

Are Symptoms of Late Whiplash Specific? A Comparison of SCL-90-R Symptom Profiles of Patients with Late Whiplash and Patients with Chronic Pain Due to Other Types of Trauma

BOGDAN P. RADANOV, ANNE F. MANNION, and PIETRO BALLINARI

ABSTRACT. *Objective.* Focusing on symptoms referred to as specific for late whiplash may contribute to misconceptions in assessment, treatment, and settlements. We compared Symptom Checklist 90-Revised (SCL-90-R) symptom profiles of patients with late whiplash and patients with chronic pain due to other types of trauma.

Methods. We compared 156 late whiplash patients (WP group) with 54 chronic pain patients who had suffered different bodily trauma (non-WP group) with regard to the following aspects of the SCL-90-R: the Positive Symptom Total (PST); the nine SCL-90-R dimensions and additional global indices, i.e., Global Severity Index (GSI) and Positive Symptom Distress (PSD); and complaints referred to as specific for late whiplash syndrome.

Results. The mean adjusted T score for PST was in the normal range for the WP group (T = 56.1, 95% CI 54.1–58.1) and in the pathological range for the non-WP group (T = 61.1, 95% CI 57.3–64.9). Both the WP and non-WP groups showed mean T scores in the pathological range for the dimensions “Somatization,” “Obsessive-Compulsive,” and PSD. Only the non-WP group had an average score in the pathological range for the dimensions “Depression,” “Anxiety,” and “Phobic Anxiety” and for the global indices GSI and PST. Multivariable regression controlling for gender and education level was used to identify complaints “specific for late whiplash” that were significantly associated with being in the WP group rather than the non-WP group: greater headache (OR 1.54; 95% CI 1.16, 2.03; $p = 0.003$) and lower emotional lability (OR 0.96; 95% CI 0.93, 0.98; $p = 0.003$) were the only significant variables.

Conclusion. Late whiplash is not a chronic pain condition characterized by specific symptoms, other than greater headache. (J Rheumatol First Release March 1 2011; doi:10.3899/jrheum.101112)

Key Indexing Terms:

WHIPLASH

CHRONIC PAIN

SYMPTOM

SYMPTOM CHECKLIST 90-REVISED

TRAUMA

Whiplash injury to the cervical spine occurs most frequently in low-speed, rear-end car collisions. A considerable number of individuals still demonstrate symptoms after months¹, a phenomenon frequently referred to as late whiplash. Late whiplash has been defined as “the presence of pain, restricted motion, or other symptoms for 6 months or more after whiplash injury, sufficient to hinder return to normal activities such as driving, usual occupation or leisure”¹. The symptoms that characterize late whiplash are

not clearly defined and are purely subjective, which can lead to problems in interpretation in clinical routine and research.

A recent systematic review indicated considerable variation in the reported prevalence of late whiplash, ranging from 16% to 71%². There is general consensus that late whiplash is responsible for high costs resulting from assessment, treatment, lost productivity, and disability pensions^{3,4}. It was argued that in North America an industry may exist that has grown around whiplash injury, involving patients, practitioners, therapists, insurance companies, and lawyers⁵. The American insurance company State Farm estimated the annual costs of whiplash in the United States as between US\$13 billion and \$18 billion⁶. A study based on insurance company data from 8 European countries (Britain, Germany, Finland, France, Holland, Italy, Norway, and Switzerland)⁷ showed huge differences regarding the prevalence of diagnosed whiplash cases and the corresponding costs for assessment, treatment, and disability expenditure. For example, whiplash injuries comprised 3% of all bodily

From the Pain Unit, Schulthess Klinik; Department of Research and Development, Spine Center Division, Schulthess Klinik, Zürich; and Department of Psychology, University of Berne, Bern, Switzerland.

B.P. Radanov, MD, Pain Unit, Schulthess Klinik; A.F. Mannion, PhD, Department of Research and Development, Spine Center Division, Schulthess Klinik; P. Ballinari, PhD, Department of Psychology, University of Berne.

Address correspondence to Dr. B.P. Radanov, Pain Unit, Schulthess Klinik, Lengghalde 2, CH-8008 Zürich, Switzerland.

E-mail: bogdan.radanov@kws.ch

Accepted for publication January 19, 2011.

Personal non-commercial use only. The Journal of Rheumatology Copyright © 2011. All rights reserved.

injuries in France, compared with 76% in Britain⁷. This particular difference is difficult to explain considering that France and Britain have a comparable number of large cities with traffic conditions typical of those in which whiplash injuries are most likely to occur. The difference between European countries regarding diagnosis and costs for whiplash⁷ may reflect different approaches to the problem in terms of diagnostic pathways, treatment, and medicolegal procedures. In Canada, 10-fold differences between provinces have been observed in the number of compensated claims per 100,000 inhabitants per year for whiplash injury, Quebec having 70 and Saskatchewan 700¹. It has been suggested that this may reflect compensation expectations related to the different medicolegal procedures in the 2 provinces⁸.

Routine clinical experience suggests that, during the course of a chronic pain condition, physical, psychological, and cognitive symptoms appear to be similar regardless of the underlying cause of pain. At the same time it is assumed that the symptoms of late whiplash are specific for the condition, and this influences treatment and the settlement of compensation claims. In 1991, based on existing research, the Federal Supreme Court in Switzerland declared that a causal relationship between injury and disability should be acknowledged in those patients who, according to a medical professional, had experienced whiplash injury and in the long term suffered from headache, dizziness, trouble concentrating or remembering things, nausea or upset stomach, getting tired easily, neck pain, visual disturbances such as blurred vision, feeling irritated, emotional lability, depression, and change of personality⁹. As a consequence of this decision the aforementioned symptoms (i.e., headache, dizziness, trouble concentrating, and so on) were assumed to represent the specific symptoms of late (chronic) whiplash. Even in the scientific literature it appears that the specificity of symptoms referred to as late whiplash is rarely questioned. Accordingly, this implies that the assessment of late whiplash is frequently based on a limited number of complaints that are assumed to represent specific symptoms. In turn, this may lead to a biased assessment that ultimately supports the diagnosis, while a variety of other symptoms are neglected. The question whether the aforementioned symptoms really are specific for late whiplash is the main focus of this study, in which a series of patients with late whiplash were compared with a series of patients with chronic pain arising as a consequence of other bodily trauma.

