ORIGINAL ARTICLE

Psychosocial Subgroups in Persons With Spinal Cord Injuries and Chronic Pain

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ABSTRACT. Widerström-Noga EG, Felix ER, Cruz-Almeida Y, Turk DC. Psychosocial subgroups in persons with spinal cord injuries and chronic pain. Arch Phys Med Rehabil 2007;88:1628-35.

Objectives: To define adaptational subgroups in people with chronic pain and spinal cord injury (SCI), and to compare these subgroups with respect to demographic factors, level of injury, functional independence, pain disability, depressed mood, social support, and life satisfaction.

Design: Interviews.

Setting: Veterans Affairs medical center and The Miami Project to Cure Paralysis.

Participants: Persons with SCI and chronic pain (N=190).

Interventions: Not applicable.

Main Outcome Measure: The Multidimensional Pain Inventory, SCI version.

Results: Cluster analysis revealed 3 subgroups: (1) dysfunctional (34.6% of all participants), characterized by higher pain severity, life interference, and affective distress scores, and lower levels of life control and activities scores; (2) interpersonally supported (33.0% of participants), characterized by moderately high pain severity, and higher life control, support from significant others, distracting responses, solicitous responses, and activities scores; and (3) adaptive copers (32.4% of participants), characterized by lower pain severity, life interference, affective distress, support from significant others, distracting responses, solicitous responses, activities and higher life control scores. Compared with the dysfunctional subgroup, the interpersonally supported subgroup reported significantly greater social support and life satisfaction and less pain disability and emotional distress, despite moderately high pain severity.

Conclusion: Three subgroups, independent of sex, pain duration, and functional status, were identified. Although severe pain significantly decreases life satisfaction after SCI, its impact is moderated by perceived social support.

Key Words: Pain; Pain measurement; Psychometrics; Rehabilitation; Social support; Spinal cord injuries.

PERSISTENT PAIN IS A significant problem for large numbers of people with spinal cord injuries (SCI).[1-3] Only a small percentage (5.8%) of the chronic pains and distressing sensory abnormalities that develop after SCI spontaneously disappear or are completely resolved as a result of treatment.[4]

When pain persists, people have no alternative but to find ways to adapt. For those with SCI, persistent pain is superimposed on the limitations caused by their injury. Clinical experience reveals wide variations in how and how well people with SCI adjust and accommodate to their symptoms and functional limitations. Although several studies have identified and characterized patterns of adjustment to SCI[5-7] and to chronic pain in general, much less is known about specific adjustment to pain associated with SCI.

One strategy with which to identify patterns of adaptation to chronic pain includes cluster analysis, a statistical method in which the within-group variability is minimized (ie, people within a cluster share as many characteristics as possible) and between-group variability is maximized (ie, people of different clusters share as few characteristics as possible). The Multidimensional Pain Inventory (MPI)[8] has been used for this particular purpose. The MPI is a 60-item self-report inventory consisting of 12 empirically derived scales. It assesses pain severity, perceived interference of pain in life activities (life interference), affective distress, perceived control over life, support from significant others, responses by significant others (negative responses, distracting responses, solicitous responses), and the performance of a set of common, general activities.

Cluster analyses of responses on the MPI scales have identified 3 unique patterns of adaptation to chronic pain in groups with diverse diagnoses.[9] These 3 clusters, or subgroups, are characterized by: (1) high levels of pain, affective distress, perceived interference, and low levels of perceived control and activity (dysfunctional); (2) lower levels of pain, affective distress, life interference, and higher sense of control and activity (adaptive copers); and (3) high levels of pain and low levels of social, instrumental, and emotional support (interpersonally distressed). These particular subgroups have been confirmed across several chronic pain diagnostic groups including, among others, headache,[10,11] back pain,[12,13] orofacial pain,[12,14] whiplash injuries,[15] fibromyalgia syndrome,[16] and cancer.[17]

