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Mild Traumatic Brain Injury: Effects on Word Retrieval in Naming and Discourse

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ABSTRACT

Currently, research has not systematically investigated the existence and nature of word retrieval deficits in naming and discourse following a mild traumatic brain injury (TBI). Furthermore, it is unknown whether there are subgroups of individuals with mild TBI who exhibit word retrieval deficits in either of these contexts. The purpose of the current study was to investigate the subtle, specific deficit of word retrieval as associated with mild TBI, with an emphasis on identifying word retrieval deficits in naming and discourse tasks. Specifically, the **Test of Adolescent/Adult Word Finding (TAWF)** (German, 1990) and the **Test of Word Finding in Discourse (TWFD)** (German, 1991) were used to evaluate the occurrence of word retrieval deficits in persons with mild TBI as compared to normal participants. The responses to the test battery were evaluated in terms of accuracy, latency, and error patterns. In summary, the mild TBI group demonstrated a higher overall occurrence of word finding errors during naming tasks on the **TAWF**, with decreased overall accuracy. For word finding errors in discourse (**TWFD**), the mild TBI group did not demonstrate a significant difference from the controls.

BACKGROUND AND INTRODUCTION

Mild Traumatic Brain Injury (MTBI) accounts for approximately 75-80% of the total TBI population (Consensus Report, 1999). Individuals with mild TBI present with specific deficits, such as persistent amnesia (McCroly & Johnston, 2002; Ralph, 1998). Investigations of discourse after MTBI have revealed impairment on measures of information structure and language (Chapman, Levin, Wanek, Weyrauch, & Kufner, 1998). This study investigated performance on word retrieval tasks for participants who have sustained a mild TBI, as compared to normal controls.

CLASSIFYING MILD TBI

Loss of consciousness and/or PTA (20 minutes or less)
Glasgow Coma Scale (Jeanette & Teasdale, 1974) -- score of 13 - 15
Rancho Levels (Hagen & Malkus, 1979) -- score of 7 - 8
No evidence of intracranial mass lesion or intracranial surgical procedures

WORD RETRIEVAL

A process of finding the correct terminology for an object, picture, orthographic representation, or conversation, in which a person converts the initial conception to a lexical version (Culpas, 1987; German, 1997; Nelson, 1982).

Word Retrieval in Naming

- Picture naming
- Category: noun and verb
- Sentence completion
- Naming from description
- Consider accuracy, word finding errors, and response latency

Word Retrieval in Discourse Language in naturally occurring form influenced by linguistic, cognitive, and social skills (Galski, Tompkins, and Johnston, 1998)

MATERIALS & METHODS

TESTS ADMINISTERED:

Pre-experimental: Experimental:
- PPVT-III Test of Adolescent/Adult Word Finding
- Raven's Coloured Progressive Matrices (TBI only) Test of Word Finding in Discourse
- SCATBI (TBI only)

Participants:

Age: 18-45
Age, gender, and education matched (Mild TBI and non-brain damaged controls)
No history of learning disabilities, psychiatric history nor previous head injury per self-report

RESULTS: FIGURES and TABLES

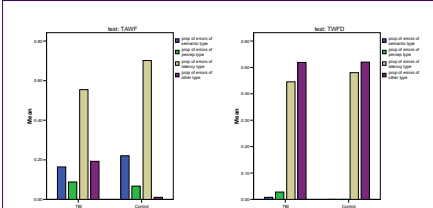


Figure 1: Bar graph illustrating the proportion of errors for each group on the **TAWF**. A significant main effect for error type was identified ($p < .001$) and a significant interaction effect for group and error type ($p < .05$).

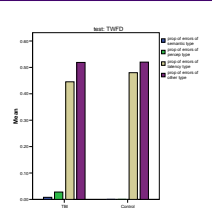


Figure 2: Bar graph illustrating the proportion of errors for each group on the **TWFD**. Latency and 'other' error types had the greatest proportion of occurrence. The error type and the pattern of error occurrence were similar for both groups.

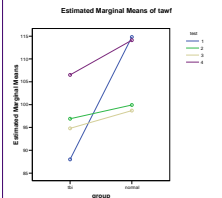


Figure 3: Profile plot illustrating the mean scores on the experimental tasks. A significant main effect for group was identified ($p < .002$) and a significant interaction effect for group and test ($p < .05$).

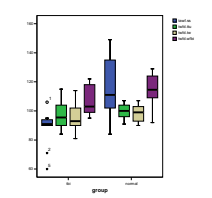


Figure 4: Box plot illustrating the distribution of scores on the **TAWF** and the **TWFD** for both groups.

Group Statistics				
group	N	Mean	Std. Deviation	Std. Error Mean
tawf.ss	10	88.00	13.021	4.118
tbi	10	114.80	20.980	6.635
normal	10	96.90	9.562	3.024
twfd.tu	10	99.90	5.363	1.696
tbi	10	106.50	9.846	3.114
normal	10	114.10	11.257	3.592
twfd.tw	10	94.80	9.693	3.065
tbi	10	98.70	6.183	1.955
ppvt.ss	10	87.80	15.267	4.828
normal	10	108.90	14.232	4.500

Table 1: Mean scores and standard deviations for the pre-experimental and experimental tasks administered to both groups.