MATERIALS AND METHODS

In Switzerland, all persons who are disabled following trauma, and for whom it can be "established by a preponderance of the evidence that the disability is the natural and proximate result of the injury sustained" (documented by medical expert opinion), are entitled to receive a disability pension. The particulars of Swiss accident insurance law state that a higher financial support may be provided to an individual for disability following

trauma compared with disability resulting from nontraumatic conditions. These facts led us to compare the symptoms of late whiplash patients with individuals who complained of chronic pain lasting > 6 months due to other bodily trauma. A series of 156 consecutive patients with late whiplash syndrome (symptoms for ≥ 6 months after the accident; denoted the WP group) were compared with 54 consecutive patients who had chronic pain (≥ 6 months) due to other types of physical trauma (the non-WP group). Whiplash in this study was defined as an injury to the cervical spine due to an acceleration-deceleration mechanism (car collision) without loss of consciousness or posttraumatic amnesia. The only inclusion criterion for the study was that patients were native German speakers or spoke German fluently, having been able to finish their school or professional education in this language or were currently working in this language. All patients from both groups had been referred to the first author (a senior consultant in the pain center of a specialized hospital for orthopedics, neurology, rheumatology, sports medicine) for an expert opinion, the essential purpose of which was to establish whether the disability was the natural and proximate result of the injury sustained. In this sense, all patients were by default effectively involved in a litigation process¹⁰. This study was approved by the local ethics committee (KEK-StV-No. 29/10).

Both WP and non-WP groups underwent a clinical interview by at least 2 experienced physicians, one of whom was a neurologist, a rheumatologist, or an orthopedic surgeon. The other investigating physician had a professional training in psychosomatic medicine including pain assessment and treatment. Instead of reporting interview data, the analysis here was based on a standardized and validated self-rating of symptoms, assessing a higher number of symptoms than is usually assessed in the clinical interview. We considered that self-rating would be superior to clinical interview because it likely obviates any assessment bias of the physician who may focus on particular symptoms to support the diagnosis. Following clinical interview and physical examination both WP and non-WP groups completed the validated German version¹¹ of the Symptom Checklist 90-Revised (SCL-90-R)^{12,13}. The SCL-90-R is a widely used self-rating instrument that screens for 90 different symptoms including somatic, cognitive, and a broad range of psychological problems. The individual is asked to rate the presence and intensity of symptoms in the previous 7 days. The 90 items are rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely) indicating symptom distress. The sum of items scored above 0 indicates the total number of symptoms, referred to as the Positive Symptom Total (PST). The PST score can range from 0 to 90. Based on answers to all 90 items, the following nine SCL-90-R dimensions are calculated: "Somatization" (reflecting psychological distress based on perceived bodily dysfunction); "Obsessive-Compulsive" (focusing on thoughts and actions experienced as unremitting and irresistible, e.g., trouble concentrating, difficulty in making decisions); "Interpersonal Sensitivity" (reflecting feelings of personal inadequacy or inferiority); "Depression" (focusing on signs and symptoms of a clinical depression, such as dysphoric affect or mood, withdrawal of interest in life activities, and so on); "Anxiety" (assessing symptoms associated with anxiety, e.g., restlessness, nervousness); "Anger-Hostility" (focusing on hostile thoughts, feelings, or actions, such as annoyance, irritability, urges to break things, etc.); "Phobic Anxiety" (e.g., anxiety towards travel, open spaces, crowds, and so on); "Paranoid Ideation" (e.g., projections, suspiciousness, fear of loss of autonomy); and "Psychoticism," which in a nonpsychotic sample primarily measures aspects of social alienation. Finally, there are 7 further symptoms that are not included in any of the 9 primary dimensions (e.g., trouble falling asleep, sleep that is restless or disturbed, poor appetite). Two additional global indices are calculated to provide measures of overall psychological distress. These are the Global Severity Index (GSI), which is considered to be an indicator of current distress level due to symptoms, and the Positive Symptom Distress (PSD), which is assumed to be a measure of response style, indicating whether the individual is augmenting or attenuating distress while reporting it. The GSI is calculated as the sum of the 9 symptom dimensions plus the additional items not included in any of the dimension scores, divided by the total number of items to which the indi-

vidual responded (i.e., 90). The PSD is the sum of the values of the items receiving non-zero responses divided by the PST. The scores for each SCL-90-R dimension and the global indices are presented as T scores. T scores are adjusted for gender, to account for the higher rates of self-reported symptoms for females than males, and for educational attainment under 3 categories: basic education, high school, and university degree. T scores between 40 and 60 (i.e., ± 1 SD of the absolute mean adjusted T score) correspond to the normal range, whereas T scores > 60 are considered increasingly abnormal or pathological.

