

The Ecological Validity of Neuropsychological Tests of Executive Function in Children with Fetal Alcohol Spectrum Disorder (FASD)

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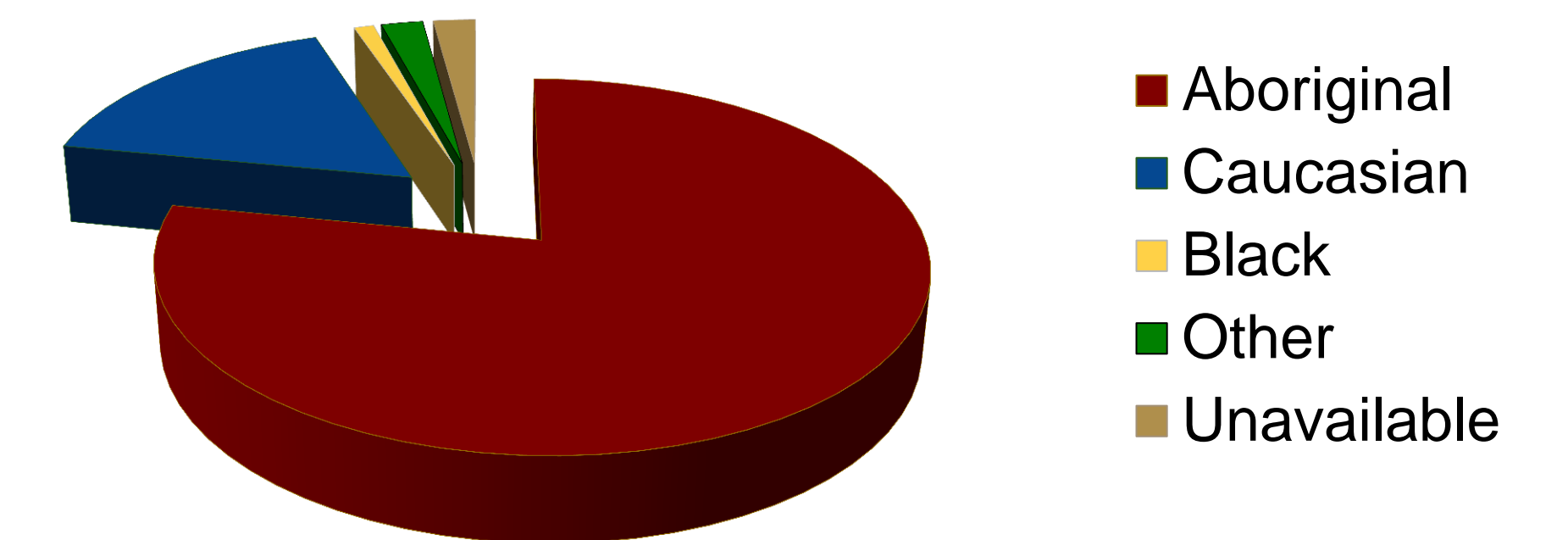


Introduction

- Executive function (EF) refers to the self-regulatory processes that organize and direct cognitive activity, emotional responses, and overt behaviour (Gioia & Isquith, 2004).
- In neuropsychological assessment, EF is typically evaluated using performance-based tests of planning and goal setting, initiation, inhibition, cognitive flexibility, and working memory (Salimpoor & Desrocher, 2006).
- Studies comparing scores from performance-based and behavioural measures of EF suggest that the former have little, if any, ecological validity in various clinical populations (e.g., Vriezen & Pigott, 2002).
- This study investigated the ecological validity of performance-based EF tests in a new clinical sample: children with Fetal Alcohol Spectrum Disorder (FASD).

Methods

- Retrospective data were analyzed from 96 children with FASD (62.5% male) who were assessed at the private practice of a child neuropsychologist.
- Bivariate correlations, multiple regression, and canonical correlation analysis were used to examine the extent and nature of the relationship between four performance-based EF test scores (Wisconsin Card Sorting Test (WCST) perseverative errors, Trail Making Test (TMT) Part B time to completion and B/A ratio, and Controlled Oral Word Association (COWA) total words) and the Behavior Rating Inventory of Executive Function (BRIEF).