Descriptive Statistics					
group	N	Minimum	Maximum	Mean	Std. Deviation
tbi	10	18.33	43.16	28.8130	8.13761
education	10	12	16	13.70	1.767
Valid N (listwise)	10				
normal	10	18.33	42.33	28.7970	7.89382
education	10	12	17	14.00	1.764
Valid N (listwise)	10				

Table 2: This table shows the mean age and years of education for each group. The study included 4 males and 6 females in each group.

	TWFD-TU	TWFD-TW	TWFD-WFBI	PPVT-R
TAWF				
Pearson Correlation	-.346	-.406	.350	.142
Sig. (2-tailed)	.328	.244	.322	.695
TWFD-TU				
Pearson Correlation		.964**	-.120	.480
Sig. (2-tailed)		.000	.441	.160
TWFD-TW				
Pearson Correlation			-.243	.559
Sig. (2-tailed)			.498	.093
TWFD-WFBI				
Pearson Correlation				-.157
Sig. (2-tailed)				.664

Table 3: Correlations for the control group. No significant correlations were identified relative to the research hypotheses (a significant correlation between the **TWFD** and the total T-units and total words produced were identified but this finding is expected since the T-units are calculated using the total words).

	TWFD-TU	TWFD-TW	TWFD-WFBI	PPVT-III	SCATBI-Standard Score	SCATBI-Recall Subtest
TAWF						
Pearson Correlation	-.346	-.406	.350	.142	.701*	.624
Sig. (2-tailed)	.328	.244	.322	.695	.024	.054
TWFD-TU						
Pearson Correlation		.964**	-.120	.480	.286	.102
Sig. (2-tailed)		.000	.741	.160	.423	.780
TWFD-TW						
Pearson Correlation			-.243	.559	.330	.136
Sig. (2-tailed)			.498	.093	.351	.707
TWFD-WFBI						
Pearson Correlation				.157	.161	.286
Sig. (2-tailed)				.664	.656	.424
SCATBI-Standard Score						
Pearson Correlation				.711*		.975**
Sig. (2-tailed)				.021		.000

Table 4: Correlations for the TBI group on all tests. A correlation between the **SCATBI** and **TAWF** was significant at the .05 p-value level.

RESULTS AND DISCUSSION

On the **TAWF**, the participants with mild TBI exhibited increased word finding errors during naming tasks. Overall, the **TAWF** standard scores for the mild TBI group were significantly lower ($p < .05$) than for the control group. Between group differences on the **TAWF** standard scores were statistically significant ($p < .003$). On the **TAWF**, the mild TBI group demonstrated a higher proportion of latency errors than any other error type. Latency errors accounted for 55.5% of the errors made by the mild TBI group. All error types were exhibited by the mild TBI group during the **TAWF**, with 16.4% being semantic, 8.8% perceptual, and 19.3% being 'other' (Figure 1). For the control group of non-brain damaged participants, latency again was the most prevalent error type on the **TAWF**, with 70% of all errors being of the latency type. A main effect for error type was found ($F(3, 54) = 41.707$; $p < .001$) and an interaction effect for group and error was observed ($F(3, 54) = 5.841$; $p = .02$).

One must also address the proportion of the total words produced on which errors occurred. The mild TBI group demonstrated an overall greater proportion of word finding behaviors on the **TAWF** than did the control group. The mild TBI group demonstrated word finding behaviors on 19.25% of the words, while the control group had errors on 6.8% of the words.

The **TWFD** scores revealed that the mild TBI group and the control group performed similarly on the overall scores, the two Productivity Indices and the Word Finding Behaviors Index. There was no significant difference for any of the three scores between groups. On the **TWFD**, both groups exhibited a similar and higher distribution of the latency and 'other' error types, which were markedly different from the other error types, illustrating a similar pattern (Figure 2). The proportion of total words produced on the **TWFD** was similar between the two groups. When considering the **TWFD**, a similar pattern of error types is observed, with both latency and other being the more prevalent errors than semantic and perceptual. Although a main effect for the error type was found ($F(3, 54) = 31.704$; $p < .001$), no interaction effect for group and error was identified.

CONCLUSIONS

Since results indicated that the mild TBI participants exhibited evidence of word retrieval deficits in confrontational naming tasks, these tasks may be a sensitive measure to use with persons following a mild TBI to assist in identifying potential linguistic and cognitive problems. Furthermore, the persons with mild TBI demonstrated overall slower response time, resulting in latency errors; this may be indicative of delayed lexical processing.

The discrepancy between performance with confrontational naming tasks and discourse also should be considered. Persons with mild TBI are often observed to converse well and are then thought to be "clear," with an evidence of linguistic or cognitive deficits. Since discourse allows a person to speak without the pressure of time or structure, persons with true mild TBI may not have difficulty with this task. It may be that only with the pressure of confrontational tasks that linguistic difficulties become more evident.

The results support the notion that persons with mild TBI exhibit subtle deficits in language. Examining both accuracy and latency in naming skills appears to be valuable in identifying word retrieval deficits that may impact communicative function following a mild TBI.

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