The outcomes of interest concerned the overall symptom number (i.e., PST) and the profiles of the SCL-90-R dimensions in each group. Of particular interest was an analysis focusing on the symptoms assumed to be “specific for late whiplash” based on the decision of the Swiss Federal Supreme Court. For this, the corresponding items from the SCL-90-R were used, i.e., headache (item 1), faintness or dizziness (item 4), trouble concentrating (item 55), trouble remembering things (item 9), nausea or upset stomach (item 40), and feeling easily annoyed or irritated (item 11). Since the symptom “getting tired easily” (purportedly one of the typical symptoms of late whiplash) does not exist as a single item in the SCL-90-R, this was calculated using the average scores from items reflecting the symptoms frequently reported by patients suffering from tiredness, namely, feeling low in energy or slowed down (item 14), feeling blocked in getting things done (item 28), feeling weak in parts of your body (item 56), and heavy feelings in your arms or legs (item 58). Emotional lability (also one of the symptoms purported to be specific for late whiplash) tends to reflect a personality trait rather than a single symptom and may comprise temper outbursts, anxiety, nervousness, becoming tense easily, irritability, and being easily hurt. Many of these exist as single items of the SCL-90-R and hence emotional lability was determined from the sum score of appropriate items from the SCL-90-R. This included all items from the SCL-90-R dimension “anxiety,” feeling easily annoyed or irritated (item 11), temper outbursts that you could not control (item 24), and your feelings being easily hurt (item 34). Since the item “feeling easily annoyed or irritated” (item 11) is considered to be a complaint specific for late whiplash in its own right, we controlled for its possible influence on the results by calculating emotional lability with and without this particular item. For the aforementioned analyses, the mean symptom ratings ranging from 0 to 4 were used. For “Depression,” assumed to be another late whiplash-specific complaint, the T score from the corresponding SCL-90-R scale was used.

The frequency with which each of the 90 symptoms was reported in each group was presented as descriptive data (percentage of patients reporting symptom). Spearman rank correlation coefficients were used to describe the relationship between PST and the length of time between trauma and investigation in each group. Mann-Whitney U tests were used to examine the significance of the difference between the groups in the length of time between accident and assessment. Independent t tests were used to examine differences between the WP and non-WP groups in the T scores for the SCL-90-R dimensions, the subjective intensity of symptoms (i.e., rated 0–4), and the symptoms assumed to be specific for late whiplash. The analyses for all but the T scores (which are already gender-corrected) were first examined for gender differences before the data from the men and women were pooled. Where homogeneity of variance for the groups being compared could not be established, the Welch test was used instead of the t test to determine the significance of the difference in means between groups. Due to the overlapping and hence potentially redundant information carried by some of the individual items, multiple logistic regression analysis was carried out to examine which of the “symptoms assumed specific for late whiplash” (measured on the 5-point Likert scale) best predicted (statistically) group membership (WP or non-WP). Gender and level of education were forced into the model in a first step, and then forward stepwise selection (based on the likelihood ratio) was used to examine the unique contribution of the remaining 9 items; the p value for stepwise entry was 0.05 and for removal, 0.1. The level of statistical significance was set at $p < 0.05$, but was adjusted where appropriate to account for multiple comparisons using Bonferroni corrections, such that significance was only

accepted when the p values achieved were less than 0.05 divided by the number of repeated analyses carried out for a given set of data. The data were analyzed using PASW Statistics 18.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Demographic data and injury details for the 2 groups are shown in Table 1. Compared with the non-WP group, the WP group had a higher proportion of women ($p = 0.018$) and a lower education level ($p = 0.001$), but there were no differences between the groups for age or length of time between trauma and investigation. All patients of the WP group initially had the diagnosis of whiplash injury grade I or II according to the Quebec Task Force¹. All had neck pain and various other symptoms referred to as late whiplash. None had neurological signs, fractures to the cervical spine, or instabilities.

Descriptive data showing the frequency with which each symptom was reported in the 2 groups is presented in Table 2. Headache, trouble concentrating, feeling low in energy/slowed down, trouble remembering things, and sleep that is restless/disturbed were the 5 most frequent symptoms in both groups alike, reported by $> 81.4\%$ in the WP group and $> 83.3\%$ in the non-WP group.

The mean adjusted T score for PST was in the normal range for the WP group ($T = 56.1$, 95% CI 54.1–58.1) and in the pathological range for the non-WP group ($T = 61.1$, 95% CI 57.3–64.9; Table 3). There was no significant correlation between the number of positive symptoms (PST) and the time interval since trauma in the WP group (Spearman $\rho = -0.09$, $p = 0.84$) or the non-WP group (Spearman $\rho = 0.07$, $p = 0.74$).

With regard to the SCL-90-R dimensions and the global indices (Table 3), both WP and non-WP groups showed mean T scores in the pathological range for the dimensions “Somatization,” “Obsessive-Compulsive,” and PSD. Only the non-WP group had an average score in the pathological range for the dimensions “Depression,” “Anxiety,” and “Phobic Anxiety” and for the global indices GSI and PST (Table 3). The non-WP group had significantly higher T scores than the WP group for the dimensions “Interpersonal Sensitivity” and “Anger-Hostility,” although the scores were in the normal range for both groups.

No significant group differences were found in the severity scores for the symptoms referred to as specific for late whiplash (Table 4). Given that women usually complain of headache more often than men, this particular symptom was also analyzed in the women alone (the sample size was too small to do the analysis for men only). Similar to the analyses for the whole group, there was a tendency for the women in the WP group to have a higher score for headache than those in the non-WP group, but the difference just failed to reach significance ($p = 0.059$).

The results of the multiple logistic regression, controlling for gender (OR 1.683, 95% CI 0.869–3.991, $p = 0.110$) and education level (OR 0.376, 95% CI 0.212–0.668, $p = 0.001$)

Table 1. Sociodemographic data and injury mechanism for patients in the whiplash (WP) and non-whiplash (non-WP) groups.