A previous cluster analysis of MPI scores of 120 subjects with SCI[18] yielded 2 patterns of adaptation to pain in SCI. These were similar to 2 of the subgroups that were identified in the other chronic pain samples described above. Specifically, 1 cluster that was characterized by high pain severity, affective distress, life interference, and low life control was analogous to the previously identified cluster labeled the dysfunctional subgroup. The second cluster was characterized by low pain severity, affective distress, life interference, and high levels of life control and general activities, comparable to the adaptive copers cluster identified in previous studies (with the exception that the scores were somewhat lower on support from significant others, solicitous responses, and negative responses, and

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higher on distracting responses than scores reported with other diagnostic groups). In this preliminary study, however, we found no group comparable to the interpersonally distressed subgroup. We[18] have previously shown that the overall perceived interpersonal pain-related support was lower in persons with SCI compared with diverse chronic pain samples but was comparable to populations with specific underlying diseases, namely, postpoliomyelitis syndrome and cancer.

Our primary objective in this study was to confirm the subgroups based on the MPI, SCI version (MPI-SCI) identified in the previous study.[18] An additional objective was to expand our understanding of the subgroup characteristics of people with pain and SCIs. We had a particular interest in clarifying the role of perceived social support from significant others because of the previously observed differences between heterogeneous chronic pain populations and those with SCI-related pain.[18] Thus, our intent in this study was to expand on the previous findings by defining adaptational subgroups in a larger sample of subjects with chronic pain and SCI; and to compare these subgroups with respect to demographic factors, level of injury, functional independence, pain disability, depressed mood, life satisfaction, and social support.

METHODS

The institutional review boards of the Miami Veterans Administration Medical Center (VAMC) and the University of Miami approved the study. People (N=190) aged 18 years or older with traumatic SCI who had experienced chronic pain for more than 6 months were recruited from Miami-Dade, Broward, and Palm Beach counties in Florida to participate in the study. Recruitment was by advertisements posted throughout the Miami VAMC and the University of Miami/Jackson Memorial Hospitals and Clinics, including the Miami Project to Cure Paralysis, and by word of mouth.

Each subject participated in a 2- to 3-hour session in which they completed structured interviews, including the MPI-SCI[19] and an additional set of questionnaires, and underwent a physical examination so that we could determine the level of their spinal injury (described below).

Demographic Factors

As part of the interview, participants provided demographic information (ie, sex, age, time since injury, neurologic level of injury, pain duration).

Measures

The MPI-SCI. The MPI is based on a cognitive-behavioral perspective and was designed to assess the impact of chronic pain, responses by significant others to that pain, and emotional and physical adaptation to chronic pain.[8] The answers are given on a numeric rating scale ranging from 0 to 6. The MPI's psychometric properties (ie, internal consistency, stability, validity) are excellent and the factor structure has been confirmed in several studies.[20-22] Furthermore, the MPI has predicted levels of disability[15] and is responsive to changes resulting from treatment.[16,23] Based on exploratory and confirmatory factor analyses, Widerström-Noga et al[24] determined that the original version of the MPI required modification in order to be useful with the SCI chronic pain population. To improve the factor structure of the MPI-SCI, we deleted 3 questions from the life interference subscale and 1 from the life control subscale, and 2 questions regarding perceived responses by significant others. The MPI's general activities scale was supplemented with a question about the degree to which activity levels were decreased specifically because of pain, as distinct from restrictions of activity because of other aspects of the SCI.

The MPI-SCI's psychometric properties were recently established in the chronic pain SCI population.[24] Results of that study indicated that the MPI-SCI was appropriate for use with the SCI population.

American Spinal Injury Association examination. A physician with extensive experience in SCI conducted American Spinal Injury Association (ASIA) examinations to assess neurologic status and to grade the severity of the SCI. The grading, based on the ASIA Impairment Scale, was from ASIA grade A (no motor or sensory function in the sacral segments S4-5) through ASIA grade E (motor and sensory function are normal).[25] If the physician described more than 1 level of injury, we used the highest level in our analyses. The level of injury was divided into 2 categories: cervical and below cervical (ie, tetraplegia and paraplegia).