Mean age, education, and intellectual functioning estimates

Estimate	<i>n</i>	<i>M(SD)</i>	Range
Demographic variables			
Age	96	13.30(2.37)	9.0 – 16.0
Education	95	7.86(2.49)	2.0 – 12.0
Intellectual functioning			
Verbal IQ	94	76.69(12.56)	47.0 – 108.0
Performance IQ	94	86.27(14.39)	52.0 – 122.0
Full Scale IQ	94	76.76(12.65)	41.0 – 102.0

Results

Mean scores on performance-based tests of EF and the BRIEF

Variable	<i>M(SD)</i>	Range
Performance-based EF tests ^a		
WCST perseverative errors	47.05(9.28)	28.0 – 73.0
COWA total words	30.47(14.13)	0.00 – 63.0
TMT-B time to completion	23.55(20.10)	0.00 – 66.8
TMT B/A ratio	3.01(1.26)	1.07 – 7.52
BRIEF ^b		
Inhibit	74.47(13.03)	41.0 – 103.0
Shift	73.93(12.27)	40.0 – 95.0
Emotional Control	72.23(13.59)	39.0 – 123.0
Initiate	70.85(10.78)	43.0 – 93.0
Working Memory	75.47(10.17)	45.0 – 93.0
Plan/Organize	72.44(9.15)	53.0 – 103.0
Organization of Materials	62.38(9.91)	34.0 – 98.0
Monitor	71.26(8.10)	47.0 – 91.0
Behavior Regulation Index	76.48(12.15)	44.0 – 109.0
Metacognition Index	74.09(8.35)	54.0 – 92.0

Notes. WCST = Wisconsin Card Sorting Test; COWA = Controlled Oral Word Association Test; TMT-B = Trail Making Test Part B; TMT = Trail Making Test. BRIEF = Behavior Rating Inventory of Executive Function.

^aAll scores, with the exception of the TMT B/A ratio, are standardized to *T* scores such that higher values reflect better performance (i.e., less impairment). TMT B/A ratios greater than 3.0 denote impairment (Lamberty et al., 1994).

^bAll scores are in the form of *T* scores such that higher scores reflect more impairment. *T* scores greater than 65 are considered to be clinically significant.

- Scores of children with FASD were impaired on all performance-based EF tests except the WCST.
- Caregiver ratings produced clinically-significant elevations on all scales and indexes of the BRIEF except Organization of Materials.
- Bivariate correlations between performance-based and BRIEF variables, as well as the canonical correlation analysis, were not statistically significant, although more impaired scores on BRIEF Organization of Materials were weakly associated with fewer WCST perseverative errors.
- Performance-based test variables did not meaningfully predict scores on the BRIEF Metacognition and Behavior Regulation Indexes.

Correlations between performance-based EF test variables and scales and indexes of the BRIEF

BRIEF score ^b	Performance-based EF test score ^a			
	WCST perseverative errors	COWAT total words	TMT-B time to completion	TMT B/A ratio
Inhibit	.12	.08	-.08	.06
Shift	.00	-.08	-.17	.003
Emotional Control	.09	-.01	-.09	.004
Initiate	-.02	-.18	-.18	.04
Working Memory	-.06	-.18	-.16	.003
Plan/Organize	.06	-.06	.16	-.14
Organization of Materials	.21*	.11	.07	-.01
Monitor	-.01	-.09	-.03	-.04
Behavior Regulation Index	.05	-.01	-.16	.06
Metacognition Index	.12	-.12	-.04	-.05

Notes. BRIEF = Behavior Rating Inventory of Executive Function; WCST = Wisconsin Card Sorting Test; COWAT = Controlled Oral Word Association Test; TMT-B = Trail Making Test Part B; TMT = Trail Making Test.

^aAll performance-based EF test scores, with the exception of the TMT B/A ratio, were standardized to *T* scores prior to analyses, such that higher scores represented better performance (i.e., less impairment).

^bAll BRIEF scores were in the form of *T* scores, such that higher scores denoted greater dysfunction.

**p* < .05, two-tailed.

Conclusions

- The results of this study add to the growing literature demonstrating a weak relationship between performance-based and behavioural measures of EF.
- It appears that performance-based and behavioural measures assess either different aspects of EF or different constructs altogether.
- There is a need for the development of new performance-based EF tests that follow from a clear theoretical conceptualization of EF.