

Results of a Multimodal Treatment Program for Patients With Chronic Symptoms After a Whiplash Injury of the Neck

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Study Design. A descriptive case series pre- and post-treatment design, including a 6-month follow-up.

Objectives. The objective of this study was to document the improvements of patients with chronic symptoms after a “whiplash” injury of the neck, who attended a 4-week multimodal treatment program at the Rug AdviesCentra Nederland.

Summary of Background Data. To the authors’ knowledge, no studies have been conducted on the effectiveness of multidisciplinary treatment of chronic symptoms after whiplash injury.

Methods. Twenty-six patients who experienced Quebec type 1 or 2 lesions of the neck (whiplash) with persisting symptoms of longer than 6 months’ duration participated in the study. The measures included were pain intensity (according to the visual analog scale), number of painful sites (determined by pain drawing), self-reported disability Quebec Back Pain Disability Scale; and symptoms of somatic and psychological distress and cognitive symptoms (according to selected Minnesota Multiphasic Personality Inventory-2 scales). Furthermore, objective outcome criteria were used regarding return to work, medication, and medical and paramedical treatment. Statistical and clinical significance of treatment results were both assessed.

Results. The patients’ symptoms improved significantly on nearly all self-report measures. Their scores for objective outcome criteria reported during the 6-month follow-up evaluation were: complete return to work (65%); complete or partial return to work (92%); no use of analgesics in the past 6 months (58%); and no medical or paramedical treatments in the past 6 months (81%).

Conclusion. These early results indicate that a multimodal treatment program has the potential to be an effective treatment for patients with chronic symptoms after a whiplash injury of the neck—a group of patients who have in the past been considered intractable or, at the very least, puzzling. [Key words: chronic pain, multidisciplinary treatment, rehabilitation, treatment outcome, whiplash injury. *Spine* 2000;25:238–244

During rear-end auto collisions, people are subjected to an extension–acceleration force, that often results in the development of pain symptoms. The term “whiplash” refers to this mechanism. After such an injury, people often report neck pain and numbness, dizziness, and headaches.¹ Acute symptoms are attributed to lesions

within the muscles and/or ligaments of the neck (neck sprain), because evidence of skeletal or nervous system injuries is absent in most patients.³³ However, evidence of structural damage beyond the average healing time is seldom found among patients with whiplash,⁵ even when sophisticated imaging techniques such as magnetic resonance imaging (MRI) are used.²

Clinical studies indicate that between 14% and 42% of patients with whiplash injuries have chronic neck pain and that approximately 10% of this group experience constant, severe pain.^{6,8,11,19,22–24,26,37} Lower prevalences of chronic neck pain and headache among patients with whiplash have also been found. For example, in Lithuania, where public awareness is low concerning the potentially disabling consequences of a whiplash injury, chronic neck pain and headache were reported by 8.4% and 9.4% of people, respectively.³¹ Furthermore, the same prevalence of neck pain or headache was identified in control groups made up of people who had not been involved in rear-end auto collisions. Frequently, other chronic symptoms are reported in addition to neck pain and headache, such as concentration and memory problems, irritability, depression, tension, and sleep disturbances.^{1,33}

The costs in Western countries of chronic symptoms after whiplash injury in personal disability, work loss, and disability claims appear to be substantial and can even be termed epidemic.⁵

Stovner³³ outlined that the concept of the “whiplash syndrome” will probably lead to a predominately trauma-oriented approach and may possibly divert the research from other, more productive approaches. One likely alternative is the behavioral approach, which has been shown to be quite successful in the treatment of chronic low back pain. Unfortunately, inappropriate pain behavior and distress have been poorly studied, although they may play a role in progression toward chronicity after a whiplash injury. For example, avoidance of normal neck movement may result in the so-called “disuse syndrome,”³ and, consequently, muscle atrophy. There is some evidence that decreased regional blood flow due to muscle atrophy is associated with neck pain.¹⁸ Also, disturbed sleep patterns caused by distress and accompanied by hyperactivity of the trapezius muscle may lead to persisting pain and dizziness, while also reinforcing the distress. The ultimate consequence is a vicious circle, out of which the patient cannot escape.

