

Perceived and Actual Memory, Concentration, and Attention Problems After Whiplash-Associated Disorders (Grades I and II): Prevalence and Predictors

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ABSTRACT. Robinson JP, Burwinkle T, Turk DC. Perceived and actual memory, concentration, and attention problems after whiplash-associated disorders (grades I and II): prevalence and predictors. *Arch Phys Med Rehabil* 2007;88:774-9.

Objectives: To evaluate neuropsychologic test performance of people with whiplash-associated disorders (WADs) and to compare the performance of those who report cognitive symptoms (CS+) with those who do not (CS-).

Design: Cross-sectional analysis of a convenience sample.

Setting: Outpatient research center.

Participants: People with recent WADs (N=203) who responded to advertisements to participate in a treatment study.

Interventions: Not applicable.

Main Outcome Measures: Participants completed a history form including information about demographics, medical history, description of the collision, litigation status, a set of instruments designed to assess neck disability, pain severity, depressed mood, pain-related anxiety, and fear of potentially stressful neck movements and completed a generic 38-item symptom checklist that included items about memory and concentration problems. They also were administered the third revision of the Wechsler Memory Scale (WMS-III) and the Trail-Making Test (TMT). Participants were designated CS+ if they endorsed memory problems or concentration problems on the symptom checklist and CS- if they did not endorse either type of problem.

Results: CS+ and CS- participants performed equally well on the TMT and on all WMS-III indexes. Univariate analyses revealed that CS+ participants scored higher than CS- participants in neck disability, pain severity, depression, pain-related anxiety, and fear of neck movements. They also endorsed more items on the symptom checklist, including items (eg, skin rash) that had no obvious connection with WADs. In a multivariate analysis, CS+ versus CS- status was predicted only by the total number of items endorsed on the symptom checklist.

Conclusions: Reports of memory or concentration problems appear to be indicators of heightened somatic vigilance rather than indicators of actual neuropsychologic deficits. Our results suggest that it is reasonable for physicians to defer neuropsychologic testing or advanced imaging studies on WAD patients

who report cognitive symptoms but no other indicators of brain injuries and instead to rely on reassurance and education about the normal aftermath of motor vehicle collisions.

Key Words: Cognition disorders; Motor vehicles; Neuropsychology; Rehabilitation; Somatization disorder; Whiplash injuries.

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THE QUEBEC TASK FORCE on Whiplash-Associated Disorders (WADs) created a useful grading system of WADs associated with motor vehicle collisions (MVCs).¹ This system distinguishes among people with neck pain but no physical findings (grade I), pain and musculoskeletal findings such as reduced cervical range of motion (grade II), neurologic injury (grade III), and major skeletal injury such as a fracture (grade IV). The present study focuses on people with grades I and II WADs. They comprise more than 90% of all WADs sustained in MVCs.²

When people with WADs symptoms undergo medical evaluations, they routinely complete checklists that ask about a broad range of symptoms that they might be experiencing. The examining physician also typically asks for information about the nature and severity of the MVC and the patient's symptoms after the MVC. The information that patients provide in response to these queries reflects their recollections about their MVC and its aftermath and their perceptions about their current functioning. The information may or may not be completely accurate, but it forms an important portion of the dataset, which the physician considers as he/she formulates a plan for managing a patient.³

Cognitive problems such as impaired memory or impaired ability to concentrate are among the symptoms frequently reported by people with WAD grade I or II injuries.^{4,5} Physicians treating such patients must decide whether to refer the patients for neuropsychologic testing to document the presence and severity of deficits in cognitive functioning or for imaging studies that might identify brain lesions. The appropriateness of making such referrals depends on 2 issues: (1) Are the reports of cognitive problems valid, namely, do people who report them actually show deficits in cognitive functioning? and (2) If so, are these deficits indicators of traumatic brain injury (TBI) or other processes such as emotional distress or distraction secondary to pain?