FIM instrument. The FIM instrument[26] is a well-established method of evaluating disability. In this study, we administered it according to the Guide for the Uniform Data Set for Medical Rehabilitation.[27] The motor component subscale includes 13 questions about mobility and self-care. The internal consistency has been reported to range between .88 and .97.[28]

Pain Disability Index. The Pain Disability Index (PDI)[29] is a self-report measure of the extent of pain interference with functioning in 7 areas: family/home responsibilities, social activity, occupation, sexual behavior, self-care, and life support activity. The responses are given on an 11-point Likert scale from 0 (no disability) to 10 (total disability). The PDI is valid and reliable,[30] with an internal consistency of .86. In a sample of people with chronic pain and SCI, its internal consistency was .88.[24]

Beck Depression Inventory. The Beck Depression Inventory (BDI)[31] is a 21-item multiple-choice instrument designed to assess the presence and degree of depressed mood. Each response category for the 21 questions is assigned a number from 0 to 4, with higher scores indicating a greater degree of emotional distress. The internal consistency coefficient has ranged between .73 and .92[32] in depressed population samples, and was .88 in a group of people with chronic pain and SCI.[24]

Interpersonal Support Evaluation List. The Interpersonal Support Evaluation List (ISEL)[33] consists of 4 subscales of 10 questions each. The subscales assess the perceived availability of different types of social support: (1) appraisal (someone to talk to about one's problems); (2) belonging (people one can do things with); (3) self-esteem (a positive comparison when comparing oneself to others); and (4) tangible (material aid). We used only the appraisal subscale in this study because we were interested in perceptions of more interpersonal-intimate communication support from others. This subscale includes items such as "When I need suggestions on how to deal with a personal problem, I know someone I can turn to" and "I feel that there is no one I can share my most private worries and fears with." This subscale showed satisfactory internal consistency (Cronbach α=.82) in a sample of SCI subjects with chronic pain.[24]

Satisfaction With Life Scale. The Satisfaction With Life Scale (SWLS)[34] is a measure designed to assess global satisfaction with life that allows people to indicate how satisfied they are with their lives based on their own values. It consists of 5 questions measured on a 7-point Likert scale, ranging from "completely agree" to "completely disagree."

Statistical Analysis

Because a purpose of the cluster analysis was to determine the number of clusters inherent in the MPI-SCI dataset, we used a 2-step cluster procedure in which cases are initially

Table 1: Comparisons Among the Average MPI-SCI Subscale Scores for the 3 Clusters

MPI-SCI Subscales	Dysfunctional (34.6%)	Interpersonally Supported (33.0%)	Adaptive Copers (32.4%)	One-Way ANOVA F and *P* Values	Dysfunctional – Interpersonally Supported	Dysfunctional – Adaptive Copers	Interpersonally Supported – Adaptive Copers
Pain severity	4.6±1.2	3.8±1.4	2.9±1.3	25.2, <.000	0.2 to 1.3, <.01	1.1 to 2.2, <.000	0.3 to 1.4, <.001
Life interference	3.6±1.5	2.3±1.4	1.1±1.0	55.6, <.000	0.8 to 1.9, <.000	1.9 to 3.1, <.000	0.6 to 1.8, <.000
Life control	3.1±1.6	4.6±1.1	4.2±1.1	25.5, <.000	−2.1 to −1.0, <.000	−1.7 to −0.6, <.000	−0.1 to 1.1, NS
Affective distress	3.4±1.2	2.1±1.3	1.5±1.0	41.8, <.000	0.8 to 1.8, <.000	1.4 to 2.4, <.000	0.1 to 1.1, <.05
Support from significant others	4.0±1.8	5.1±1.1	3.2±1.7	20.7, <.000	−1.7 to −0.4, <.001	0.8 to 1.4, <.05	1.1 to 2.5,
Distracting responses	3.3±1.6	4.7±1.2	1.7±1.0	81.2, <.000	−1.9 to −0.8, <.000	1.1 to 2.2, <.000	2.4 to 3.6, <.000
Negative responses	2.3±1.4	1.2±1.4	0.6±1.0	20.6, <.000	0.4 to 1.8, <.000	1.1 to 2.4, <.000	0.0 to 1.3, NS
Solicitous responses	2.8±1.3	3.8±1.2	1.8±1.2	42.5, <.000	−1.6 to −0.5, <.000	0.4 to 1.5, <.000	1.5 to 2.5, <.000
General activities	1.7±0.9	2.6±0.9	1.7±0.8	20.0, <.000	−1.2 to −0.5, <.000	−0.4 to 0.4, NS	0.5 to 1.2, <.000