Characteristic	WP Group	Non-WP Group	p
No.	156	54	—
Sex, n (%)			
Men	28 (18)	18 (33)	0.018
Women	128 (82)	36 (67)	
Age, yrs	43.1 ± 10.6 (range 18–66)	43.1 ± 11.1 (range 19–63)	0.85
Highest education (%)			
Secondary	138 (89)	36 (67)	0.001
College	13 (8)	11 (20)	
University	5 (3)	7 (13)	
Injury details	96 rear-end collision 22 frontal collision 14 side collision 24 complex mechanisms (e.g., mixture of above)	10 back contusion 8 head injury (concussion) 6 polytrauma 6 spinal trauma 2 pelvic ring fracture 5 lower limb fracture 4 upper limb fracture 5 contusion of lower limb 6 contusion of upper limb 2 chest contusion	—
Mean ± SD interval between trauma and investigation, mo	54.8 ± 46.6 (median 40.5, range 6–313)	71.4 ± 66.6 (median 47.5, range 7–386)	0.093*

* Mann-Whitney U test.

in the model, revealed that headache (OR 1.531, 95% CI 1.155–2.030, $p = 0.003$) and emotional lability (OR 0.956, 95% CI 0.929–0.984, $p = 0.003$) were the only unique significant variables predicting membership in the WP group (Nagelkerke R-square, 20.3%). Patients were more likely to belong to the WP than the non-WP group if they were female, had a lower education level, and had greater headache symptoms and lower emotional lability scores.

DISCUSSION

Our study does not support the view that late whiplash syndrome is a condition associated with a specific spectrum of symptoms. The results instead support the reported experience in clinical practice that chronic pain of different origins is accompanied by a broad range of symptoms. Accordingly, the development of symptoms following whiplash should be analyzed in detail in order to understand the problem on an individual basis. Not only might this assist in providing the most appropriate treatment, it may also provide a more adequate basis for settlement of compensation claims.

Of all the symptoms considered to be specific for whiplash, in the multiple regression analysis only greater complaint of headache was significantly associated with being in the WP rather than the non-WP group. This was so, even after control for gender (it was essential to control for this confounder, since previous epidemiological studies have shown a tendency for women to have all types of headache more frequently than men^{14,15}, and there was a

higher proportion of women in the WP group than in the non-WP group) and education level (also differed between the groups and could influence symptom reporting). This is an important finding, since headache is one of the most prominent physical symptoms in late whiplash, and this suggests that it may indeed represent a specific symptom, albeit with a weak statistical association with the condition. However, interpretation is complicated because we could not ascertain how many patients in each group suffered from headache before experiencing trauma. This would have been of interest, because pretrauma headache has been identified as a factor influencing the development of chronic headache following whiplash mechanism injuries¹⁶.

Many of the so-called specific symptoms for late whiplash (e.g., dizziness, trouble concentrating, trouble remembering things, feeling easily annoyed or irritated) were reported to a similar extent by patients in both groups. The non-WP group had an average score in the pathological range for all the global indices, Positive Symptom Total (PST), Global Severity Index (GSI), and Positive Symptom Distress (PSD), whereas only PSD was in the pathological range for the WP group. This indicates greater pain distress in the non-WP group, reflected also by the pathological T scores for the SCL-90-R dimensions assessing emotional problems (i.e., “Depression,” “Anxiety,” and “Phobic Anxiety”). The results here in particular emphasize that depression is not the principal emotional problem of late whiplash, since the WP group scored within the normal T

Table 2. Symptom Checklist-90-Revised (SCL-90-R) item frequencies in WP and non-WP groups, sorted according to the most frequent symptoms in the WP group.

