Cognitive Proficiency: Comparing NTCB to CAS-2 With an ADHD Sample

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Introduction

- Cognitive proficiency consists of working memory and processing speed.[1]
- Research informs us that individuals with ADHD tend to have decreased levels of cognitive proficiency.[2]
- The Cognitive Assessment System, Second Edition (CAS-2) is an empirically-validated assessment that identifies cognitive strengths and vulnerabilities.[3]
- The NIH Toolbox Cognition Battery (NTCB) is a more accessible and briefer assessment battery that also assesses cognitive proficiency via the Pattern Comparison and List Sorting subtests.[4]
- The current study examines whether performance on NTCB working memory and processing speed tests correlates with those from the CAS-2, a previously validated neuropsychological battery.

Method

Procedure

- Participants and/or their legal guardians provided written consent for the use of de-identified testing data prior to undergoing a comprehensive neuropsychological battery.

Participants

- 118 pediatric patients were selected from de-identified archival data from 2019 to 2022 who were diagnosed with ADHD consistent with DSM-5 criteria (Inattentive 22.9%, Hyperactive-Impulsive 5.9%, Combined 71.2%).
  - Gender: 58.5% boys, 41.5% girls
  - Ages: 5-18 years (M_{age}= 11.46, *SD*= 3.54)
  - Race: White 76.3%, Black 3.4%, Asian 3.4%, Other 14.4%, Missing 2.5%
  - Ethnicity: Not Hispanic/Latinx 85.6%, Hispanic/Latinx 11.9%, Missing 2.5%

Measures

- **NTCB: Pattern Comparison Processing Speed Test**
  - Assesses the rate at which a participant can accurately detect differences between two visual stimuli.[5]
- **NTCB: List Sorting Working Memory Test**
  - Assesses the participant's ability to briefly store, manipulate, and recall verbal and visual information in sequential order.[6]
- **CAS-2: Speed/Fluency**
  - Assesses processing speed as derived from the first two trials of the Expressive Attention subtest (speeded color and word naming).[7]
- **CAS-2: Working Memory**
  - Comprised of an index score of two subtests measuring the participant's ability to accurately recall increasingly complex auditory and visual information (verbal-spatial subtest) and instructions (sentence repetition/questions)

Results

Analytic Approach: Pearson correlations were used to examine the relation between NTCB and CAS-2 working memory and processing speed scores.

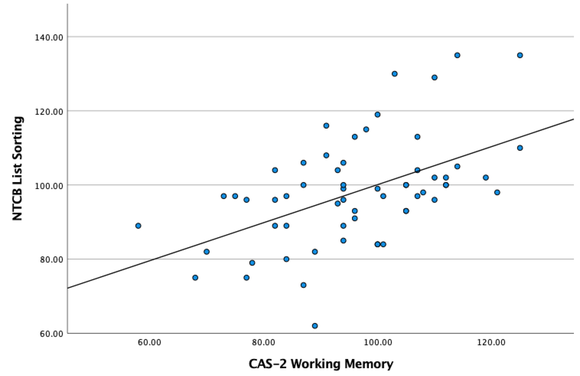
Table 1: NTCB and CAS-2 Correlations

		NIH Toolbox List Sorting	NIH Toolbox Pattern Comparison	CAS-2 Working Memory	CAS-2 Speeded Fluency
NIH Toolbox List Sorting	Pearson Correlation	--			
	N	104			
NIH Toolbox Pattern Comparison	Pearson Correlation	.193	--		
	Sig. (2-tailed)	.052			
	N	102	104		
CAS-2 Working Memory	Pearson Correlation	.472**	-.042	--	
	Sig. (2-tailed)	<.001	.753		
	N	60	58	67	
CAS-2 Speed/Fluency	Pearson Correlation	.004	.214*	.142	--
	Sig. (2-tailed)	.966	.029	.253	
	N	104	104	67	118

**. Correlation is significant at the 0.01 level (2-tailed).

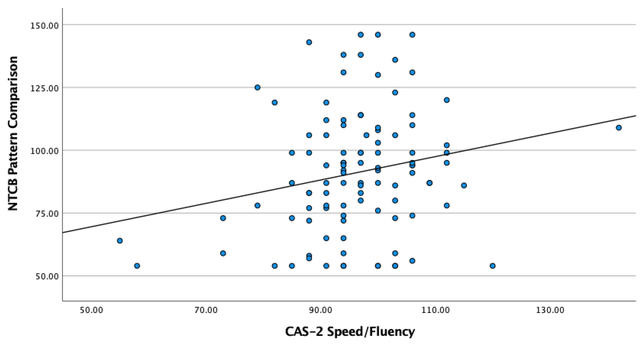
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 1: Working Memory Correlation



- Results demonstrated that there was a significant moderate relation between CAS-2 Working Memory and NTCB List Sorting
  - $r(60)=.472$, $p<.001$

Figure 2: Processing Speed Correlation



- Results demonstrated that there was a significant minimal relation between NTCB Pattern Comparison and CAS Speed/Fluency
  - $r(104)=.214$, $p<.05$

Discussion

- Our study found minimal to moderate relationships between performance on NTCB and CAS-2 measures of cognitive proficiency.
- Despite not being more strongly correlated, the current findings reflect significant positive correlations between the two assessment tools on measures of cognitive proficiency.
- Differences in how these batteries assess these functions may have contributed to the weaker correlation.
- It is also worth mentioning that the norms for the NTCB are based largely on a neurotypical sample, while this study uses an entirely neurodivergent ADHD sample.
- Therefore, the correlations between these measures may have been impacted by these brain-based differences.
- Given the high cost of neuropsychological evaluations, the NTCB offers several advantages, including being more accessible for administration in other healthcare settings.
- Future studies should examine the correlation between the NTCB and other empirically-validated neuropsychological assessments with pediatric neurodivergent samples, particularly given the rapid changes that occur within this age demographic.

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