NOTE. Values are mean ± standard deviation (SD), F value and *P* value, or 95% confidence interval (CI) and *P* value. F and *P* values from the ANOVA and post hoc Bonferroni adjustments. Figures in parentheses are percentages of subjects in each cluster.
Abbreviation: NS, not significant.

assigned to preclusters based on preset algorithms using a sequential clustering approach. It scans the records one by one and decides whether the current record should merge with the previously formed clusters, or start a new cluster based on the distance criterion. In the second step, these preclusters are grouped using the hierarchical clustering procedure.[35] We determined the number of clusters by using the automatic SPSS[35,a] for Windows default criterion (Akaike information criterion).[36] Once the number of clusters was defined, we compared the characteristics of the MPI-SCI scores to determine the appropriateness of the clusters. After this step, the clusters were statistically compared with regard to psychosocial impact, physical function, severity of injury, and demographic factors, using 1-way analyses of variance (ANOVAs) with post hoc adjustments. We used the nonparametric Kruskal-Wallis and Mann-Whitney *U* tests to determine statistically significant differences between the clusters; these tests are appropriate for use with dichotomous variables (ie, sex, level of injury).

RESULTS

Demographic Factors

The 190 participants included 161 men (84.7%) and 29 women (15.3%). Their average age at the time of the study was 41.7±13.4 years, the time since injury was 9.4±9.6 years, and the pain duration was 8.2±7.7 years. Eighty-nine subjects (46.8%) had cervical injuries and 99 (52.1%) had below cervical injuries. The level of injury in 2 participants was undetermined.

Cluster Analysis

The SPSS 2-step cluster analysis of the MPI-SCI subscales resulted in 3 approximately equally sized but distinctly different clusters. ANOVA confirmed that the 3 subgroups differed significantly from one another on all 9 MPI-SCI subscales. Table 1 shows the scores and statistical data for each of the 3 cluster profiles.

The first cluster was similar to the dysfunctional cluster commonly observed in heterogeneous pain populations, as well as in our previous study with SCI patients.[18] Subjects comprising this cluster had higher levels of pain severity, life interference, and affective distress, moderate levels of support from significant others, negative responses, distracting responses, solicitous responses, and lower levels of life control and general activities. The percentage of subjects (34.6%) belonging to this subgroup was smaller in this study compared with the 42.5% in the previous study in which only 2 clusters were obtained (ie, dysfunctional subgroup, adaptive copers subgroup).

The second cluster (33.0% of the subjects) was characterized by moderately high pain severity, although it was significantly lower than what was observed in the dysfunctional cluster. This cluster was labeled "interpersonally supported" because the scores on the pain-related support scales (ie, support from significant others, distracting responses, and solicitous responses) were significantly higher than for either of the other 2 clusters identified. High levels of life control and general activities also characterized this cluster. In contrast, the levels of life interference, affective distress, and negative responses were moderate. The third cluster (32.4% of the subjects) resembled the previously observed adaptive copers subgroup (ie, lower levels of pain severity compared with the dysfunctional subgroup and interpersonally supported subgroup, higher levels of life control but lower scores on all other scales).

Comparisons Among Clusters

Table 2 shows the comparisons among the 3 derived clusters on age, pain duration, years postinjury, functional independence, pain disability, depressed mood, social support, and life satisfaction They are described below.