Most Frequent Symptom (in WP Group)	SCL-90-R Item No.	SCL-90-R Item	WP Group, % (95% CI)*	Non-WP Group, % (95% CI)*
1	1	Headache	92.9 (88.9–97.0)	83.3 (73.4–93.3)
2	55	Trouble concentrating	89.7 (85.0–94.5)	90.7 (83.0–98.5)
3	14	Feeling low in energy or slowed down	85.3 (79.7–90.8)	88.9 (80.5–97.3)
4	9	Trouble remembering things	84.6 (79.0–90.3)	87.0 (78.1–96.0)
5	66	Sleep that is restless or disturbed	81.4 (75.3–87.5)	85.2 (75.7–94.7)
6	56	Feeling weak in parts of your body	77.6 (71.0–84.1)	75.9 (64.5–87.3)
7	42	Soreness of your muscles	75.0 (68.2–81.8)	64.8 (52.1–77.6)
8	11	Feeling easily annoyed or irritated	73.7 (66.8–80.6)	83.3 (73.4–93.3)
9	52	Numbness or tingling in parts of your body	73.1 (66.1–80.0)	77.8 (66.7–88.9)
10	71	Feeling everything is an effort	73.1 (66.1–80.0)	74.1 (62.4–85.8)
11	2	Nervousness or shakiness inside	69.9 (62.7–77.1)	77.8 (66.7–88.9)
12	4	Faintness or dizziness	69.9 (62.7–77.1)	64.8 (52.1–77.6)
13	34	Your feelings being easily hurt	68.6 (61.3–75.9)	81.5 (71.1–91.8)
14	27	Pain in lower back	67.3 (59.9–74.7)	74.1 (62.4–85.8)
15	57	Feeling tense or keyed up	67.3 (59.9–74.7)	72.2 (60.3–84.2)
16	87	The idea that something serious is wrong with your body	65.4 (57.9–72.9)	72.2 (60.3–84.2)
17	44	Trouble falling asleep	64.1 (56.6–71.6)	77.8 (66.7–88.9)
18	31	Worrying too much about things	63.5 (55.9–71.0)	74.1 (62.4–85.8)
19	5	Loss of sexual interest or pleasure	61.5 (53.9–69.2)	75.9 (64.5–87.3)
20	20	Crying easily	60.3 (52.6–67.9)	64.8 (52.1–77.6)
21	70	Feeling uneasy in crowds such as shopping or at a movie	57.1 (49.3–64.8)	66.7 (54.1–79.2)
22	3	Unwanted thoughts or ideas that won't leave your head	56.4 (48.6–64.2)	77.8 (66.7–88.9)
23	64	Awakening in the early morning	56.4 (48.6–64.2)	55.6 (42.3–68.8)
24	6	Feeling critical of others	55.1 (47.3–62.9)	70.4 (58.2–82.5)
25	38	Having to do things very slowly	55.1 (47.3–62.9)	61.1 (48.1–74.1)
26	49	Hot or cold spells	55.1 (47.3–62.9)	57.4 (44.2–70.6)
27	28	Feeling blocked in getting things done	53.8 (46.0–61.7)	70.4 (58.2–82.5)
28	46	Difficulty making decisions	53.8 (46.0–61.7)	66.7 (54.7–79.2)
29	58	Heavy feelings in your arms or legs	53.8 (46.0–61.7)	51.9 (38.5–65.2)
30	36	Feeling others do not understand you or are unsympathetic	51.9 (44.1–59.8)	53.8 (46.2–72.4)
31	51	Your mind going blank	51.3 (43.4–59.1)	44.4 (31.2–57.7)
32	54	Feeling hopeless about the future	50.6 (42.8–58.5)	64.8 (52.1–77.6)
33	40	Nausea or upset stomach	50.0 (42.2–57.8)	50.0 (36.7–63.3)
34	24	Temper outbursts that you could not control	46.8 (39.0–54.6)	63.0 (50.1–75.8)
35	10	Worried about sloppiness or carelessness	46.8 (39.0–54.6)	61.1 (48.1–74.1)
36	26	Blaming yourself for things	42.9 (35.2–50.7)	46.3 (33.0–59.6)
37	41	Feeling inferior to others	37.2 (29.6–44.8)	51.9 (38.5–65.2)
38	30	Feeling blue	36.5 (29.0–44.1)	59.3 (46.2–72.4)
39	79	Feeling of worthlessness	36.5 (29.0–44.1)	50.0 (36.7–63.3)
40	83	Feeling that people will take advantage of you if you let them	36.5 (29.0–44.1)	31.5 (19.1–43.9)
41	17	Trembling	35.9 (28.4–43.4)	46.3 (33.0–59.6)
42	19	Poor appetite	34.6 (27.1–42.1)	40.7 (27.6–53.8)
43	29	Feeling lonely	33.3 (25.9–40.7)	48.1 (34.8–61.5)
44	53	A lump in your throat	32.1 (24.7–39.4)	50.0 (36.7–63.3)
45	89	Feelings of guilt	32.1 (24.7–39.4)	35.2 (22.4–47.9)
46	76	Others not giving you proper credit for your achievements	31.4 (24.1–38.7)	38.9 (25.9–51.9)
47	23	Suddenly scared for no reason	31.4 (24.1–38.7)	29.6 (17.5–41.8)
48	33	Feeling fearful	30.1 (22.9–37.3)	44.4 (31.2–57.7)
49	18	Feeling that most people cannot be trusted	30.1 (22.9–37.3)	37.0 (24.2–49.9)
50	39	Heart pounding or racing	30.1 (22.9–37.3)	35.2 (22.4–47.9)

Personal non-commercial use only. The Journal of Rheumatology Copyright © 2011. All rights reserved.

Table 2. Continued

Most Frequent Symptom (in WP Group)	SCL-90-R Item No.	SCL-90-R Item	WP Group, % (95% CI)*	Non-WP Group, % (95% CI)*
51	13	Feeling afraid in open spaces or on the street	29.5 (22.3–36.6)	44.4 (31.2–57.7)
52	61	Feeling uneasy when people are watching or talking about you	29.5 (22.3–36.6)	37.0 (24.2–49.9)
53	50	Having to avoid certain things, places or activities	28.2 (21.1–35.3)	44.4 (31.2–57.7)
54	47	Feeling afraid to travel on buses, subways or trains	27.6 (20.6–34.6)	31.5 (19.1–43.9)
55	72	Spells of terror or panic	27.6 (20.6–34.6)	31.5 (19.1–43.9)
56	32	Feeling no interest in things	26.9 (20.0–33.9)	42.6 (29.4–55.8)
57	68	Having ideas or beliefs that others do not share	26.3 (19.4–33.2)	29.6 (17.5–41.8)
58	8	Feeling others are to blame for most of your troubles	25.6 (18.8–32.5)	40.7 (27.6–53.8)
59	43	Feeling that you are watched or talked about by others	25.6 (18.8–32.5)	38.9 (25.9–51.9)
60	48	Trouble getting your breath	25.6 (18.8–32.5)	37.0 (24.2–49.9)
61	12	Pains in heart or chest	25.0 (18.2–31.8)	35.2 (22.4–47.9)
62	78	Feeling so restless you couldn't sit still	24.4 (17.6–31.1)	44.4 (31.2–57.7)
63	45	Having to check and double check what you do	24.4 (17.6–31.1)	42.6 (29.4–55.8)
64	59	Thoughts of death or dying	24.4 (17.6–31.1)	42.6 (29.4–55.8)
65	69	Feeling very self-conscious with others	24.4 (17.6–31.1)	27.8 (15.8–39.7)
66	77	Feeling lonely even when you are with people	23.7 (17.0–30.4)	37.0 (24.2–49.9)
67	25	Feeling afraid to go out of your house alone	22.4 (15.9–29.0)	35.2 (22.4–47.9)
68	90	The idea that something is wrong with your mind	20.5 (14.2–26.8)	24.1 (12.7–35.5)
69	81	Shouting or throwing things	18.6 (12.5–24.7)	24.1 (12.7–25.5)
70	60	Overeating	18.6 (12.5–24.7)	16.7 (6.7–26.6)
71	74	Getting into frequent arguments	17.9 (11.9–24.0)	35.2 (22.4–47.9)
72	75	Feeling nervous when you are left alone	17.9 (11.9–24.0)	33.3 (20.8–45.9)
73	88	Never feeling close to another person	17.9 (11.9–24.0)	31.5 (19.1–43.9)
74	15	Thoughts of ending life (suicidal thoughts)	17.9 (11.9–24.0)	29.6 (17.5–41.8)
75	86	Feeling pushed to get things done	17.9 (11.9–24.0)	27.8 (15.8–39.7)
76	37	Feeling that people are unfriendly	17.9 (11.9–24.0)	25.9 (14.2–37.6)
77	82	Feeling afraid you will faint in public	17.9 (11.9–24.0)	18.5 (8.2–28.9)
78	21	Feeling shy or uneasy with the opposite sex	16.7 (10.8–22.5)	22.2 (11.1–33.3)
79	80	Feeling that familiar things are strange or unreal	15.4 (9.7–21.0)	29.6 (17.5–41.8)
80	65	Having to repeat the same actions such as touching, counting, washing	12.2 (7.0–17.3)	14.8 (5.3–24.3)
81	7	The idea that someone else can control your thoughts	10.9 (6.0–15.8)	22.2 (11.1–33.3)
82	73	Feeling uncomfortable about eating or drinking in public	10.9 (6.0–15.8)	16.7 (6.7–26.6)
83	35	Other people being aware of your private thoughts	10.3 (5.5–15.0)	16.7 (6.7–26.6)
84	62	Having thoughts that are not your own	9.0 (4.5–13.5)	27.8 (15.8–39.7)
85	67	Having urges to break or smash things	8.3 (4.0–12.7)	14.8 (5.3–24.3)
86	22	Feeling of being trapped or caught	7.1 (3.0–11.1)	13.0 (4.0–21.9)
87	84	Having thoughts about sex that bother you a lot	4.5 (1.2–7.7)	16.7 (6.7–16.6)
88	63	Having urges to beat, injure or harm someone	3.8 (0.8–6.9)	11.1 (2.7–19.5)
89	85	The idea that you should be punished for your sins	3.2 (0.4–6.0)	14.8 (5.3–24.3)
90	16	Hearing voices that other people do not hear	1.9 (0.0–4.1)	5.6 (0.0–11.7)

