The Woodcock-Muñoz Foundation

Research Brief

Can Sensory and Motor Skills Successfully Differentiate Patients with CVA's from Patients with TBI's?

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Introduction

Individuals who have been diagnosed with either a Cerebral Vascular Accident (CVA) or a Traumatic Brain Injury (TBI) may experience similar difficulties with vestibular functioning, spatial orientation, coordination, cognitive functioning, vision and speech. These similarities may cause problems for neuropsychologists in making a differential diagnosis among the two disorders, especially when the TBI or CVA is mild.

For individuals who have experienced a CVA or TBI, the severity and types of symptoms will depend on which area of the brain is affected (Gouvier et al., 1997). Despite the common symptoms which result from the two disorders, it is likely that differences arise from the severity and localization of impairment. Sensory and motor functioning differences could assist Neuropsychologists in the process of differential diagnosis, as well as determine functional outcomes.

The purpose of the current study was to investigate and differentiate the sensory and motor functioning for individuals diagnosed with CVA from individuals who have experienced a TBI using the *Dean-Woodcock Sensory Motor Battery* (DWSMB; Dean & Woodcock, 2003). The DWSMB yields three factors: simple sensory skills, motor and complex sensory skills, and subcortical motor skills and auditory/visual acuity which can be used to investigate different areas of localization (Davis et al, under review).

The authors hypothesized that cortical and subcortical differences would emerge between the two samples as a result of different neurological bases, to which the DWSMB should be sensitive.

Methodology

The current study examined a group of 40 individuals (mean age = 53 years, 1 month, standard deviation = 15.8) with a diagnosis of Cerebral Vascular Accident and a group of 40 individuals with a diagnosis of a Traumatic Brain Injury (mean age = 46 years, 3 months; SD =13.9). Each of the 80 individuals had been referred for a neuropsychological assessment and were administered all 35 subtests from the *Dean-Woodcock Sensory Motor Battery* as part of a comprehensive evaluation.

Sensory-Motor Subtests	*Mean CVA*	*Mean TBI*	*F*	*P*
Visual Acuity-R	418.3	426.28	1.952	.166
Visual Acuity-L	420.73	431.37	3.320	.072
Visual Conf-R	484.85	483.03	.731	.395
Visual Conf-L	482.85	486.00	1.282	.261
Visual Conf- B	483.65	484.43	.074	.786
Auditory Percept-R	469.23	467.92	.077	.078
Auditory Percept-L	469.70	468.53	.046	.831
Auditory Percept-B	473.25	479.50	2.575	.113
Palm Writing-Dom	493.80	496.00	.351	.555
Palm Writing-Non	496.13	495.10	.091	.763
Object ID-R	488.00	492.35	2.344	.130
Object ID-L	492.28	492.95	.045	.833
Finger ID-R	481.78	488.25	9.160	**.003***
Finger ID-L	483.05	488.80	4.258	**.042***
Sim Loc-R hand	507.92	510.18	2.083	.153
Sim Loc-L hand	508.10	510.17	1.397	.241
Sim Loc-B hand	511.00	513.00	1.076	.303
Sim Loc-R hand & cheek	514.25	518.18	1.315	.255
Sim Loc-L hand & cheek	514.75	519.03	1.745	.190
Sim Loc B hand & cheek	508.35	511.13	.733	.394
Gait & Station	462.10	469.15	2.193	.143
Romberg	465.50	469.60	.515	.475
Clock Construction A	481.55	486.38	2.877	.094
Clock Construction B	489.08	492.60	2.083	.153
Finger-Nose R	470.95	479.19	1.704	.196
Finger-Nose L	468.98	476.62	1.424	.236
Hand-Thigh R	473.95	470.60	.630	.430
Hand-Thigh L	471.80	472.28	.011	.917
Mime Movements	494.05	491.78	.754	.388
L-R Movements	494.40	499.08	4.243	**.043***
Finger Tapping-Dom	498.75	500.15	.584	.447
Finger Tapping-Non	499.20	500.35	.257	.614
Expressive Speech	488.93	489.42	.033	.857
Grip Strength- Dom	524.90	531.75	2.103	.151
Grip Strength- Non	522.78	530.45	2.058	.155

* Indicates statistical significance at .05 level

Results and Summary

The results of a Multivariate Analysis of Variance (MANOVA) indicated that the change in the combined dependent variable of the subtests for group participants was not significantly related to diagnosis, Wilks' Lambda = .463, F (35, 44) = 1.46, $p > .05$.

Overall, results indicated the sample of individuals with either a CVA or TBI did not differ significantly on broad measures of sensory skills, cortical motor skills, or subcortical motor skills. It appears that this sample of individuals diagnosed with either CVA or TBI shared similar sensory and motor impairment.

Subsequent univariate tests indicated that only one sensory and one motor task could successfully differentiate the two groups. Individuals with TBI's performed better on the finger identification subtests, and the left right movement subtest. Finger Identification subtests measure a subjects ability to make fine sensory discriminations and Left Right Movements subtest measures purposeful motor movements upon command. The differences were likely a result of those individuals who experienced a CVA and had impaired motor movement.

Although this study did not match groups along lines of area of impairment, or severity, the results suggest future research is warranted. Future research should target individuals from both groups who have experienced similar areas of impairment. Furthermore, a larger sample should be utilized to more accurately examine differences.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed-Text Revision). Washington, DC: Author.

Davis, A. S., Finch, W. H., Dean, R. S., & Woodcock, R. S. (under review). Evaluating the construct validity of the Dean-Woodcock Sensory Motor Battery with exploratory factor analysis. *International Journal of Neuroscience.*

Dean, R.S., Woodcock R.W. (2003). Examiner's Manual. Dean-Woodcock Neuropsychological Battery. Itasca, IL: Riverside Publishing.

Semrud-Clikeman, M. (2001). *Traumatic Brain Injury in Children and Adolescents: Assessment and Intervention.* New York, The Guilford Press

Gouvier, W., Ryan, L., O'Jile, J., Parks-Levy, J., Webster, J., & Blanton, P. (1997). Cognitive retraining with brain-damaged patients. In A. Horton, D. Wedding, & J. Websterm (Eds.). *The neuropsychology handbook, volume 2.* Springer Publishing Company: New York.

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