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Therefore, a multimodal treatment program may be the treatment of choice to manage the aforementioned processes and thus restore patients' functioning and decrease the symptoms. However, the authors are aware of no empirical efforts in this area.

The purpose of the present study was to document the improvements of patients with chronic symptoms after a whiplash injury who attended a 4-week multimodal treatment program. The results at the end of the program and at 6-month follow-up are reported.

■ Methods

Study Design. The study was an uncontrolled pre- and post-treatment design, including a 6-month follow-up period. The outcome measures were assessed by independent observers who were not members of the treatment team.

Participants. The study took place at the (Netherlands Back Advice Center) Rug AdviesCentra Nederland during 1996. Fifty-one patients who were referred by their occupational or insurance physicians were initially assessed at the Rug AdviesCentra Nederland. Of the 51 initially assessed patients, 26 enrolled in the treatment program. Diverse reasons accounted for not participating in the program: Some patients were assessed only for medicolegal reasons, some lacked funding for the treatment, some found the distance to the treatment center insurmountable, and others were strongly convinced that nothing could help them and therefore elected not to participate in the program.

The mean age of participants (13 men; 13 women) entering the program was 35.8 ± 8.7 years (mean \pm SD). All patients had symptoms, resulting from a whiplash injury that had occurred at least 6 months ago, with a mean duration of symptoms of 20.8 ± 10.2 months. All patients had a Quebec type 1 or 2 lesion and had no symptoms or signs indicating an objective neurologic deficit detected at physical examination or with imaging, including MRI. All patients in this study were partially or completely unable to work as a result of their symptoms. The mean duration of absenteeism due to symptoms was 15.7 ± 11.1 months. Memory or concentration difficulties were not regarded as exclusion criteria for participation.

Procedure. Before participating in the treatment program, all patients were evaluated by a multidisciplinary team. The orthopedic surgeon or neurologist conducted a full physical examination and assessed radiographs, including extension–flexion films of the cervical spine and in a number of cases reviewed computed tomographic or MRI scan results. The physical therapist assessed the cardiorespiratory fitness (VO_2 -max) by means of a submaximal protocol.²⁷ A clinical psychologist performed a psychologic assessment, including the administration of the Minnesota Multiphasic Personality Inventory (MMPI)-2. Also, a neuropsychologic screening was conducted. Finally, the work situation was evaluated by the occupational therapist, using a structured protocol to assess the physical and mental demands of each patient's work.

The results of the multidisciplinary assessment were discussed with the patient and his or her partner during a second visit. Patients who participated began the program within an average of 2 months after the assessment. At that time, all patients were required not to be using analgesics. In some cases, the use of analgesics was reduced by using a gradual, time-

contingent protocol. It was explained that the intervention was not directly intended to decrease pain but to increase normal daily activities, the goal being a normal daily pattern of activities, including return to work. “Normal” was defined as the patients' preaccident level of functioning, an explicit part being normal functioning at work.

The assessment data were used as preprogram (baseline) data. Program outcome was assessed at the last day of the program and at follow-up, approximately 6 months after the end of the program.

Program Overview. The program is a daily, 4-week, outpatient multimodal treatment program designed to restore a normal pattern of daily functioning, including complete return to work. Decreasing pain symptoms is not a direct goal of the program. The program is based on the principles of Fordyce⁹ and Mayer and Gatchel.²¹ The physical training according to operant learning principles (“graded activity”) is intended to abolish inappropriate pain behavior and to restore muscle strength and endurance as well as aerobic fitness. Pain behavior such as wearing a soft neck collar was also discussed by the treatment team and was reduced by the previously mentioned time-contingent protocol. Also, sport activities such as swimming and squash were part of the program. During the group sessions, patients' deeply rooted beliefs regarding symptoms and disability were discussed. The occupational therapist assisted the patient in the process of returning to work.