The present study addresses the first question because research to date has not provided a definite answer. There is some evidence that people with WADs show deficits on neuropsychologic tests of attentional processes and perhaps memory,⁶⁻¹² although findings have not been entirely consistent.¹³ When neuropsychologic deficits are found, some investigators attribute them to subtle brain injuries.^{14,15} However, the more

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Table 1: Comparisons Between Participants With (CS+) and Without (CS-) Cognitive Symptoms: Demographics, Collision-Related Variables, Legal Involvement, Use of Centrally Acting Drugs, and Symptoms

Characteristics	Mean, Mode, or Percent by CS+ vs CS- Status		Comparisons Between CS+ and CS-
	CS+	CS-	
Demographic variables			
Age (y)	37.2	36.2	$t=.51$ (NS)
Sex (% female)	71	72	$\chi^2=.02$ (NS)
Education (y)*	5.70	5.67	$\chi^2=5.33$ (NS)
Income [†]	4.49	4.32	$\chi^2=3.78$ (NS)
Collision-related variables			
Rated seriousness of MVC [‡]	2.11	1.90	$\chi^2=5.87$ (NS)
Estimate of damage sustained by vehicle [§]	3.0	2.9	$\chi^2=2.73$ (NS)
Legal involvement			
Consulted an attorney (%)	28%	19%	$\chi^2=2.23$ (NS)
Usage of centrally acting drugs			
Reported using a muscle relaxant, antidepressant, anticonvulsant, or opioid	19%	10%	$\chi^2=3.60$ (NS)
Symptoms			
Pain severity	2.76	2.21	$t=3.01$ ($P<.01$)
CES-D	19.97	15.07	$t=3.61$ ($P<.001$)
PASS	69.82	57.46	$t=3.49$ ($P<.01$)
PCS	15.32	11.27	$t=2.87$ ($P<.01$)
PFAcTS	2.59	1.56	$t=3.90$ ($P<.001$)
NDI	16.57	10.54	$t=6.39$ ($P<.001$)

Abbreviation: NS, not significant.

*Rating range: 5, some college; 6, college degree.

[†]Rating range: 4, family income of \$30,000–\$40,000; 5, family income of \$40,000–\$50,000.

[‡]Rating range from 1 (minor) to 4 (extremely serious).

[§]Rating range from 1 (< \$500) to 4 (>\$2500).

^{||}Taken from MPI (range, 0–6).

widely held view is that people with WAD perform poorly because of emotional dysfunction and the distracting effects of pain.^{7,10,13,16}

WAD patients in neuropsychologic studies have generally been examined in the aggregate, with no attempt to distinguish between ones with cognitive symptoms compared with ones without them. We are aware of only 1 study in which such a distinction has been made. Di Stefano and Radanov⁴ compared WAD patients with persistent neck pain and cognitive symptoms to patients with persistent neck pain but no cognitive symptoms. The 2 groups performed comparably on multiple tests of memory; however, participants with cognitive symptoms performed somewhat worse than ones without such symptoms on 3 of 6 tests designed to assess attention and concentration.

The present study compared people with WADs grades I and II who reported cognitive symptoms to ones who did not report such symptoms. The 2 groups were compared on well-established neuropsychologic tests of memory and concentration that have been used in several previous studies of WAD patients, the Trail-Making Test (TMT) and the Wechsler Memory Scale, third revision (WMS-III) (described later). Based on the available literature, we hypothesized that (1) people with WADs who report cognitive symptoms (CS+) will perform worse than those who do not report such symptoms (CS-) on attention-concentration tasks (TMT and working memory index of the WMS-III) but not on the other WMS-III indices, and (2) performance differences between CS+ and CS- will be eliminated when statistical controls for depressed mood and pain intensity are introduced.

METHODS

Participants

A convenience sample of people with a history of a WAD from an MVC (N=203) were evaluated 2 to 3 months after their MVC in preparation for participation in a treatment trial for persistent neck pain. Inclusion criteria were as follows: (1) neck pain attributed to an MVC in the past 2 to 3 months, (2) not hospitalized after MVC, (3) no indication of loss of consciousness, (4) no current substance abuse, and (5) ability to understand and read English. All participants met the Quebec Task Force classification of WADs, grades I or II.¹ Demographic information and collision-related characteristics are enumerated in table 1. The study was approved by the Biomedical Institutional Review Board at the University of Washington.

Procedures

The WAD grade of each participant was confirmed by a physical examination to rule out neurologic injury and by anteroposterior and lateral cervical spine radiographs to rule out fracture or dislocation. Participants completed a background and history form and several self-report questionnaires (described later). In addition, a licensed neuropsychologist administered the WMS-III and the TMT.

Measures

Background and history form. The background and history form included demographic information (eg, age, ethnicity, income, education level), information about the MVC (eg, amount of damage to their vehicle), the types of treatments

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