Table 2: Comparison of the Study's Measures Among the 3 Clusters, the Average Years Post SCI, Age, and Years With Pain

Factors	Dysfunctional	Interpersonally Supported	Adaptive Copers	One-Way ANOVA F and *P* Values	Dysfunctional – Interpersonally Supported	Dysfunctional – Adaptive Copers	Interpersonally Supported – Adaptive Copers
Age	43.8±12.1	42.9±14.0	37.8±13.6	3.8, <.05	−57.4 to 78.8, NS	4.2 to 140.9, <.05	−7.3 to 131.0, NS
Years post SCI	7.2±7.1	8.3±8.0	13.3±12.7	4.5, <.05	−5.9 to 3.8, NS	−11.2 to −0.9, <.05	−10.1 to 0.1, NS
PDI	32.4±17.2	19.3±13.9	11.6±10.3	35.2, <.000	7.1 to 19.2, <.000	14.7 to 26.9, <.000	1.5 to 13.8, <.01
BDI	15.1±8.9	9.7±8.5	5.6±4.7	25.6, <.000	2.2 to 8.8, <.000	6.4 to 12.9, <.000	0.9 to 7.5, <.01
ISEL	20.0±5.9	24.5±5.2	23.3±6.3	10.1, <.000	−7.0 to −2.0, <.000	−5.9 to 0.8, <.01	−1.4 to 3.7, NS
SWLS	13.8±6.6	20.9±7.8	21.0±7.5	20.4, <.000	−10.2 to −4.0, <.000	4.0 to 10.2, <.000	−3.3 to 3.1, NS
Years with pain	8.0±7.6	7.3±7.4	9.2±8.4	0.9, NS	−2.8 to 4.1, NS	−4.6 to 2.2, NS	−5.4 to 1.6, NS
FIM	61.5±23.0	67.5±22.1	60.5±24.7	1.6, NS	−16.1 to 4.0, NS	−9.1 to 11.0, NS	−3.2 to 17.3, NS

NOTE. Values are mean ± SD or 95% CI and *P* value. F and *P* values from the ANOVA and post hoc Bonferroni adjustments.

Years post-SCI and age at time of study. The subjects comprising the adaptive copers cluster had been injured significantly longer (13.3±12.7y) than the dysfunctional subgroup (7.2±7.1y) cluster. They were also significantly younger (37.8±13.6y) than the dysfunctional cluster (43.8±12.1y), and were also younger, but not significantly, than the interpersonally supported cluster (42.9±14.0y).

Pain disability. The scores of the PDI were significantly different among all pairs of clusters, with the highest scores for pain disability found in the dysfunctional cluster (32.4±17.2). There were moderately low levels of pain disability in the interpersonally supported cluster (19.3±13.9). The adaptive copers cluster had the lowest levels of pain disability (11.6±10.3). These data provide support for the convergent and discriminant validity of the clusters.

Depressed mood. Although the BDI scores differed significantly among clusters—with highest scores for the dysfunctional cluster (15.1±8.9) (indicating mild to moderate depressed mood[32]), lower levels for the interpersonally supported cluster (9.7±8.5), and the lowest levels for the adaptive copers cluster (5.6±4.7)—the average scores for both the dysfunctional subgroup and interpersonally supported subgroup indicated mild to moderately depressed mood[32] (table 3). In the dysfunctional cluster, 69.2% of the subjects scored within or above the range of mildly depressed mood, compared with 37.7% of subjects in the interpersonally supported cluster and 21.3% of the subjects in the adaptive copers cluster who scored within this range.

Social support. The scores on the ISEL appraisal subscale were significantly higher in the 2 clusters with lower psychosocial impact (ie, interpersonally supported subgroup [24.5±5.2] and adaptive copers subgroup [23.3±6.37) than in the dysfunctional cluster (20.0±5.9). Interestingly, scores on this scale did not differ significantly between the interpersonally supported subgroup and adaptive copers subgroup. By comparison, however, although the levels of pain-related support (ie, the support from significant others, distracting responses, and solicitous responses subscales) on the MPI-SCI (see table 1) were greatest in the interpersonally supported subgroup, the dysfunctional subgroup actually scored significantly higher than the adaptive copers subgroup on each of these scales.