Program Outcome Measures. Outcome measures included both self-report measures and objective criteria. The self-report measures covered a wide range of symptoms often reported by patients with chronic symptoms after a whiplash injury. They included neck pain and headache, disability, fatigue and “vague” somatic symptoms, psychologic distress, depression, and difficulty with memory and concentration. Objective criteria focused on aspects of daily functioning, that have been described as relevant in chronic illness, such as actual return to work, medical consumption, and drug usage.

The MMPI-2 and the Quebec Back Pain Disability Scale (QBPDS; described later) were administered before entering the program, immediately after the program, and at 6-month follow-up. The visual analog scale (VAS) and pain drawing (described in the next section) were administered twice, before entering the program and at 6-month follow-up. These measures were not administered at program termination, because it would have been contradictory to the explanation to the patient that pain reduction was not the direct goal of the program.

Self-report Measures. *Pain Intensity.* The VAS assesses the intensity of the pain experienced by the patient on a 10-cm line. The VAS score can vary from 0 (no pain) to 100 (the worst pain ever experienced). The patient was asked to estimate the average amount of pain for the past week, including the current day.

Painful Sites. The pain drawing²⁰ assesses pain distress and is scored according to the “pain sites” method described by Parker et al,²⁵ who found this method to be the method of choice for scoring pain behavior. The score for the pain drawing can vary from 0 to 45 assigned body parts.

Self-Reported Disability. At the time of this study, there was no Dutch translation and reliable version of the Neck Disability

Index³⁶ available. Besides this index, there are currently no other neck-specific disability inventories circulating. Therefore, it was decided to include the Dutch-translated and validated version³⁰ of the Quebec Back Pain Disability Scale (QBPDS),¹⁷ although it was realized that this questionnaire is not tailored to neck disability. The items of the QBPDS do not refer to specific back-related questions, rather to common physical activities, and therefore the questions were suitable for the purpose of this study. The QBPDS was constructed using a conceptual approach to disability assessment and empirical methods of item development, analysis, and selection. Test-retest reliability of the Dutch version of the QBPDS is 0.90; Cronbach's α is 0.95.³⁰

Minnesota Multiphasic Personality Inventory-2. The Dutch translation⁷ of the MMPI-2⁴ was used for the assessment of the somatic symptoms, psychological distress, depression, fatigue symptoms, and memory and concentration problems. The first three clinical scales (the so-called "neurotic scales") are generally elevated among people with chronic pain. These scales present a broad reflection of distress and contain more than 40 items indicating somatic symptoms. Although the complete MMPI-2 was administered, a selection of scales was made reflecting the disturbances prevalent in this population. It is important to note that the MMPI-2 scale names are used by convention and do not necessarily reflect the scale's contents. The MMPI-2 scales assess the items specified between brackets. The selected scales were Hypochondriasis (Hs, 32 items: somatic complaints); Depression (D, 57 items: psychological distress, depression); Lassitude-Malaise (Hy3, 15 items: high loading on fatigue complaints); Mental Dullness (D4, 15 items: high loading on memory and concentration difficulties); and Lack of Ego Mastery, cognitive (Sc3, 10 items: high loading on memory and concentration difficulties). Scales D4 and Sc3 were selected because these scales load high on memory and concentration deficits as reported by patients with closed head injuries.¹² Test-retest reliability of the selected MMPI-2 scales ranges from 0.64 to 0.88 ($M = 0.76$). Internal consistency of the selected MMPI-2 scales ranges from 0.60 to 0.80 ($M = 0.68$).^{7,13}

Objective Outcome Criteria. At the 6-month follow-up, it was documented whether the patient had achieved the goals of normal daily functioning: complete return to work, not even a single use of analgesics during the past 6 months to reduce the pain symptoms, and no medical or paramedical treatment for symptoms of whiplash-associated disorder. It may appear rather strict to regard the result a failure when, for example, a patient had taken a pain killer only once during the follow-up phase. However, this action was considered to be an indication of unchanged behavior. This means that the patient has not acquired new cognitions about his neck pain and performs activities still contingent on pain symptoms.

