

# Late Whiplash: The Controversy of Organic vs. Biopsychosocial Models

Arthur Croft, DC, MS, MPH, FACO

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## The Biopsychosocial Model

For more than 100 years, whiplash has evoked lively debate that generally splits participants into two factions: those who perceive it as a trivial and self-limited disorder; and those who acknowledge that a substantial proportion of victims do not fully recover.

Explanations offered by the former groups include an interest in bringing a lawsuit against the other party or third party, in hopes of winning a settlement, and secondary gain opportunities, such as an excuse from work or other obligations; or a need for pity. Others have suggested that extrinsic factors, such as a low level of educational attainment; poor job satisfaction; marital disharmony; substance abuse; and other social factors may contribute to the observed claims for chronic pain after whiplash. Poor psychological functioning is often attributed to poor outcome, as well.

Numerous outcome studies conducted over the past four decades have reported that, when taken as an independent variable, litigation did not significantly affect outcome in whiplash injuries.<sup>1</sup> I am aware of none that have made the converse conclusion. Two papers in the past year have also reported no correlation between litigants and nonlitigants in of durations of symptoms.<sup>2,3</sup> Conversely, there are numerous papers in which authors have offered the opinion that such a connection exists. One group recently claimed to have found a link, but the authors failed to support their comment.<sup>4</sup>

Attributing psychological dysfunction to poor outcome is problematic for a number of reasons, not the least of which is that in most instances little is known of the patients' pre-injury psychological status. Most such studies have assessed post-injury psychological status using standardized health questionnaires (MMPI, SCL-90-R, etc.). Unfortunately, these have all been shown to be sensitive to physical ailments,<sup>5</sup> and most were developed within a medically healthy population - not among those with musculoskeletal and neurological complaints. For example, endorsing widespread pain or recurring headaches - symptoms common in certain musculoskeletal conditions - accrues abnormal points on test subscales, such as the somatiform scale on the SCL-90-R.

Not surprisingly, then, in several longitudinal outcome studies it has been shown that these "psychological" aberrances resolve in parallel to physical complaints,<sup>6-10</sup> offering compelling evidence that the psychological profile is not an independent domain in most cases of whiplash, but is dependent upon physical well-being. More to the point, no studies that I am aware of have offered any scientific evidence that the majority of whiplash victims (or even a substantial

proportion) fit any specific psychological profile outside the context of a neurological or musculoskeletal injury.

Castro, et al., recently reported that volunteers who perceived an injury in a sham collision had psychological scores that were more abnormal than the average German population.<sup>11</sup> However, this was a small study and, since at most, only 3.9 percent of these volunteers had symptoms that would be described as whiplash or WAD, the findings are difficult to interpret.

Ferrari, et al., have recently promoted the so-called *biopsychosocial model* in the context of whiplash, making numerous excursions into the literature in support of it.<sup>12</sup> The lynchpin of their theory relies on two studies conducted in Lithuania which purportedly followed the natural history of *late* (i.e., chronic) whiplash in a population of persons exposed to rear-impact motor vehicle crashes - the putative injury mechanism for acute whiplash injury.<sup>13,14</sup> Unfortunately, "fatal" errors in study design in both cases prevented meaningful interpretation of their results,<sup>15,16</sup> not the least of which was that only a small portion of their cohort actually had an acute whiplash - the necessary precursor for late whiplash. Our *post hoc* power calculation revealed that their cohort was inadequate to support any of their conclusions.

Unfortunately, many authors - since these flaws were pointed out - have failed to be dissuaded from citing this literature in support of the biopsychosocial theory, particularly those authors from the camp of the nonbelievers. These Lithuanian papers, it should also be noted, stand alone as outliers to more than 50 other published reports of outcome over the past 45 or so years, and arrive at some rather improbable conclusions that almost immediately beg some questions. In the first paper, the results suggested that persons exposed to whiplash mechanisms would have about the same long-term neck pain as age-matched uninjured persons in the population. In the second study, acute whiplash trauma exposure seemed to actually have a protective effect, somehow immunizing these people against future neck pain. Again, these findings would be particularly interesting if the studies had the added virtue of being valid on a statistical and methodological basis.

Most recently Virani, et al.,<sup>17</sup> reported that physicians tend to recover quicker, have fewer time off work and had shorter duration of symptoms than nonphysicians. Again, the biopsychosocial model was evoked to explain this variance. Again, however, the study was plagued with major methodological errors, the most significant of them being the fact that most of the nonphysician group were females, while most of the physician group were males. It is well known that females have twice the risk of whiplash injury as males and, thus, the two groups are not comparable without the proper stratification. There were further problems with randomization, recall bias, etc.