Life satisfaction. As would be expected from the characteristics of the subgroups, the scores on the SWLS were significantly lower for the dysfunctional subgroup (13.8±6.6) than for the interpersonally supported (20.9±7.8) and adaptive copers (21.0±7.5) clusters. These results, once again, confirm the construct validity of the results of the cluster analysis. It is notable that the average scores for the interpersonally supported and adaptive copers clusters were comparable and were high on life satisfaction despite the observation that the interpersonally supported subgroup experienced significantly higher levels of pain than the adaptive copers subgroup.

Duration of pain and functional independence. There were no significant differences among the clusters in pain duration or in the scores on the FIM motor subscale.

Sex and level of injury. There were no significant differences between clusters with respect to sex (table 4). However, the relative proportion of cervical injuries was significantly higher in the adaptive copers subgroup (61.7%) compared with the interpersonally supported cluster (39.3%), but did not differ significantly from the dysfunctional subgroup (42.9%). This finding may explain the low levels of general activities in the adaptive copers subgroup despite less severe pain and its impact.

Table 3: Cutoff Levels for Depression Based on BDI Scores

BDI Scores	Dysfunctional (%)	Interpersonally Supported (%)	Adaptive Copers (%)
No depression (range, 0−9)	30.8	62.3	78.7
Mild to moderate (range, 10−18)	26.6	26.2	21.3
Moderate to severe (range, 19−29)	27.7	6.6	0.0
Severe (range, 30−63)	4.6	4.9	0.0

Table 4: Comparisons of the Percentages of Male Participants and Tetraplegia for Each of the 3 Clusters

Factors	Dysfunctional (%)	Interpersonally Supported	Adaptive Copers (%)	Kruskal-Wallis	Chi-Square	Dysfunctional − Interpersonally Supported Mann-Whitney *U*, *P* Value	Dysfunctional − Adaptive Copers Mann-Whitney *U*, *P* Value	Interpersonally Supported − Adaptive Copers Mann-Whitney *U*, *P* Value
Tetraplegia	43.8	38.7	61.7	.03	7.0	1884, NS	1576, NS	1433, <.05
Male sex	80.0	83.9	90.2	.28	2.3	NS	NS	NS

NOTE. The significance levels from the Kruskal-Wallis and Mann-Whitney *U* tests and subsequent post hoc Bonferroni adjustments are shown.

DISCUSSION

Our sample of people with SCI-related chronic pain in this study was substantially larger than our sample in a previous study[18] of subgroups based on patterns of adaptation to chronic pain after SCI. In contrast to that study, cluster analysis of the MPI-SCI scores in this study revealed 3 rather than 2 subgroups. In addition to the previously identified dysfunctional and adaptive copers clusters, a third cluster (ie, interpersonally supported) was identified. A 1-way ANOVA confirmed that there were significant differences among the 3 clusters on all MPI subscales. Post hoc analyses indicated that the dysfunctional and interpersonally supported subgroups differed significantly on all MPI-SCI subscales, whereas the adaptive copers subgroup did not differ significantly from the dysfunctional subgroup on general activities, or from the interpersonally supported subgroup on the life control and negative responses scales (see table 1).

Although the adaptive copers and dysfunctional clusters derived in this study were similar to the adaptational patterns that have been observed in other populations with chronic pain,[12-17] the interpersonally supported cluster consisted of subjects who experienced relatively low psychosocial impact despite moderately high pain severity. The primary aspect that characterized the interpersonally supported cluster were the significantly higher levels of positive pain-specific social support (support from significant others, distracting responses, and solicitous responses) compared with the other clusters. Despite moderately high levels of pain severity, this subgroup scored lower than the dysfunctional cluster on life interference and affective distress and higher on life control and general activities. Thus, there are both discrepancies and similarities in the ways that people with SCI adapt to persistent pain compared with other chronic pain populations. A possible reason why adaptation patterns, including pain-specific social support in chronic pain after SCI, differ from other chronic pain populations is the impairment and disability caused by the other consequences of SCI (eg, impaired mobility, decreased bowel, bladder, sexual function).[37,38] All of these consequences of SCI are likely to influence both adaptation and the responses by significant others to persistent pain.