Statistical Analysis. The statistical significance of changes on the metric measures between the program's beginning and end and the beginning and follow-up was determined using paired t tests. However, a change in statistical terms does not necessarily indicate that this change is also clinically meaningful—that is, of clinical significance. A treatment that resulted in clinically significant improvement was characterized by notable improvement in a patient. Statistical significance, on the other hand, was defined as quantitative change in a group of

patients.³² Jacobson and Truax¹⁵ developed a model to assess the clinical significance of individual improvement (the interested reader should refer to Jacobson and Truax¹⁵ for the specific computational equations). Two questions are of interest according to this method: 1) Are the individual changes on the outcome measures due to the test-retest (un)reliability? This answers the question of whether the changes were reliable (RC). 2) Have the patients with a significant improvement "moved" from the dysfunctional (ill) population into the healthy population? Clinically significant change is defined as both end-state functioning within the healthy distribution (normal population) and reliable change. Reliable change is defined as 95% confidence in patient improvement, given the intrasubject variability and measurement error associated with the dependent measure. Reliable change indexes higher than 1.65 are regarded as reliable.¹⁵

In this study, for each (metric) measure, the frequency of subjects was documented with RCs more than 1.65. A cutoff score of $T = 65$ (recommended by the MMPI-2 test publisher) was used to determine whether a patient's end-state functioning on the MMPI-2 scales fell within the normal population. However, healthy normative data are not available for the QBPDS, VAS, and pain drawing, and end-state functioning on these measures therefore was defined as postprogram and follow-up scores that fell two standard deviations from the mean of the dysfunctional population in the direction of normal functioning, as recommended by Jacobson and Truax.¹⁵

■ Results

Participants Versus Nonparticipants and Withdrawals

The sample of patients who participated in the program ($n = 26$) was compared with initially assessed patients who did not ($n = 25$). According to results of analysis of variance (ANOVA), no differences emerged between the participants and nonparticipants regarding age, duration of symptoms, and duration of work absenteeism due to symptoms. A multivariate analysis of variance (MANOVA) was performed to examine baseline differences (assessment data) regarding the clinical variables. On the multivariate test and the univariate tests, there were no group differences ($P > 0.05$) observed. Thus, the sample of patients in this study seems to be representative of the total population of patients with whiplash who used the services at one of the authors' centers, at least in terms of the considered clinical variables, although it cannot be excluded that they are selective as a result of medicolegal status, funding, beliefs, and geographic location.

All patients who enrolled in the program, completed the program, and attended the follow-up sessions. Therefore, an analysis of withdrawals was not necessary.

Results Before and After the Program and at Follow-Up

In Table 1, patients' preprogram, immediately postprogram, and follow-up scores on the self-reported measures are presented. As outlined before, postprogram scores for VAS and pain drawing were not assessed for clinical reasons.

Table 1. Means and Standard Deviations of Outcome Variables at Preprogram, Postprogram, and 6-Month Follow-Up [Total Sample (N = 26)]

Variable (scale)	Preprogram		Postprogram		Follow-up		Preprogram – Follow-up (†)
	Mean	SD	Mean	SD	Mean	SD	
Pain intensity (VAS*)	46.5	17.5	—	—	28.0	30.6	3.1‡
Painful sites (pain drawing*†)	8.4	5.4	—	—	5.4	7.0	3.4‡
Disability (QBPDS)	34.5	13.8	17.0	8.1	18.5	16.3	4.8§
Somatic complaints (MMPI2 Hs)	72.6	11.2	58.6	9.6	60.4	11.7	4.3§
Depression (MMPI2 D)	63.5	9.9	49.0	10.2	51.0	10.5	5.7§
Lassitude (MMPI2 Hy3)	66.3	10.3	51.6	10.7	54.5	12.9	4.8§
Mental dullness (MMPI2 D4)	60.5	10.0	48.4	8.9	48.2	9.5	4.5§
Cognitive complaints (MMPI2 Sc3)	63.7	12.0	51.1	10.4	52.4	10.5	4.0‡

* The VAS and pain drawing were not assessed at postprogram because this would have been conflicting for the patients since they were told that the goal of treatment was not the reduction of pain.

