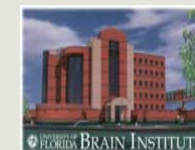
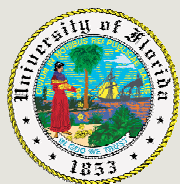


Classification Accuracy of Malingering Measures in a Yoked Control Group Design

Otto Pedraza^{1,2}, Dawn Bowers^{1,2}, Russell M. Bauer¹, Eileen B. Fennell¹,
and Michael Marsiske¹

¹Department of Clinical & Health Psychology and ²Cognitive Neuroscience Lab, McKnight Brain Institute
University of Florida, Gainesville, Florida



ABSTRACT

Previous investigations have explored the sensitivity, specificity, and overall classification accuracy of numerous measures designed to evaluate malingering during neuropsychological assessments. The majority of these studies have attempted to reduce the potentially confounding effects of demographic variables via analyses of covariance, with demographic variables entered as covariates, or matching the groups of interest by minimizing the group mean difference in these variables. A yoked control group design may provide an additional and more powerful alternative to these methods. The aim of this study was to investigate the classification accuracy of the Rey 15-item test, Reliable Digit Span (RDS), Letter Memory Test (LMT), Word Memory Test (WMT), and Computerized Assessment of Response Bias (CARB), in an analogue malingering design. Each analogue participant was yoked to a control participant of the same sex, with comparable years of age and education (most participants within ± 1 year), and selected from a larger study pool ($n = 129$). There were $n = 32$ analogue and $n = 32$ control participants. Cutoff values were determined from published studies or test manuals. Results suggested that the computerized measures (i.e., LMT, WMT, and CARB) performed best, with sensitivities between 90.6% and 96.9% and specificities between 96.9% and 100%. The Rey 15-item test performed worst overall, with sensitivity of 12.5% and specificity of 100% (overall hit rate = 56%). These results are consistent with prior analogue investigations and provide additional support for the use of these measures in the assessment of malingering of cognitive deficits.

INTRODUCTION

Previous investigations have explored the sensitivity, specificity, and overall classification accuracy of numerous measures designed to evaluate malingering during neuropsychological assessments. Symptom validity tests (SVT) such as the Word Memory Test (WMT) and Computerized Assessment of Response Bias (CARB) have received much attention recently, in part due to the large normative samples accumulated to demonstrate their psychometric properties. Most validation studies, however, have been performed by the particular test authors or investigators affiliated with the test authors, and additional independent validation appears warranted.

The majority of previous studies have attempted to reduce the potentially confounding effects of demographic variables via analyses of covariance, with demographic variables entered as covariates, or matching the groups of interest to reduce the group mean difference on demographic variables. The goal of the present study was to compare the classification accuracy of several measures of poor effort/ malingering in a yoked sample design, in which each analogue participant was individually matched on age, sex, and education to a control participant selected from a larger study pool.

METHOD

Analogue malingering participants were: (a) provided with an accident scenario and brief description of symptoms commonly experienced after brain injury, (b) informed that a brief quiz about brain injury would immediately follow the description, and (c) asked to feign believable cognitive impairment on all measures. Each analogue participant ($n = 32$) was yoked to a control participant ($n = 32$) of the same sex, with comparable years of age and education (most participants within ± 1 year), and selected from a larger study pool ($n = 129$). Cutoff values for effort/ malingering measures were obtained from test manuals or published studies.

RESULTS

Table 1. Continuous demographic variables.

Variable	Malingering			Control			t	p
	n	M	SD	n	M	SD		
Age	32	24.22	8.35	32	24.03	7.58	.09	.93
Education	32	15.06	1.77	32	15.13	1.74	-.15	.88
GPA ^a	25	3.46	0.37	24	3.43	0.51	.24	.82
Employment (Years) ^b	6	12.88	13.17	7	8.79	7.04	.72	.49

^aGPA = Grade-point average of participants currently enrolled in college courses.
^bYears of employment of participants not attending college.

Table 2. Categorical demographic variables.