In this study, we measured 2 different types of social support: (1) pain-specific responses (ie, positive [support from significant others, distracting responses, solicitous responses] and negative responses) and (2) general intimate-interpersonal support (ie, ISEL appraisal subscale). Although there was positive pain-specific support in the 2 subgroups with the most severe pain (ie, dysfunctional subgroup, interpersonally supported subgroup), the highest levels were found in the interpersonally supported subgroup. In contrast, the levels of negative pain-specific responses were highest in the dysfunctional cluster. Both the dysfunctional and the interpersonally supported clusters reported higher levels of pain severity than the adaptive copers cluster, although the adaptational patterns were significantly different. In both clusters, pain-specific positive support was significantly higher than in the adaptive copers subgroup, which indicates that this type of support is only solicited or offered when pain levels are relatively high. Interestingly, the intimate-interpersonal type of support followed a different pattern, with significantly lower scores in the dysfunctional cluster compared with the interpersonally supported subgroup and adaptive copers subgroups. These results indicate that the combination of positive pain-specific support and general intimate-interpersonal support is associated with less pain-induced disability and depressed mood and greater life satisfaction in persons with SCI and chronic pain.

Interpersonal social support has a positive influence on negative life factors such as stress[39] and functional disability,[40] and is important for participation in daily life activities after SCI.[41] Possible underlying mechanisms of the positive effects of social support may include reinforcement of healthy behaviors, adherence to treatments, and more adaptive coping. Although social support may diminish depression,[42] specific pain-related interpersonal responses appear to have complex relationships with both levels of pain and treatment outcome.[43] For example, solicitous spouse behaviors and responses have repeatedly been shown to be related to increased pain severity and pain disability in diverse heterogeneous pain populations.[44-46] Paradoxically, negative responses from significant others are also related to more pain and disability.[42,46-48]

Differential effects of social support have also been indicated in the SCI population. A recent study[24] found only minimal correlations between intimate-interpersonal support and the MPI-SCI pain-specific support scales, which suggests that intimate-interpersonal support may represent a different dimension of social support than pain-specific support. Rintala et al[1] suggested that the relation between stress and affective distress was moderated by interpersonal social support (as measured with the ISEL) after SCI. They also found that lower levels of social support were related to consistency of pain. In contrast, another study[49] found that high levels of distracting and solicitous responses were associated with higher levels of depressive symptoms and with pain-induced interference after SCI. No subgroups were analyzed in that study, however.

The 3 clusters that emerged from the cluster analysis in this study also differed significantly from each other on the levels of depressed mood, pain induced disability, and satisfaction with life (see table 3). Scores on the BDI differed significantly among the 3 clusters, with the highest levels found in the dysfunctional cluster (indicating greater emotional distress), lower levels in the interpersonally supported cluster, and even lower levels in the adaptive copers cluster. Thus, the BDI was consistent with the affective distress and life interference subscales of the MPI-SCI and provided external validation for the subgroups. Although the average BDI score for the interpersonally supported subgroup was significantly lower than for the

dysfunctional subgroup, it was still within the range of mild to moderate depressed mood.[31] The majority (69.2%) of the subjects classified as the dysfunctional subgroup had elevated levels of depressed mood, compared with 37.7% for the interpersonally supported subgroup and 21.3% for the adaptive copers subgroup (see table 3).

The older ages of subjects in the dysfunctional subgroup and interpersonally supported clusters is consistent with the results of Saikkonen et al,[50] who also found higher BDI scores in persons with SCI who were injured at an older age. In their sample, nearly one third of participants reported having depressed moods. This proportion was comparable with the BDI scores reported by adaptive copers and interpersonally supported clusters in this study, but substantially lower than the dysfunctional cluster. In the study by Saikkonen,[50] however, only 37% of their sample experienced chronic pain whereas all subjects in our study had chronic pain. The data also suggest that being injured when younger is predictive of less severe pain and lower levels of psychosocial impact. Surprisingly, duration of pain was not significantly different among clusters, which indicates that coping patterns are relatively independent of how long pain has been present and may be more related to age at injury than duration of pain.