† In the statistical analysis, the sum of the number of painful sites (0–45) was converted to logit scores. According Rudy et al,²⁹ this procedure corrects for the nonlinearities that can exist in simple summated scales.

‡ $P < 0.01$.

§ $P < 0.001$.

VAS = Visual Analogue Scale; QBPDS = Quebec Back Pain Disability Scale (with adapted instruction); MMPI2 = Minnesota Multiphasic Personality Inventory-2.

The preprogram data showed that this sample of patients was very disturbed by pain, symptoms, and distress. The relatively high scores on the MMPI-2 subscales D4 and Sc3 indicate that they had problems with memory and concentration. Visual inspection of the mean preprogram results compared with the mean postprogram and mean follow-up results showed a dramatic decrease of disturbances before and after the program, with a slight relapse after the program and at follow-up on some measures. Paired t tests (preprogram score minus follow-up score) with α set at 0.006 (0.05/8) for eight concurrent tests, indicated significant changes on all measures.

Clinically Significant Change

As indicated, the improvements during the program on the self-report measures were statistically highly significant. However, the question of whether these gains were clinically significant has yet to be answered.

As can be seen in Table 2, postprogram and follow-up scores of most patients (<90%) on the MMPI-2 scales fell within the healthy distribution. A slight relapse (from 92% to 81%) emerged for Hy3 (fatigue symptoms), indicating that some patients had more fatigue symptoms in the phase between program termination and follow-up. After the program and at follow-up, approximately 50% of patients fell within the healthy distribution regarding pain intensity and number of painful sites. Thus, their level of pain was minimally different from the pain experienced by healthy people. A further improvement regarding the decrease of disability (QBPDS) emerged between the end of the program and follow-up: from 27% of patients deemed “healthy” after the program to 38% deemed healthy at follow-up. This difference is most likely because the patients were more active at home, resulting in lower rates of self-reported disability. The overall clinically significant change was between 30% and 50%. The relatively low clinically significant change of QBPDS, in spite of its high accompanying RC,

indicates that many patients improved substantially regarding disability. However, approximately 60% of them are still dysfunctional.

Objective Outcome Criteria

Outcome in terms of “normal” functioning regarding work and health-care regulation is presented in Table 3. Considering the high levels of pain and distress before the program and the persistence of the symptoms since accident ($M = 20.8$ months), a complete return-to-work rate of 65% combined with partial return-to-work rate

Table 2. Frequency (and %) of Patients Within the Healthy Distribution at Postprogram and at Follow-Up, Reliable Change, and Clinical Significance* [Total Sample (N = 26)]

Variable (scale)	Within Normal Population†	RC > 1.96	Clinical Significance
Postprogram			
Disability (QBPDS)	7 (27)	16 (62)	7 (27)
Somatic complaints (MMPI2 Hs)	20 (77)	15 (58)	14 (54)
Depression (MMPI2 D)	25 (96)	15 (58)	15 (58)
Lassitude (MMPI2 Hy3)	24 (92)	9 (35)	9 (35)
Mental dullness (MMPI2 D4)	15 (58)	15 (58)	15 (58)
Cognitive complaints (MMPI2 Sc3)	24 (92)	9 (35)	9 (35)
Follow-up			
Pain intensity (VAS)	12 (46)	14 (54)	11 (42)
Painful sites (pain drawing‡)	13 (50)	15 (58)	14 (54)
Disability (QBPDS)	10 (38)	16 (62)	10 (38)
Somatic complaints (MMPI2 Hs)	19 (73)	12 (46)	10 (38)
Depression (MMPI2 D)	25 (96)	12 (46)	12 (46)
Lassitude (MMPI2 Hy3)	21 (81)	10 (38)	10 (38)
Mental dullness (MMPI2 D4)	25 (96)	14 (54)	14 (54)
Cognitive complaints (MMPI2 Sc3)	22 (85)	9 (35)	9 (35)

* Endstate within healthy distribution and reliable change.

