Exploratory Factor Analysis of the WISC-IV Perceptual Reasoning Index in a Referred Sample Using a CHC Framework

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Abstract

The Cattell-Horn-Carroll (CHC) theory of cognitive abilities suggests that the Perceptual Reasoning Index (PRI) of the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV) comprises subtests that measure two different constructs – fluid reasoning (Gf) and visual processing (Gv). This study examined whether the PRI is better represented by the two separate factors of fluid reasoning (Gf) and visual processing (Gv) with the addition of the Beery Visual Motor Integration (Beery VMI) task. An anonymous database of 296 children referred for psychoeducational assessment was subjected to an exploratory factor analysis (EFA). Results suggest that there is only one factor underlying the PRI. This study did not provide support for the hypothesis that dividing the PRI into two factors would aid interpretation, as suggested by CHC theory.

Rationale

- The WISC-IV represents the most substantial revision of the WISC to date Although the new factorial structure is better grounded theoretically, it is still not in line with modern theories of cognitive abilities, such as the Cattell-Horn-Carroll (CHC) theory
- CHC theory suggests that that Perceptual Reasoning Index (PRI) confounds fluid intelligence (Gf) with visual processing (Gv) by including subtests that measure each of these abilities on the same Index
- Some have suggested that models based on CHC theory provide a better fit to the standardization data than the four-factor structure presented in the WISC-IV technical manual
- Keith and colleagues (2006) found that a five factor model of the WISC-IV (separating out Gf and Gv in the PRI) was a better fit to the standardization sample data when examining core and supplemental subtests
- The present study aims to determine whether the PRI is better represented by two separate factors by examining the core and supplemental PRI subtests, along with Arithmetic and the Beery VMI

Subtest	Mean	*SD*	Skew	Kurtosis
BD	7.21	3.02	.25	-.30
PCn	8.50	3.11	-.35	.14
MR	7.56	2.92	-.09	-.52
PCm	7.56	2.95	-.11	-.70
A	6.43	2.37	.05	-.10
VMI	84.82	12.83	-.16	1.76

Component Matrix

Subtest	Loading
BD	.835
PCm	.829
MR	.793
PCn	.721
VMI	.665
A	.635

Method & Results

- Anonymous database of 296 children (211 boys, 85 girls) referred for psychoeducational assessment
- Mean child age = 10.94, *SD* = 2.06
- Prior medical history included:
  - None 57.2%, ADHD 14.9%, Head Injury 2.3%, CAPD 1.9%, Other 23.8%
- Medication taken at time of assessment:
  - None 72.7%, ADHD 15.2%, Other 11.6%
- Block Design (BD), Picture Concepts (PCn), Matrix Reasoning (MR), Picture Completion (PComp), and Arithmetic (A) scaled scores, as well as the Beery VMI (VMI; standard score) were subjected to a principal components analysis, pairwise deletion
- Determining number of factors to retain:
  - Eigenvalues >1 indicated 1 factor
  - Scree plot indicated 1 factor
  - Parallel Analysis indicated 1 factor
- Final one-factor solution accounts for 56.2% of total variance

Discussion & Conclusions

- Results of the present study do not support splitting up the PRI into two separate Gf and Gv factors
  - Perhaps this is an artifact of the sample used in the present study
  - All previous studies finding more than one factor underlying the PRI have examined the standardization sample data, rather than a clinical sample
  - Perhaps the Beery VMI is not a pure measure of Gv, and as such clouded the data rather than helped clarify two potential components
- Interpretation of the WISC-IV Perceptual Reasoning Index should remain as a single factor

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