* Lower and upper limit for the 95% confidence interval.

score range for this dimension. This indicates that clinical diagnosis of late whiplash as an affective disorder is difficult to substantiate, and reports implicating the diagnoses of

depression¹⁷, anxiety¹⁸, or phobic disorder (including post-traumatic stress disorder)^{19,20} should be reconsidered regarding the specificity of the reported affective symptoms.

Table 3. Adjusted T scores for the nine SCL-90-R dimensions and global indices. Where necessary (i.e., heterogeneous variance between the groups), the Welch test was used instead of the T test.

Measure	WP Group, mean (95% CI)	Non-WP Group, mean (95% CI)	t	p (2-tailed)
SCL-90-R dimension				
Somatization	67.9 (66.26–69.52)	67.8 (64.56–71.10)	-0.03	0.973
Obsessive-compulsive	61.5 (59.37–63.59)	63.7 (60.07–67.37)	-1.07	0.288
Interpersonal sensitivity	51.6 (49.72–53.56)	57.7 (53.96–61.45)	-3.05	0.003*
Depression	58.0 (56.06–59.98)	63.3 (59.60–67.03)	-2.64	0.009
Anxiety	55.2 (53.35–57.06)	60.2 (56.55–63.90)	-2.6	0.010
Anger-hostility	52.9 (51.13–54.78)	58.2 (54.78–61.59)	-2.81	0.005*
Phobic anxiety	58.2 (56.18–60.17)	62.7 (59.12–66.29)	-2.25	0.026
Paranoid ideation	50.5 (48.74–52.36)	54.6 (50.80–58.43)	-2.12	0.035
Psychoticism	52.2 (50.47–53.86)	57.8 (54.08–61.44)	-2.76	0.007
Global				
Global Severity Index (GSI)	60.0 (58.07–61.95)	64.4 (60.72–68.10)	-2.11	0.028
Positive Symptom Total (PST)	56.1 (54.13–58.06)	61.1 (57.35–64.87)	-2.49	0.014
Positive Symptom Distress (PSD)	64.1 (62.62–65.49)	66.8 (64.09–69.43)	-1.78	0.066

* With Bonferroni correction, p values < 0.0055 (0.05/9) are considered statistically significant for each of the 9 individual dimensions.

Table 4. Group comparison of symptoms assumed to be specific for late whiplash. Where necessary (i.e., heterogeneous variance between groups), the significance of the difference between groups was derived from the Welch test rather than the t test. No corrections for gender were made, since no significant gender differences for any of these items were found, except for depression, which being a T score was already gender-corrected.

Symptom	WP Group, mean (95% CI)	Non-WP Group, mean (95% CI)	t	p (2-tailed)
Headache	2.52 (2.34–2.71)	2.09 (1.73–2.43)	1.94	0.055
Faintness or dizziness	1.38 (1.19–1.57)	1.33 (1.03–1.65)	0.23	0.815
Trouble concentrating	2.40 (2.18–2.61)	2.26 (1.92–2.58)	0.68	0.499
Trouble remembering things	2.19 (1.99–2.40)	2.09 (1.74–2.40)	0.44	0.657
Nausea or upset stomach	0.80 (0.65–0.95)	1.07 (0.77–1.37)	-1.41	0.161
Feeling easily annoyed or irritated	1.60 (1.40–1.80)	1.91 (1.57–2.22)	-1.47	0.144
Getting easily tired	1.48 (1.33–1.63)	1.63 (1.36–1.92)	-0.95	0.342
Emotional lability	0.75 (0.65–0.84)	1.05 (0.85–1.26)	-2.32	0.023
Depression (T score)	58.0 (56.00–59.86)	63.3 (59.95–66.80)	-2.64	0.009

With Bonferroni correction, p values < 0.0055 (0.05/9) are considered statistically significant.