Variable	Malingering	Control	χ^2	p
Sex (% Male)	28.1	28.1	.00	1.0
Race/ethnicity			2.09	.72
Caucasian	71.9	75.0		
African American	3.1	6.3		
Hispanic	6.3	3.1		
Native American	0	0		
Asian American	18.8	12.5		
Other	0	3.1		
TBI History ^a (%Yes)	18.8	15.6	.11	.74
Psychiatric History (%Yes)	9.4	12.9	.20	.66
Drug Use History ^b (%Yes)	9.4	6.3	.22	.64
Weekly Alcohol Use			3.18	.37
None	48.4	31.3		
1 to 3 drinks	38.7	50.0		
4 to 6 drinks	6.5	15.6		
7 or more drinks	6.5	3.1		

Note. Values represent percent within each group.

^aTBI = Traumatic brain injury.

^bExcludes alcohol, tobacco, or prescribed medications.

Classification accuracy rates are presented in Table 4. Results suggested that the computerized measures (i.e., LMT, WMT, and CARB) performed best, with sensitivities between 90.6% and 96.9% and specificities between 96.9% and 100%. The Rey 15-item test performed worst overall, with sensitivity of 12.5% and specificity of 100% (overall hit rate = 56%).

RESULTS (cont.)

Table 3. Performance on malingering measures.

Variable ^a	Malingering		Control		Statistic	p
	M	SD	M	SD		
Reliable Digit Span	5.97	2.28	10.59	1.85	-8.92 ^b	.00
Rey 15-Item Test	13.09	2.15	14.91	.53	269.50 ^c	.00
Letter Memory Test	52.71	20.56	99.59	1.04	19.00 ^c	.00
Word Memory Test – IR	62.58	18.29	98.20	3.77	31.50 ^c	.00
Word Memory Test – DR	58.05	18.68	98.28	3.67	23.50 ^c	.00
CARB	57.35	19.27	99.53	1.07	19.00 ^c	.00

^aIR = Immediate Recall trial; DR = Delayed Recall trial; CARB = Computerized Assessment of Response Bias.
^bt-test.

^cMann-Whitney U.

Table 4. Classification accuracy of malingering measures.

Variable ^a	Actual			Variable ^a			Actual			
	Malingering	Control	%	WMT – IR ($\leq 82.5\%$)	Malingering	Control	%	Malingering	Control	%
RDS (≤ 7)										
Predicted				Predicted				Predicted		
Malingering	24	2		Malingering	29	0		Malingering	29	0
Control	8	30		Control	3	32		Control	3	32
Sensitivity			.75	Sensitivity			.91	Sensitivity		.91
Specificity			.94	Specificity			1.00	Specificity		1.00
Hit Rate			.84	Hit Rate			.95	Hit Rate		.95
Rey 15-Item test (≤ 9)				WMT – DR ($\leq 82.5\%$)						
Predicted				Predicted				Predicted		
Malingering	4	0		Malingering	30	1		Malingering	30	1
Control	28	32		Control	2	31		Control	2	31
Sensitivity			.13	Sensitivity			.94	Sensitivity		.94
Specificity			1.00	Specificity			.97	Specificity		.97
Hit Rate			.56	Hit Rate			.95	Hit Rate		.95
LMT ($\leq 93\%$)				CARB ($\leq 89\%$)						
Predicted				Predicted				Predicted		
Malingering	30	0		Malingering	31	0		Malingering	31	0
Control	2	32		Control	1	32		Control	1	32
Sensitivity			.94	Sensitivity			.97	Sensitivity		.97
Specificity			1.00	Specificity			1.00	Specificity		1.00
Hit Rate			.97	Hit Rate			.98	Hit Rate		.98

Note. RDS = Reliable Digit Span; LMT = Letter Memory Test; IR = Word Memory Test Immediate Recall; DR = Word Memory Test Delayed Recall; CARB = Computerized Assessment of Response Bias.

^aCut-off values for each measure are in parenthesis.

CONCLUSION

The Rey 15-Item test performed unacceptably low, with a sensitivity of only 12.5% and an overall hit rate of 56%. The other five measures performed acceptably well and within the range found in published studies. The Computerized Assessment of Response Bias (CARB) performed best overall, with 97% sensitivity and 100% specificity. Within the parameters of the current study (malingering base rate = 50%), these results are consistent with prior analogue investigations and provide additional independent support for the use of these measures in the assessment of malingering of cognitive deficits.

Acknowledgment: We want to express our gratitude to David T.R. Berry, Ph.D., for use of the LMT.