Although I have not exhaustively reported the literature, the foregoing is a balanced overview. One must conclude from this that there is currently no strong evidence to support the notion that litigation significantly affects outcome in whiplash, and that psychological profiles of whiplash patients do not differ fundamentally from those of control groups, beyond the influences from concomitant neurological or musculoskeletal complaints. Moreover, what little information exists concerning work status, education attainment, and other social issues is conflicting and does not allow us to draw any firm conclusions. For the most part, these components of the biopsychosocial model have been offered only as theoretical and conjectural explanations for, for example, the findings of the Lithuanian studies that chronic pain does not follow whiplash there. They should be taken in the context that they are usually offered: editorial, anecdotal, and as untested hypotheses offered in the Lithuanian cases to explain findings not seen in the mainstream literature, and probably represent merely an artifact of poor study design.

## The Organic Model

The literature supporting an organic basis for late whiplash is extensive, but also conflicting, owing to the difficulty in documenting the various soft tissue lesions generally attributed to whiplash. A great deal of cadaver studies have been conducted in recent years. This research reveals injuries to ligaments and discs thought to be similar to those seen in whiplash victims. However, extrapolation to real-world crash victims should be made cautiously.

Extensive animal research has revealed injury to muscle; tendon; ligament; disc; and injury to cartilaginous end plate and bone. Again, caution is advised in extrapolation to real-world crash victims. At least two autopsy studies of whiplash patients who died shortly after their injuries from unrelated causes (suicide, drug overdose, etc.) have allowed a limited investigation of these lesions *in vivo*, along with a correlation with the usual host of laboratory studies including radiographs, CT, and MRI.<sup>18,19</sup> Generally, the findings are that surprising degrees of soft tissue injury are present - mirroring in many cases those of the animal and cadaver studies - and these are rarely visible on standard imaging studies.

Rather elegant clinical research has also pointed to the facet joint as a key player in the genesis of neck pain following whiplash<sup>20</sup> being responsible for some 60-70 percent of it. It was also been demonstrated rather definitively now, using a large randomly selected population sample, that whiplash victims have a generally greater lifetime experience of neck pain and headaches.<sup>21</sup> While this finding comes as little surprise, perhaps the most important and revealing aspect of this study was the association of various other comorbidities found to be present with a history of neck injury from motor vehicle crash. The authors looked at allergy, breathing disorders, hypertension, cardiovascular disorders, digestive disorders, and low back pain. They found higher comorbidities in all categories except hypertension, and in most cases, the severity of the reported complaints was close to twice that seen in those with the conditions, but with no history of neck injury. The impact of these comorbidities was greater on the lives of those suffering neck injury than in those uninjured.

Over the past 45 years, some 50 outcome studies have been published, which continue to appear each year. A meta-analysis of this literature revealed that more than half of persons injured in these crashes may suffer chronic pain.<sup>22</sup>

On balance then, there seems to be a good deal of face validity to the organic nature of late whiplash which comes to us by way of animal, *in vitro*, autopsy, clinical, and epidemiological sources.

Most recently, we conducted an internet survey of international and North American whiplash sufferers to attempt to validate the notion that persons from westernized countries such as the U.S. and Canada have different outcomes than those of other nations as a result of different claiming behavior; tort systems; media; or expectations based on cultural variances. This was the explanation offered to explain the differences in reported outcome between Lithuania and westernized nations. Although this study is ongoing, we have analyzed the first 700 responses to the survey. Specifically, we asked respondents to endorse a wide range of symptoms and functional limitations. Clear patterns emerged which included - in addition to the most common symptoms of headache and neck pain - symptoms such as difficulty in concentration, dizziness, and blurred vision, which have sometimes been thought to suggest an inorganic condition. When North American patients were compared to all other nations (e.g., from New Zealand, Africa, South America, Middle East, Far East, etc.), there were no significant differences in the symptoms

endorsed, or in the functional impairments endorsed.

If cultural, social or economic factors were the basis for late whiplash complaints (i.e., if there were no real organic basis for them), these endorsements would not be expected to consistently overlap. We also invited professional attendees of a European whiplash conference to complete this survey, instructing them to attempt to answer the questions as they would expect a person with late whiplash to answer. This audience was composed of mostly medical practitioners, lawyers, and insurance many years of experience in dealing with whiplash sufferers. These "experts," however, were not able to agree with the endorsements of the true whiplash group on several of the symptoms and functional impairments. They were thus unable to fake a profile, despite their knowledge of whiplash. All of this bears strong evidence that whiplash is indeed an organic lesion which produces a classical - albeit complex and still incompletely understood - clinical presentation and a common pattern of functional deficit.

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Arthur Croft, DC,MS,MPH,FACO,FACFE  
Director, Spine Research Institute of San Diego  
San Diego, California  
[drcroft@srisd.com](mailto:drcroft@srisd.com)

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