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Original Article

Effects of coping on psychological outcome when controlling for background variables: a study of traumatically spinal cord lesioned persons

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Study design: Cross-sectional.
Objectives: In a previous study we found spinal cord lesion (SCL)-related coping factors to be distinctly related to levels of SCL-related psychological outcome. However, we did not control for other potentially confounding variables. In this study we investigated effects of coping strategies on psychological outcome reactions in traumatically spinal cord lesioned persons controlling for sociodemographic, disability-related and social support variables.
Setting: The Gothenburg Spinal Injuries Unit in Sweden.
Methods: The study sample comprised 255 persons and a subsample of 157 persons. A series of stepwise multiple regression analyses were performed.
Results: SCL-related coping factors clearly predicted psychological outcome even when background variables were controlled. Higher levels of acceptance coping predicted decreased psychological distress and increased positive morale. Elevated social reliance coping predicted heightened distress. Higher levels of social support predicted lower feelings of helplessness. Sociodemographic and disability-related variables were weak predictors of psychological outcome with one exception: higher education predicted less bitterness and brooding.
Conclusion: SCL-related coping remained the most important predictor of psychological outcome even when a wide range of variables was controlled. Thus we conclude that psychosocial interventions aimed at helping individuals develop their coping strategies might be of substantial value in their adjustment to SCL.
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Keywords: spinal cord lesion; coping; distress; mental health

Introduction

From a clinical point of view, coping strategies mobilised in response to devastating events like traumatic spinal cord lesions (SCL) should be crucial determinants of the psychological impact of the lesion. Indeed, studies have supported this assumption.[1,2] Nevertheless, the only large scale study of coping strategies and emotional well-being to include background variables[3] did not find any contribution from coping. Instead, sociodemographic factors (gender, age, race, income and education) together with an indirect measure of situation appraisal (the Appraisal Scale)[4] and a summed measure of the individual's perceived uncertainty about symptoms, diagnosis, treatment, relationships with caregivers, and future plans (the Mishel Uncertainty in Illness Scale)[5] explained about half the variance in emotional well-being. However, a number of weaknesses have been noted concerning the psychometric stability in the coping questionnaire used[6] (the Ways of Coping Checklist (revised)).[7]

Two other studies using another coping measure (COPE)[8] and controlling for functional independence, marital satisfaction and duration of disability[9] and functional independence,[10] found coping strategies to be the strongest predictors of psychological distress, while marital satisfaction had no effect at all. However, another study using the same coping measure failed to

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detect differences in coping strategies between a coping effectiveness training group of SCL participants and matched controls, although psychological distress was significantly reduced in the intervention group.[11] It thus remains to study whether the effects of coping strategies on psychosocial adaptation can be uniquely and independently assessed in SCL.

In a previous study we found a psychometrically stable scale for measurement of SCL-related coping and psychological outcome factors.[1] The coping factors were clearly associated with levels of psychological outcome. However, a shortcoming of the design was that sociodemographic and disability-related variables shown to impact emotional well-being in other studies were not controlled. Because social support has repeatedly proven to be a correlate of psychological distress in SCL[12,13] it seemed necessary to include this variable among the background variables.

The purpose of this study was to investigate effects of coping strategies on psychological outcome reactions in traumatically spinal cord lesioned persons when sociodemographic, disability-related and social support variables were controlled. It should be noted that according to the transactional theory of stress and coping,[14,15] emotional well-being is not an isolated endpoint but a link in an ongoing process. Therefore psychological outcome factors can be viewed as both dependent and independent variables.

