Examining the Influence of Cognitive Constructs on Reading Ability

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ABSTRACT

The purpose of this study was to evaluate how specific cognitive constructs of contemporary intellectual and neuropsychological batteries predict reading ability within a mixed clinical sample. Previous research has indicated that reading difficulties are comprised of a number of complex interactions of cognitive functions (Ashkenazi et al., 2013).

It was hypothesized that performance on selected subtests of the WJ-II ACH NU, WJ-III COG NU and NEPSY-II would predict Basic Reading and Reading Comprehension domains of the WJ-III ACH NU. The results indicate that the neurocognitive attributes measured by these assessments predict both reading comprehension and basic reading skills.

INTRODUCTION

Reading disabilities are subcategorized into deficits of 1) word recognition, 2) reading fluency, and 3) reading comprehension as a convention of federal law (Fletcher, Foorman, Boudousquie, Barnes, Schatschneider, & Francis, 2002).

Previous research describes reading disability as a result of neurobiological influences (Ashkenazi, Black, Abrams, Hoeft, & Menon, 2013; Joseph, Noble, & Eden, 2001).

The literature also notes that cognitive processes are shared among reading and other academic skills (Vellutino, Fletcher, Snowling, & Scanlon, 2004). Assessment of these processes is typically conducted through the use of neurocognitive and academic batteries.

The aim of the current study was to further identify and evaluate the predictive power of contemporary neurocognitive subtests on reading ability.

METHOD

This study incorporated data from the Kids Inc. School Neuropsychology Post-Graduate Training Program. Participants included 952 individuals ages 6-18 previously identified as having a clinical diagnosis of Learning Disability, Neurological Impairment, Attention-Deficit/Hyperactivity Disorder, or Autism.

Two NEPSY-II subtests were utilized as predictor variables: Phonological Processing and Comprehension of Instructions. Three WJ-III COG NU subtests were also utilized: Verbal Comprehension, General Information, and Visual-Auditory Learning.

To determine if these subtests predict reading ability, two multiple regression analyses were computed. Before analyzing the data, major assumptions were checked to see if multiple regression was an appropriate analysis technique. Tolerance (> 0.1) and VIF (< 10) statistics were in an acceptable range on both analyses.

RESULTS

The results of the first analysis confirmed that the cognitive subtests explain a significant amount of the variance in basic reading, $F(5, 952) = 17.68$, $p < .05$, $R^2 = .085$, $R^2_{adjusted} = .081$.

Specifically, the General Information subtest of the WJ-III COG NU significantly predicted basic reading achievement on the WJ-III ACH, $\beta = .217$, $t(5, 952) = 4.78$, $p < .05$.

The results also demonstrate that the NEPSY-II subtest Phonological Processing significantly predicted basic reading ability, $\beta = .179$, $t(5, 952) = 4.93$, $p < .05$, as did the Comprehension of Instructions subtest, $\beta = .135$, $t(5, 952) = 3.96$, $p < .05$.

The results of the second analysis also confirmed that cognitive subtests explain a significant amount of the variance in reading comprehension, $F(5, 952) = 25.29$, $p < .05$, $R^2 = .118$, $R^2_{adjusted} = .113$.

Specifically, the analysis shows that the Verbal Comprehension subtest of the WJ-III COG NU significantly predicted reading comprehension on the WJ-III ACH NU, $\beta = .189$, $t(5, 952) = 4.81$, $p < .05$, as did the Verbal-Auditory Learning subtest, $\beta = .07$, $t(5, 952) = 2.01$, $p < .05$.

The results also demonstrate that the NEPSY-II Phonological Processing subtest, β =. -09, $t(5, 952) = -2.56$, $p < .05$ and Comprehension of Instructions subtest significantly predicted reading comprehension ability as measured by the WJ-III ACH NU,

Table 1: *Basic Reading predicted by WJ-III COG NU and NEPSY-II subtests*

Neurocognitive Subtests	*B*	SE *B*	β	*p*
COGVC	-.107	.056	-.077	.054
COGVAL	-.013	.039	-.012	.736
COGGI	.217	.045	.172	.001
NPCI	.735	.186	.135	.001
NPPP	1.12	.229	.179	.001

Table 2: *Reading Comprehension predicted by WJ-III COG NU and NEPSY-II subtests*

Neurocognitive Subtests	*B*	SE *B*	β	*p*
COGVC	.271	.056	.189	.001
COGVAL	.079	.039	.071	.045
COGGI	.058	.046	.044	.209
NPCI	1.39	.189	.246	.001
NPPP	-.595	.233	-.091	.011

DISCUSSION

These findings provide further evidence that underlying neurocognitive factors play a major role in the acquisition of basic reading skills and reading comprehension.

Tasks requiring semantic activation and phonological awareness predicted basic reading skills, while subtests measuring associative memory and lexical knowledge predicted reading comprehension ability.

Delineating the predictive strength of specific neurocognitive constructs and measures that influence reading assessment may enhance the efficiency and accuracy of reading disability identification.

References

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