MindPrint Linking Study Brief

The Relationship between MindPrint Cognitive Assessment and the New Jersey Student Learning Assessment (NJSLA)

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Research Overview

The MindPrint assessment battery significantly predicted student outcomes on the New Jersey Student Learning Assessment, accounting for performance on Mathematics (58%), English Language Arts (52%), and Science (66%).

Methodology (or "About the Students in the Study")

MindPrint Learning conducted a large-scale study examining performance on the assessment battery in 2021 and the New Jersey Student Learning Assessment (NJSLA) in 2022. Third to eleventh grade students (n= 278; 82% male) participated in the study **(Table 1)**. We examined both sets of data to uncover the predictive link between student performance on the cognitive assessments and their performance on Mathematics, English Language Arts (ELA), and Science outcomes on the NJSLA.

Table 1. Student Demographics (grade and gender frequencies)

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| Grade	Count	% of Total	Male
3	10	3.6%	3.6%
4	28	10.1%	8.6%
5	30	10.8%	10.8%
6	34	12.2%	10.8%
7	41	14.7%	11.9%
8	51	18.3%	12.2%
9	36	12.9%	11.2%
10	14	5%	3.2%
11	34	12.2%	10.1%

Results

Correlation Results

We estimated Pearson's r correlation coefficients to quantify the associations among all the cognitive factors of interest by accuracy and reaction time and student outcomes on the NJSLA. Findings on performance for Mathematics, ELA, and Science are presented below.

Performance accuracy in the following areas had small to moderate significant (*p*<.05) correlations with **Math** outcomes: Verbal Reasoning (*r*=0.37), Spatial Perception (*r*=0.32), Abstract Reasoning (*r*=0.29), Flexible Thinking (*r*=0.20), Working Memory (*r*=0.16), and Verbal Memory (*r*=0.17).

Performance in the following areas had small to moderate significant correlations with **ELA** outcomes: Flexible Thinking (*r*=0.46), Verbal Reasoning accuracy (*r*=0.42) and speed (*r*=0.29), Spatial Perception (*r*=0.31), and Abstract Reasoning (*r*=0.24).

Performance in the following areas had small to moderate significant correlations with **Science** outcomes: Abstract Reasoning accuracy (*r*=0.51), Spatial Perception accuracy (*r*=0.50), Verbal Reasoning accuracy (*r*=0.48), Flexible Thinking accuracy (*r*=0.30), Attention accuracy (*r*=0.40) and speed (*r*=-0.33), and Visual Memory accuracy (*r*=0.37).

Figure 1. Correlation Results
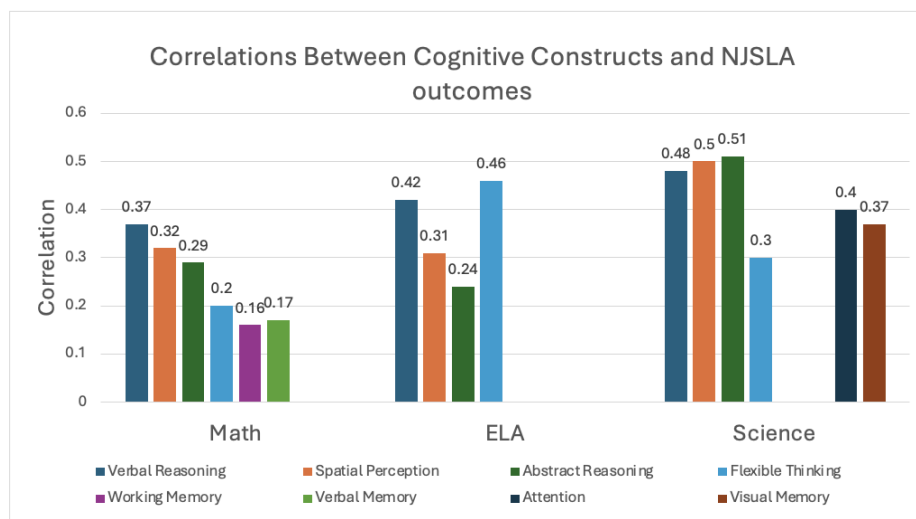
Note. All correlations presented are significant at *p* < .05

Multivariate Regression Results

We then expand on these bivariate correlations using multivariate regression modeling to examine the unique explanatory power of each factor in predicting student performance outcomes on the NJSLA assessments. Student performance on Mathematics, ELA, and Science were used as the dependent measures for the three models. The primary interest of these regression models is to identify which student factors hold the greatest predictive power for the outcomes by examining statistical

significance and beta-coefficient output. The relations between all the cognitive measures on Mathematics, ELA, and Science outcomes while controlling for grade level are presented in **Table 2**.

Table 2
Regression model of the relationship between NJSLA outcomes and MindPrint cognitive assessments

Variable	Mathematics Model B (SE)	ELA Model B (SE)	Science Model B (SE)
Visual Memory$_{acc}$	5.5 (2.21)**		
Visual Memory$_{sp}$	6.3 (3.04)*		
Verbal Reasoning$_{acc}$	8.25 (3.99)*		
Abstract Reasoning$_{acc}$	9.8 (4.25)*		
Abstract Reasoning$_{sp}$		6.5 (3.15)*	
Working Memory$_{sp}$	-7.41 (3.06)*		
Visual Memory$_{acc}$		-6.83 (2.55)**	
Visual Memory$_{sp}$	-7.02 (2.75)*		
Spatial Perception$_{acc}$			15.76 (7.61)*
R^2	0.58	0.52	
N	128	100	50

$^*p < .05,\ ^{**}p < .01,\ ^{***}p < .001$

Discussion

Overall, the research indicates that the MindPrint Assessment accounted for 59% of Math outcomes, 52% of the ELA outcomes, and 65% of the Science outcomes on the NJSLA. This reaffirms the importance of examining a broad range of cognitive functions when predicting student outcomes on summative assessments. Student data from the MindPrint Assessment has the potential to guide teachers to meet the needs of individual learners. In particular, student performance on the Verbal Reasoning, Abstract Reasoning, and Spatial Perception tasks were most highly predictive of achievement outcomes. This suggests that adjusting instruction to support students based on their performance on these skills could lead to gains across Math, ELA, and Science.

About the Author

Dr. Nancy Tsai is an expert in applied Cognitive Neuroscience where she examines the link between executive functions and human well-being. She completed her scholarly training at U.C. Berkeley, Harvard University, U.C. Irvine, and is currently a research fellow at MIT and instructional faculty member at Harvard College. Nancy has won numerous awards for her scientific work, including funding from the National Science Foundation. Her original research is published in *Journal of Neuroscience, Brain & Cognition*, *Journal of Applied Research in Memory and Cognition*, among other top peer-reviewed journals.