The scores on the PDI differed significantly among the 3 clusters, with the highest levels in the dysfunctional cluster indicating greater pain-induced disability, compared with the interpersonally supported cluster, and even lower levels for the adaptive copers cluster. Similar to the BDI, the PDI scores were congruent with the affective distress and life interference subscales of the MPI-SCI and thus provided further external validation for the subgroups.

In a sample of persons with low back pain, Tait and Chibnall[51] reported average PDI scores that were comparable to the dysfunctional cluster in this study, but much greater (more pain-induced disability) than both the interpersonally supported and adaptive copers clusters. This is similar to previous observations in that people with SCI-related chronic pain scored significantly lower on the MPI-SCI life interference subscale[18] compared with heterogeneous chronic pain[13] and chronic headache,[11] but similar to postpolio syndrome.[52] The scores of the FIM motor subscale did not differ significantly between clusters, which suggests that activities—including issues of mobility and self-care—are relatively independent of pain severity and do not significantly influence adaptation.

Satisfaction with life was significantly higher in the interpersonally supported cluster compared with the dysfunctional cluster, but similar to the adaptive copers cluster. Again, these data serve to support the construct validity of the MPI-SCI cluster solution. The average levels of life satisfaction in our sample were comparable to another sample of people with SCI.[53] In comparison with the study by Putzke et al,[53] however, the dysfunctional subgroup scored lower and the interpersonally supported and adaptive copers clusters scored somewhat higher. The high SWLS scores in the interpersonally supported cluster were consistent with lower levels of depressed mood and pain-induced disability despite a moderately high pain severity level.

Study Limitations

This study has several limitations. All participants were volunteers and it is not possible to conclude that they were representative of all people with SCI who experience chronic pain. Demographic and injury characteristics of our participants, however, are similar to those reported in the national SCI database[54] where 81.5% of patients are male and 54.0% have cervical injuries. Because the study was cross-sectional, no causal inferences can be made regarding the associations among pain, coping, support, physical functioning, and life satisfaction. Finally, the stability of the MPI clusters has been questioned.[55] Future research needs to determine the degree of stability in cluster classifications over time.

CONCLUSIONS

Consistent with studies in other chronic pain samples, in this study we identified 3 different psychosocial patterns associated with SCI-related chronic pain. Two of the 3 patterns (dysfunctional subgroup, adaptive copers subgroup) were comparable with the subgroups observed in heterogeneous chronic pain populations, including a previous study of people with SCIs.[18] A third pattern characterized by high levels of interpersonal support appeared to be the converse of the interpersonally distressed subgroup observed in other chronic pain samples. Thus, interpersonal support seems to influence adaptation to chronic pain in diverse populations, including SCI, but in somewhat different ways. Whereas it is the perception of positive support that characterizes 1 adaptational pattern (interpersonally supported) in the SCI population, it is the absence of positive, pain-specific support and the presence of negative pain-specific support that play a more significant role in other chronic pain groups. In this study, positive support in response to pain, in combination with intimate-interpersonal support, was associated with greater life satisfaction, perhaps by moderating pain-related disability and depressed mood.

The divergence in results found for the different types of perceived supportive responses by significant others suggests that social support is not a unidimensional construct. Our results in this study confirm the relevance of the assessment of multiple types of support in the SCI chronic pain population. Although the different dimensions of support have not been given much attention in the pain literature, our results suggest that instrumental responses, as assessed by the MPI support scales, and perceptions of intimate supportive agents, as assessed by the ISEL appraisal scale, should be more carefully examined in future studies that evaluate the role of social support in chronic pain in general and in the chronic pain that accompanies SCI.

Defining specific adaptational patterns to chronic pain after SCI may aid in tailoring the psychologic part of a multidisciplinary pain management program in combination with more medically oriented treatments.

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