An Evidence-Based Assessment Approach to Identifying ADHD Subtypes With the BRIEF2A

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Background and Objective

Executive dysfunction has long been recognized as a core feature of attention-deficit/hyperactivity disorder (ADHD), and administering a rating scale of executive function with known diagnostic accuracy is recommended practice in evidence-based assessment (EBA) of ADHD (Eng et al., 2024). Adults with ADHD show well-established profiles of everyday self-regulation on the Behavior Rating Inventory of Executive Function, Adult Version (BRIEF-A; Roth et al., 2005) and its second edition (BRIEF2A; Roth et al., 2024) that are sensitive to change with treatment (Surman & Walsh, 2023).

Objective: We sought to test an EBA approach using the BRIEF2A to detect and predict ADHD diagnoses by subtype in a large, well-defined sample of adults with ADHD.

Method

Participants: Self-report ratings on the BRIEF2A at baseline were available for a well-defined research sample of unmedicated adults ages 18–60 years categorized as ADHD, inattentive type (ADHD-I; *n* = 79) or ADHD, combined type (ADHD-C; *n* = 260). ADHD diagnosis was confirmed using the Structured Clinical Interview for DSM-5, Clinical Trials Version (SCID-5-CT; First et al., 2015), and participants had an Adult ADHD Investigator Symptom Rating Scale (AISRS; Spencer et al., 2010) total score ≥26 (Nasser et al., 2022).

Age- and sex-matched healthy adults (*n* = 339) were selected from the BRIEF2A standardization sample (see Table 1).

Measure: Self-report form of the BRIEF2A, a 70-item rating scale of executive functioning.

Procedures: Participants in the research sample completed the BRIEF-A; responses were rescored as BRIEF2A (the five deleted items were removed and BRIEF2A norms were applied). Matched healthy adults completed the BRIEF2A and a demographic questionnaire as part of standardization data collection.

Analysis: BRIEF2A ratings on each scale were submitted as within-subjects dependent variables in multivariate analyses of variance (MANOVAs) with diagnostic group as the between-subjects variable. For each scale and index, we tested simple effects and calculated Cohen's *d* effect sizes.

We generated two sets of receiver operating characteristic (ROC) curves: one predicting ADHD diagnosis versus no ADHD diagnosis using Working Memory *T* scores, and one predicting ADHD-C diagnosis versus ADHD-I diagnosis using Inhibit *T* scores. For each set, we calculated sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for *T*-score cutoff points between 60 and 70 for various prevalence (base) rates, including 10% (screening), 50% (referred), and 80% (ADHD clinic).

Results

Mean *T* scores were significantly higher on all BRIEF2A scales and indexes in both ADHD groups compared to healthy adults and on most scales and indexes in individuals with ADHD-C compared to those with ADHD-I (see Table 2).

Working Memory scale to detect any ADHD: Using Working Memory *T* scores to predict ADHD diagnosis versus no ADHD diagnosis, the area under the ROC curve (AUC) was .96 (see Figure 1). The BRIEF2A Working Memory scale had optimal sensitivity (.89) and specificity (.90) for detecting the presence of any ADHD at *T* scores ≥65 with 90% overall classification accuracy (see Table 3).

At a base rate of 50%, scores at this level accurately predicted 90% of ADHD cases (PPV) and accurately ruled out 89% of non-ADHD cases (NPV). Higher base rates yielded similar results; at lower base rates, positive cases were equally likely to be ADHD or not (PPV = .50), and negative cases were highly likely to be non-ADHD (NPV = .99; see Table 4).

Inhibit scale to detect ADHD-C versus ADHD-I: Using Inhibit *T* scores to predict ADHD subtype diagnosis within the ADHD group, the AUC was .65. Self-report ratings on the BRIEF2A Inhibit scale helped identify the presence of ADHD-C among adults with ADHD, with *T* scores ≥65 having a sensitivity of .89 though a specificity of only .28 (see Table 5).

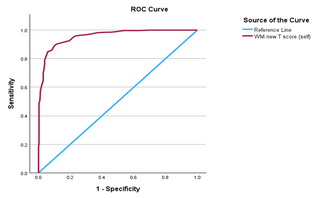
At a base rate of 50%, *T* scores of ≥65 had a PPV of .55 and an NPV of .72. Higher base rates yielded more certainty that a positive case is ADHD-C (PPV = .83), and lower base rates yielded greater certainty that a negative case is ADHD-I (NPV = .96; see Table 6).

