = Motivation; Spatial tests; Visuospatial
9. Fabio et al. (2020) = Working memory; Small sample; Episodic buffer

10. Faraone et al. (2015) = Overview; Definition; ADHD;
11. Fried et al. (2016) = Clinical; Working Memory; ADHD Diagnosis
12. Friedman et al. (2017) = Phonological; Reading
13. Kofler et al. (2018) = Episodic Buffer; Cross-Modality Tasks; Working Memory Components
14. Kofler et al. (2020) = Visuospatial; Phonological; Cognitive Impairment
15. Nyhout and Mahy (2023) = Episodic memory; Development
16. McCabe et al. (2010) = Working memory; Capacity; Executive functioning
17. Mohamed et al. (2021) = Foundational Processes; Cognitive Processes; Motivation; Methodological Critique
18. Pessoa (2009) = Motivation; Emotion; Executive control
19. Raiker et al. (2019) = Phonological; Orthographic Encoding
20. Skalski et al. (2021) = Motivation; Cognitive Capacity; ADHD; Attention

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