† Cut-off scores for healthy distribution: for MMPI-2 scales <65T; QBPDS score <7; VAS score <10; pain drawing score <2.

‡ In the statistical analysis, the sum of the number of painful sites (0–45) was converted to logit scores. According Rudy et al,²⁹ this procedure corrects for the nonlinearities that can exist in simple summated scales.

RC = reliable change; MMPI2 = Minnesota Multiphasic Personality Inventory-2; VAS = Visual Analogue Scale; QBPDS = Quebec Back Pain Disability Scale (with adapted instruction).

Table 3. Frequency (and %) of Patients Who Achieved the Objective Outcome Criteria at 6-Month Follow-Up [Total Sample (N = 26)]

Outcome Criterion	Success
Return to work (100%)	17 (65)
Return to work (at least 50%)	24 (92)
No use of drugs	15 (58)
No medical consumption	21 (81)

of 92% is very promising. During the follow-up phase, 81% of patients did not seek any medical care for symptom relief, such as conventional physical or chiropractic therapy. The lowest percentage of normal functioning was found in the area of analgesics usage; 42% of patients still used analgesics during the follow-up period.

■ Discussion

The results of this study indicate that a multimodal treatment program has the potential to be an effective treatment for patients with persisting symptoms after a whiplash injury of the neck and therefore deserves further study in more powerful designs, such as a randomized controlled design. This is also the first attempt to document the outcome results of this treatment for patients with chronic symptoms after a whiplash injury. Furthermore, multidisciplinary treatment programs have emerged as more effective than unimodal treatments for patients with chronic pain, in particular chronic low back pain and headache,⁸ and the results of this study indicate that this may also be applicable for patients with chronic symptoms after a whiplash injury.

Substantial improvements were observed that were statistically and clinically significant regarding somatic symptoms and psychological distress. At follow-up, 73% of patients fell within normal limits regarding somatic symptoms, and 96% of patients regarding psychologic distress. Moreover, although the goal of the program was not pain relief and patients actually performed many activities as part of the program that could have increased their pain, at follow-up, the pain intensity score showed a reliable improvement of 54%, and even 46% of patients fell within the healthy distribution (thus, they were nearly pain free) of this measure. Although it could be inferred from these figures that still more than 50% of patients with whiplash in this study did not improve substantially, it should be realized that the operational approach of clinically significant change for determining improvement is much stricter than a standard parametric test. In one study,³² clinically significant change was assessed in the behavioral treatment of chronic low back pain, and the reported clinically significant changes varied between 6% and 24%. In fact, a clinically significant change refers to normal functioning after treatment *and* an improvement that is of such considerable size that it must be attributed to the treatment. The clinically significant and therefore meaningful

changes shown in the current study may therefore be attributed to the treatment interventions, because such improvements would not be expected to occur spontaneously in patients with such conditions, although some influence of a "regression to the mean" may be present.

In line with the current view of outcome assessment, objective criteria indicating daily functioning and activity patterns were assessed. Considering that almost all patients had received a wide range of unimodal treatments over a long period and had also long been absent from work, the objectively assessed complete return to work of 65%, and complete or partial return to work of 92% are promising.