Table 1. Demographic Characteristics of the Samples

Characteristic	ADHD-I	ADHD-C	Matched healthy adults
n	79	260	339
Age (years)			
M (SD)	34.91 (10.48)	34.71 (10.07)	34.76 (10.15)
Range	18–60	19–58	18–60
		% of sample	
Sex			
Male	57.0	55.4	55.8
Female	43.0	44.6	44.2
Race/Ethnicity			
African American	20.3	8.8	16.2
Caucasian	53.2	59.6	53.1
Hispanic	24.1	23.1	20.6
Other	2.5	8.5	10.0

Note. ADHD-I = attention-deficit/hyperactivity disorder–inattentive type; ADHD-C = attention-deficit/hyperactivity disorder–combined type. Percentages may not add up to 100 due to rounding.

Figure 1. ROC Curve Using BRIEF2A Self-Report Working Memory T Scores for Detecting Any ADHD



Note. N = 339 adults with ADHD and 339 healthy adults. Area under the curve = .96. ROC = receiver operating characteristic; ADHD = attention-deficit/hyperactivity disorder.

Table 2. Mean BRIEF2A Self-Report Form *T* Scores for ADHD Research and Healthy Adult Samples

	Sample						ADHD-I vs. healthy		ADHD-C vs. healthy		ADHD-C vs. ADHD-I	
	ADHD-I[b]		ADHD-C[a]		Healthy[c]							
Scale/Index/Composite	*M*	*SD*	*M*	*SD*	*M*	*SD*	Mean difference	Effect size	Mean difference	Effect size	Mean difference	Effect size
Inhibit	69.95	8.45	74.30	8.90	50.47	9.28	19.48***	2.13	23.84***	2.62	4.35**	0.50
Self-Monitor	61.91	11.84	68.08	10.61	51.03	9.03	10.88***	1.13	17.06***	1.75	6.17**	0.57
Behavior Regulation Index	67.85	9.88	73.54	9.61	50.42	9.32	17.43***	1.85	23.12***	2.45	5.69**	0.59
Shift	60.62	10.36	63.72	11.63	50.40	9.96	10.22***	1.02	13.31***	1.24	3.10*	0.27
Emotional Control	55.73	11.84	58.95	11.84	49.99	9.62	5.74***	0.57	8.95***	0.84	3.21*	0.27
Emotion Regulation Index	59.10	11.83	62.89	12.11	50.36	10.50	8.74***	0.81	12.53***	1.12	3.79**	0.32
Initiate	66.28	9.12	67.69	9.34	50.86	10.44	15.42***	1.51	16.83***	1.69	1.41	0.15
Working Memory	73.49	7.95	76.18	9.99	50.40	9.44	23.09***	2.52	25.78***	2.66	2.69*	0.28
Plan/Organize	68.85	11.70	71.22	11.14	50.85	9.63	18.00***	1.79	20.37***	1.98	2.37	0.21
Task-Monitor	68.81	9.99	72.32	11.81	50.32	10.28	18.49***	1.81	22.01***	2.01	3.51*	0.31
Organization of Materials	65.30	12.70	69.51	11.35	50.54	9.45	14.76***	1.46	18.97***	1.84	4.21**	0.36
Cognitive Regulation Index	71.82	9.76	75.20	10.38	51.08	10.10	20.74***	2.07	24.12***	2.36	3.38*	0.33
Global Executive Composite	69.42	9.09	73.85	9.62	50.55	10.00	18.86***	1.92	23.1***	2.35	4.24***	0.45

Note. ADHD-C = attention-deficit/hyperactivity disorder, combined type; ADHD-I = attention-deficit/hyperactivity disorder, inattentive type.
[a]*n* = 260. [b]*n* = 79. [c]*n* = 339.
*p < .05. **p < .01. ***p < .001.