From our results, it appears justified to conclude that the patients in both the WP and non-WP groups experienced a broad range of emotional problems that most likely reflected an adjustment disorder, and in some of them, depressive symptoms were more prominent. This supports previous suggestions of late whiplash being a multifactorially determined adjustment disorder²¹. Since in our study subjective cognitive complaints (e.g., trouble concentrating, trouble remembering things) were indicated to a comparable extent in both WP and non-WP groups, these particular problems do not seem to be specific for late whiplash. These complaints may instead be a consequence of the interaction between psychological adjustment problems and pain experience²¹, influencing several aspects of cognitive functioning including attentional processing²².

The most important finding in our study was that the WP and the non-WP groups could not be distinguished from one

another on the basis of symptoms that are purportedly specific for late whiplash, with the exception of headache. This indicates that these so-called specific symptoms are frequently observed in other chronic pain conditions, entirely supporting our perception in clinical practice. The results lead us to conclude that late whiplash is simply one type of chronic pain condition and should be assessed and treated as such.

Since both the WP and non-WP groups shared many symptoms in common but suffered different types of trauma, the question arises how such symptom development may be explained. In this regard, one particular finding of our study was of interest, namely the high prevalence (over 80%) of sleep problems (item: “sleep that is restless or disturbed”) in both groups. In a prospective cohort study, pain-induced sleep disturbance was observed in the initial phase in over 76% of individuals who went on to develop late

whiplash²³. Based on the manifestation of sleep disturbance early in the course of whiplash, it was suggested that the psychological and cognitive problems that comprise late whiplash are the result of some sort of sleep deprivation²¹. The high prevalence of sleep problems in patients with chronic pain²⁴ and the complex interaction among mood disturbances, pain, and sleep problems have been recognized²⁵. Experimental research has shown that pain provoked during sleep in otherwise pain-free volunteers led to sleep disturbance over all sleep stages²⁶. Sleep disturbances have also been held responsible for problems such as difficulties in motor performance²⁷, learning capacity²⁸, memory consolidation²⁹, and emotional well-being^{15,30,31}. It therefore appears reasonable to suggest that pain-induced persistent sleep disturbance may be the common basis for understanding the similarities in the complaints reported by patients with chronic pain of differing origins.

Two systematic reviews^{2,32} have been unable to identify many specific risk factors for the condition referred to as late whiplash. Both reviews concluded that high initial neck pain intensity following whiplash injury was the only factor associated with a poor prognosis, i.e., the development of late whiplash. The initial values of several physical, cognitive, and accident-related variables were of limited prognostic value, and the previously discussed risk factors such as older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision, and the possibility of compensation were not confirmed as significant prognostic factors^{2,32}. The search for a specific risk factor in the development of late whiplash hence remains fruitless. We suggest that, instead of focusing on further research to identify prognostic factors in the development of late whiplash and assessing the so-called specific symptoms, we should pursue new avenues of investigation based on the existing scientific evidence for common symptoms in different chronic pain conditions. In particular, this concerns the potential importance of initial pain in eliciting sleep disturbances and in initiating the complex relationship between pain and sleep that likely leads to a variety of common symptoms across different pain conditions. This may eventually help to establish symptom-oriented treatment.

The salient features of this study are that the findings are based entirely on patient self-reported symptoms, rather than extracted from (potentially biased) clinical interview data. A wide spectrum of symptoms was enquired about, many of which might not normally be covered in the clinical interview, and this hence delivered a new insight into the range of problems experienced by these patients. However, certain limitations also require mention. The study examined data from 2 series of patients with chronic pain, and the groups were not well matched for gender and education level. This likely had some bearing on the frequency and severity with which symptoms were reported in each group for the unadjusted analyses. However, in the final multivari-

able model, from which the main conclusions were drawn, this was accounted for. Second, we simply took all available data for our analysis, without *a priori* determining the most appropriate sample size; however, with the smaller of the 2 groups having 54 cases the probability was 88% that we would have detected a group difference at a 2-sided 5% significance level if there had been a true difference between the groups of a medium effect size of 0.5. For the logistic regression we needed enough cases (approximately 10 per predictor for the smaller of the 2 groups) to get reliable results and this condition was more or less fulfilled. The aspect of litigation and legal representation was not considered in the final predictive model. However, according to the particulars of Swiss accident insurance law (as above) all patients were effectively involved in a litigation process because they were trauma cases¹⁰. We had no information on lawyer involvement for each patient but we consider that this was unlikely to cause bias because (1) there is no reason that there would be more lawyer involvement in whiplash cases than in other types of trauma/accident claim; and (2) as noted above, systematic reviews do not support that compensation and legal representation are of prognostic value in predicting the course of recovery in whiplash^{2,32}. Another limitation of the study was that the questionnaire was completed after the clinical interview with the physician. In theory, the clinical assessment could have biased the results of the questionnaire. However, since the findings were mostly negative, i.e., the symptoms declared by the patient were not specific for late whiplash, this seems unlikely. If the converse had been found, and the whiplash patients had indeed reported a predominance of the “typical whiplash” symptoms, one could argue that the patient might have been made more aware of these symptoms by the interview.