Cognitive symptoms, in particular symptoms related to memory and concentration, have a disabling effect on some patients with persisting symptoms after a whiplash injury. The symptoms prevent them in particular from meeting the demands of their work. Although patients often attribute these problems to a physical lesion as the direct consequence of the accident, some prospective studies on this subject indicate that such cognitive symptoms relate either to the trauma-induced symptoms, such as pain, or to the psychological symptoms resulting from the reaction of the patient to the symptoms.²⁸ In the program, no specific neuropsychological rehabilitation training was offered. The observed decrease of reported cognitive symptoms, therefore, offers indirect support for the theory of Radanov and Dvorak,²⁸ which views cognitive difficulties in the context of "chronic illness" and not as an organic abnormality. Also Taylor et al³⁴ could not support the theory of neural degeneration in the cause of whiplash-related cognitive symptoms, nor was the specificity of neuropsychological tests in detecting subtle effects of brain trauma demonstrated.

Two limitations of this study have to be acknowledged. First, the design did not include a randomized control group, the study design of choice. The use of a control group after the natural course of illness or placebo use is, however, difficult to realize with cognitive behavioral treatment programs. Only a few studies have been published using waiting-list or placebo control groups.³⁵ The design used in this study may be considered valid because the patients reported very long histories of pain and, therefore, it is not likely that the short period of treatment (4 weeks) would be sufficient in the sense of the natural history to account for the observed results.¹⁰ To illustrate, epidemiologic studies demonstrate that those patients who still have symptoms 3 to 6 months after the injury, in more than 80% of cases, continue to experience symptoms after 2 years.^{1,5} Therefore, if a waiting-list control group had been included, most likely no major change of symptoms and daily functioning would have been observed within the 4-week (treatment) or 6-month (follow-up) period. Again, the research presented here can be thought of as repeated case studies, and it does not provide the level of evidence to accept the applied treatment as a scientifically proven and effective approach to patients with chronic whip-

lash. To establish support in favor of the effectiveness of the cognitive behavioral approach to chronic whiplash, a randomized clinical trial comparing this approach with regular medical care (e.g., physical therapy) is needed. Such research would be of outstanding quality if both statistical and clinical significance of treatments were assessed.

The second limitation of this study concerns the multimodal treatment approach of the program. In fact, this issue applies to multidisciplinary pain treatment programs in general. Because the program consisted of a number of elements or cointerventions, it is difficult to isolate the most powerful, or keystone, element responsible for the improvements. For example, what would have been the outcome if the psychological group sessions had been skipped, while the physical exercises was retained? In one study, patients with neck pain without a past injury received a graded-activity training program for the neck muscles. Results indicated substantial pain relief, and 80% of patients returned to work within 8 weeks after the program.¹⁴ Again, such questions addressing the efficacy of treatment could only be answered by a randomized clinical trial design.

As has been established for chronic low back pain, cognitive behavioral treatment appears to be a promising treatment for patients with chronic symptoms after a whiplash injury. However, considering that more than 50% of patients did not show a clinically significant change and 35% of patients did not achieve a complete return to work, it is clear that there is still a great deal of work to be done. The question is, why did some patients not improve? Based upon the authors' clinical experience and supported by clinical analyses of the failures of the program, it appeared that the patients who achieved complete return to work can be distinguished from those who did not. Those with failed treatment reported high levels of pain at follow-up and showed a relapse of fatigue symptoms. It is hard to draw firm conclusions at this point, because of the small number of subjects as well as the design constraints and measures used. The authors speculate that deep-rooted beliefs such as "first, I have to be painfree before I can become active" may prevent the patient from escaping the vicious circle. Kellner et al¹⁶ showed that somatic attributions and fears are important predictors of the persistent nature of somatic symptoms. And finally, considering that the results in this group of patients reflect also the learning curve of the treatment team, even better results may be expected in the future.

■ Conclusion

The results of this study indicate that a cognitive behavioral approach has the potential to be an effective treatment for patients with chronic symptoms after a whiplash injury of the neck. Further research performed in randomized clinical trials is needed to support and extend the findings. The improvements observed in this study may provide indirect evidence that behavioral

mechanisms contribute to the maintenance of symptoms beyond healing time of whiplash injury.

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