Table 3. BRIEF2A Self-Report Form Working Memory Scale Calculations for Detecting Any ADHD

Statistic	Description of Statistic	*T* ≥ 60	*T* ≥ 61	*T* ≥ 62	*T* ≥ 63	*T* ≥ 64	*T* ≥ 65	*T* ≥ 66	*T* ≥ 67	*T* ≥ 68	*T* ≥ 69	*T* ≥ 70
True positive		314	313	313	306	306	302	291	288	280	267	258
False positive		66	65	63	39	39	34	28	20	17	13	13
False negative		25	26	26	33	33	37	48	51	59	72	81
True negative		273	274	276	300	300	305	311	319	322	326	326
Sensitivity	Likelihood of ADHD when actually ADHD	.93	.92	.92	.90	.90	.89	.86	.85	.83	.79	.76
Specificity	Likelihood of no ADHD when actually no ADHD	.81	.81	.81	.88	.88	.90	.92	.94	.95	.96	.96
PPV	Likelihood that a + test = ADHD	0.83	0.83	0.83	0.89	0.89	0.90	0.91	0.94	0.94	0.95	0.95
NPV	Likelihood that a - case = no ADHD	0.92	0.91	0.91	0.90	0.90	0.89	0.87	0.86	0.85	0.82	0.80
Odds ratio	TP*TN / FP*FN	51.95	50.75	52.74	71.33	71.33	73.22	67.34	90.07	89.89	92.99	79.87
Correct hit rate %	Classification Accuracy %	87%	87%	87%	89%	89%	90%	89%	90%	89%	87%	86%

Note. N = 339 adults with ADHD and 339 healthy adults. ADHD = attention-deficit/hyperactivity disorder.

Table 4. Classification Statistics for the BRIEF2A Self-Report Form Working Memory Scale at Various Prevalence Rates: ADHD vs. Healthy Adults

					Prevalence							
Cutoff score	Sensitivity	Specificity	Classification accuracy	Predictive value	10%	20%	30%	40%	50%	60%	70%	80%
≥60	.93	.81	87%	PPV	.35	.55	.68	.77	.83	.88	.92	.95
				NPV	.99	.98	.96	.96	.92	.89	.83	.74
≥61	.92	.81	87%	PPV	.35	.55	.67	.76	.83	.88	.92	.95
				NPV	.99	.98	.96	.96	.91	.87	.81	.72
≥62	.92	.91	87%	PPV	.53	.72	.81	.87	.91	.94	.96	.98
				NPV	.99	.98	.96	.96	.92	.88	.83	.74
≥63	.90	.88	89%	PPV	.45	.65	.76	.83	.88	.92	.95	.97
				NPV	.99	.97	.95	.95	.90	.85	.79	.69
≥64	.90	.88	89%	PPV	.45	.65	.76	.83	.88	.92	.95	.97
				NPV	.99	.97	.95	.95	.90	.85	.79	.69
≥65	.89	.90	90%	PPV	.50	.69	.79	.86	.90	.93	.95	.97
				NPV	.99	.97	.95	.95	.89	.85	.78	.67
≥66	.86	.92	89%	PPV	.54	.73	.82	.88	.91	.94	.96	.98
				NPV	.98	.96	.94	.94	.87	.81	.74	.62
≥67	.85	.94	90%	PPV	.61	.78	.86	.90	.93	.96	.97	.98
				NPV	.98	.96	.94	.94	.86	.81	.73	.61
≥68	.83	.95	89%	PPV	.65	.81	.88	.92	.94	.96	.97	.99
				NPV	.98	.96	.93	.93	.85	.79	.71	.58
≥69	.79	.96	87%	PPV	.69	.83	.89	.93	.95	.97	.98	.99
				NPV	.98	.95	.91	.91	.82	.75	.66	.53
≥70	.76	.96	86%	PPV	.68	.83	.89	.93	.95	.97	.98	.99
				NPV	.97	.94	.90	.90	.80	.73	.63	.50

Note. ADHD = attention-deficit/hyperactivity disorder; PPV = positive predictive value; NPV = negative predictive value.

Table 5. BRIEF2A Self-Report Form Inhibit Scale Calculations for Detecting ADHD-C vs. ADHD-I