REFERENCES

1. Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Durancieu J, Suissa S, et al. Scientific monograph of the Quebec Task Force on Whiplash-Associated Disorders: Redefining “whiplash” and its management. *Spine* 1995;20 Suppl:1S-73S.
2. Williams M, Williamson E, Gates S, Lamb S, Cooke M. A systematic literature review of physical prognostic factors for the development of late whiplash syndrome. *Spine* 2007;32:E764-80.
3. Gargan MF, Bannister GC. The rate of recovery following whiplash injury. *Eur Spine J* 1994;3:162-4.
4. Harder S, Veillieux M, Suissa S. The effect of socio-demographic and crash-related factors on the prognosis of whiplash. *J Clin Epidemiol* 1998;51:377-84.
5. Livingston M. Whiplash injury and peer copying. *J R Soc Med* 1993;86:536-6.
6. Malleon A. Whiplash and other useful illnesses. Montreal, Kingston: McGill-Queen’s University Press; 2005.
7. Chappuis G, Soltermann B. Number and cost of claims linked to minor cervical trauma in Europe: Results from the comparative study by CEA, AREDOC and CEREDOC. *Eur Spine J* 2008;17:1350-7.
8. Cassidy JD, Carroll LJ, Cote P, Lemstra H, Berglund A, Nygren A. Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. *N Engl J Med*

- 2000;342:1179-86.
9. Sammlung der Entscheidungen des Schweizerischen Bundesgerichts/Collection des arrêts du Tribunal fédéral Suisse/Raccolta delle decisioni del Tribunale federale svizzero. BGE 117 V 359; 04 February 1991. Lausanne, Switzerland.
 10. Frésard J-M, Moser-Szeless M. L'assurance-accidents obligatoire. In: Meyer U, editor. Schweizerisches Bundesverwaltungsrecht, Soziale Sicherheit, Band XIV, 2. Auflage. München, Basel: Helbling & Lichtenhahn Verlag; 2007:825-1040.
 11. Schmitz N, Hartkamp N, Kiuse J, Franke GH, Reiset G, Tress W. The Symptom Check-List-90-R (SCL-90-R): A German validation study. *Qual Life Res* 2000;9:185-93.
 12. Derogatis LR. The SCL-90-R: Administration, scoring, and procedures. Baltimore: Clinical Psychometric Research; 1977.
 13. Franke GH. SCL-90-R — Die Symptom-Checkliste von Derogatis — Deutsche Version. Göttingen: Beltz Test GmbH; 2002.
 14. Rasmussen BK, Jensen R, Schroll M, Olesen J. Epidemiology of headache in a general population — A prevalence study. *J Clin Epidemiol* 1991;44:1147-57.
 15. Hagen K, Zwart JA, Vatten L, Stovner LJ, Bovim G. Prevalence of migraine and non-migraine headache — Head-HUNT, a large population-based study. *Cephalalgia* 2000;20:900-6.
 16. Radanov BP, Sturzenegger M, Schnidrig A, Di Stefano G, Aljinovic M. Factors influencing recovery from headache after common whiplash. *BMJ* 1993;307:652-5.
 17. Carroll LJ, Cassidy JD, Cote P. Frequency, timing and course of depressive symptomatology after whiplash. *Spine* 2006;31:E551-6.
 18. Mayou R, Bryant B, Duthie R. Psychiatric consequences of road traffic accidents. *BMJ* 1993;307:647-51.
 19. Sterling M, Kennardy J. The relationship between sensory and sympathetic nervous system changes and posttraumatic stress reaction following whiplash injury — a prospective study. *J Psychosom Res* 2006;60:387-93.
 20. Buitenhuis J, de Jong PJ, Jaspers JPC, Groothoff JW. Relationship between posttraumatic stress disorder and the course of whiplash complaints. *J Psychosom Res* 2006;61:681-9.
 21. Radanov BP, Sturzenegger M. The effect of accident mechanisms and initial findings on the long-term course of whiplash injury. *J Musculoskel Pain* 1996;4:47-59.
 22. Pincus T, Morley S. Cognitive-processing bias in chronic pain: A review and integration. *Psychol Bull* 2001;127:599-617.
 23. Radanov BP, Sturzenegger M, Di Stefano G. Long-term outcome after whiplash injury — A two years follow-up considering features of accident mechanism, somatic, radiological and psychosocial findings. *Medicine* 1995;74:281-97.
 24. Choinière M, Dion D, Peng P, Banner R, Bartom P, Boulanger A, et al. The Canadian STOP-PAIN project — part 1: Who are the patients on the waitlists of multidisciplinary pain treatment facilities? *Can J Anaesth* 2010;57:539-48.
 25. O'Brien EM, Waxenberg LB, Atchison JW, Gremillion HA, Staud RM, McCrae CS, et al. Negative mood mediates the effect of poor sleep on pain among chronic pain patients. *Clin J Pain* 2010;26:310-9.
 26. Lavigne G, Brousseau M, Kato T, Mayer P, Manzini C, Guitard F, et al. Experimental pain perception remains equally active over all sleep stages. *Pain* 2004;100:646-55.
 27. Scott JP, McNaughton LR, Polman RC. Effects of sleep deprivation and exercise on cognitive, motor performance and mood. *Physiol Behav* 2006;87:396-408.
 28. Curcio G, Ferrara M, De Gennaro L. Sleep loss, learning capacity and academic performance. *Sleep Med Rev* 2006;10:323-7.
 29. Backhaus J, Born J, Hoeckesfeld R, Fokuhl S, Hohagen F, Junghans K. Midlife decline in declarative memory consolidation is correlated with a decline in slow wave sleep. *Learn Mem* 2007;14:336-41.
 30. Haack M, Mullington JM. Sustained sleep restriction reduces emotional and physical well-being. *Pain* 2005;119:56-64.
 31. Hamilton NA, Catley D, Karlson C. Sleep and the affective response to stress and pain. *Health Psychol* 2007;26:288-95.
 32. Scholten-Peeters GGM, Verhagen AP, Bekkering GE, van der Windt DAWM, Barnsley L, Oostendorp RAB, et al. Prognostic factors of whiplash-associated disorders: A systematic review of prospective cohort studies. *Pain* 2003;104:303-20.