Statistic	Description of Statistic	*T* ≥ 60	*T* ≥ 61	*T* ≥ 62	*T* ≥ 63	*T* ≥ 64	*T* ≥ 65	*T* ≥ 66	*T* ≥ 67	*T* ≥ 68	*T* ≥ 69	*T* ≥ 70
True positive		246	246	245	244	235	232	224	215	202	194	192
False positive		69	67	65	63	59	57	55	53	52	47	46
False negative		14	14	15	16	25	28	36	45	58	66	68
True negative		10	12	14	16	20	22	24	26	27	32	33
Sensitivity	Likelihood of ADHD-C when actually ADHD-C	.95	.95	.94	.94	.90	.89	.86	.83	.78	.75	.74
Specificity	Likelihood of ADHD-I when actually ADHD-I	.13	.15	.18	.20	.25	.28	.30	.33	.34	.41	.42
PPV	Likelihood that a + test = ADHD-C	0.78	0.79	0.79	0.79	0.80	0.80	0.80	0.80	0.80	0.80	0.81
NPV	Likelihood that a - case = ADHD-I	0.42	0.46	0.48	0.50	0.44	0.44	0.40	0.37	0.32	0.33	0.33
Odds ratio	TP*TN / FP*FN	2.55	3.15	3.52	3.87	3.19	3.20	2.72	2.34	1.81	2.00	2.03
Correct hit rate %	Classification Accuracy %	76%	76%	76%	77%	75%	75%	73%	71%	68%	67%	66%

Note. N = 260 ADHD-C; *N* = 79 ADHD-I. ADHD-C = attention-deficit/hyperactivity disorder, combined type; ADHD-I = attention-deficit/hyperactivity disorder, inattentive type.

Table 6. Classification Statistics for the BRIEF2A Self-Report Form Inhibit Scale at Various Prevalence Rates: ADHD-C vs. ADHD-I

					Prevalence							
Cutoff score	Sensitivity	Specificity	Classification accuracy	Predictive value	10%	20%	30%	40%	50%	60%	70%	80%
≥60	.95	.13	76%	PPV	.11	.21	.32	.42	.52	.62	.72	.81
				NPV	.95	.90	.85	.78	.70	.61	.50	.37
≥61	.95	.15	76%	PPV	.11	.22	.32	.43	.53	.63	.72	.82
				NPV	.96	.92	.87	.81	.74	.65	.55	.41
≥62	.94	.18	76%	PPV	.11	.22	.33	.43	.53	.63	.73	.82
				NPV	.97	.92	.88	.82	.75	.67	.57	.43
≥63	.94	.20	77%	PPV	.12	.23	.34	.44	.54	.64	.73	.82
				NPV	.95	.93	.88	.83	.77	.69	.59	.45
≥64	.90	.25	75%	PPV	.12	.23	.34	.45	.55	.64	.74	.83
				NPV	.96	.91	.86	.80	.72	.64	.53	.40
≥65	.89	.28	75%	PPV	.12	.24	.35	.45	.55	.65	.74	.83
				NPV	.96	.91	.86	.80	.72	.63	.53	.39
≥66	.86	.30	73%	PPV	.12	.24	.35	.45	.55	.65	.74	.83
				NPV	.95	.90	.84	.77	.69	.59	.48	.35
≥67	.83	.33	71%	PPV	.12	.24	.35	.45	.55	.65	.74	.83
				NPV	.94	.88	.82	.74	.66	.56	.45	.32
≥68	.78	.34	68%	PPV	.12	.23	.34	.44	.54	.64	.73	.83
				NPV	.93	.86	.78	.70	.61	.51	.40	.28
≥69	.75	.41	67%	PPV	.12	.24	.35	.46	.56	.65	.75	.83
				NPV	.93	.86	.79	.71	.61	.52	.41	.29
≥70	.74	.42	66%	PPV	.12	.24	.35	.46	.56	.66	.75	.84
				NPV	.93	.86	.79	.71	.61	.52	.41	.29

Note. ADHD-C = attention-deficit/hyperactivity disorder, combined type; ADHD-I = attention-deficit/hyperactivity disorder, inattentive type; PPV = positive predictive value; NPV = negative predictive value.

Conclusions

Summary: Self-report ratings on the BRIEF2A Working Memory scale show overall accuracy of 90% at different base rates for ruling in and ruling out ADHD diagnoses in adults. Once the likelihood of any ADHD is established, ratings on the Inhibit scale show adequate sensitivity for detecting ADHD-C but limited specificity for ruling out the combined presentation.

Clinical implications: Taken together, the findings suggest that clinically elevated scores on the BRIEF2A Working Memory scale can help inform identification of adults being considered for a diagnosis of ADHD and that an additional elevation on the Inhibit scale may suggest the combined presentation over the inattentive presentation. The pattern of diagnostic accuracy is like that of the BRIEF2 for children and adolescents, supporting the use of the BRIEF2A as part of an EBA for ADHD.

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Figure 1. BRIEF2A Self-Report Profiles