Method

Participants

All traumatically lesioned patients treated and/or followed at the Gothenburg Spinal Injuries Unit between 1982 and 1998 comprised the target population. Those who were known to have died or recovered and those who had been lesioned for <1 year were excluded. The rest ($n=381$) were mailed questionnaires with letters describing the rationale of the study. The questionnaires included coping strategies, psychological outcome reactions and social support variables. Follow-up mailings were made. A further 20 persons were excluded due to recovery from lesion, severe illness or because they were unable to be located. A total of 106 individuals were lost because they did not respond or did not complete the questionnaire. The study sample thus consisted of 255 participants (response rate = 70.6%). A supplementary questionnaire with various questions about social life was sent to the responders. The main findings from the supplementary questionnaire are to be reported elsewhere, only questions regarding residential area, working hours per week and judgement of personal finances are analysed here. Seventy persons out of the 255 responders did not respond or did not complete the questionnaire. Four persons were excluded as they had recovered from lesion and one had died. A total of 180 usable questionnaires were returned (response rate = 72.0%). Twenty-three persons were retired and were excluded from the analyses because they had no working hours per week. The subsample thus consisted of 157 participants. The local ethics committee approved the study.

Table 1 describes the sociodemographic and disability-related background characteristics of the participants. Following a neurological classification scheme used in a study of stress in SCL,[16] participants were assigned to one of three groups based on level of the lesion and in accordance with the American Spinal Injury Association (ASIA)/International Medical Society of Paraplegia (IMSOP) classification.[17] The three groups were: (I) persons with functionally complete tetraplegia who used a wheelchair and had impaired function in their upper extremities (Tetraplegia: ASIA ABC); (II) individuals with functionally complete paraplegia who typically had intact upper extremities and used wheelchairs for their mobility (Paraplegia: ASIA ABC); (III) persons with functionally incomplete SCLs at any neurological level who had neurological sparing such that ambulation was typically possible (All levels: ASIA D).

Since the Gothenburg Spinal Injuries Unit is a specialised unit receiving patients from all of Sweden, we believe that the sample is representative of the general Swedish SCL population. A majority judged their personal finances to be good, and only a few thought their finances were not good at all. Three times as many persons resided in an urban area than in a small town. Our subsample differed from the total sample in that there were more participants with university studies and fewer with only seven years compulsory school education.

Measures

Sociodemographical variables Gender, educational level and marital status were recorded from the Spinal Unit's Regional Database. Residential area, working hours per week and self-ratings of personal finances were available for a subsample of the participants. Categories for sociodemographic variables are presented in Table 1.

Disability-related variables Age at lesion, duration of disability and neurological classification were recorded from the spinal unit's regional database and are presented in Table 1.

Social support variables Short forms of the Swedish versions of Availability of attachment (AVAT) and Availability of social integration (AVSI) scales derived from the Interview schedule for social interaction[18] were used. The short forms have proven psychometrically equivalent to the original lengthier scales.[19] AVAT has a yes/no response format. AVSI uses a six-point response format and the answers are then dichotomised. Each factor consists of three items.

Table 1 Sociodemographic and disability-related characteristics of the study sample

Characteristic	*Total sample (n=255)*		*Subsample (n=157)*	
	Number	*Per cent*	*Number*	*Per cent*
Sociodemographic variables				
Gender				
Men	190	74.5	121	77.1
Women	65	25.5	36	22.9
Age				
Mean (SD)	43.9 (16.0)		40.3 (12.2)	
Median (Range)	40.0 (16–85)		39.0 (16–64)	
Educational level				
Compulsory level (7 years)	42	16.5	14	8.9
Compulsory level (9 years)	44	17.3	28	17.8
Vocational school (11 years)	61	23.9	34	21.7
Secondary school (12 years)	52	20.4	36	22.9
University	56	22.0	45	28.7
Marital status				
Single, divorced, widowed	116	45.5	69	43.9
Married, stable partner	139	54.5	88	56.1
Working hours per week[a]				
No employment			59	37.6
Part-time work/studies			54	34.4
Full-time work/studies			38	24.2
Financial judgement[b]				
Not good at all			8	5.1
Not so good			29	18.5
Good			92	58.6
Very good			27	17.2
Residential area[a]				
Rural			25	15.9
Village			28	17.8
Small town			18	11.5
Middle-sized town			27	17.2
Urban			53	33.8
Disability-related variables				
Age at lesion				
Mean (SD)	35.0 (16.7)		30.6 (12.8)	
Median (Range)	29.0 (14–80)		26.0 (14–62)	
Duration of disability				
Mean (SD)	8.9 (7.0)		9.7 (7.4)	
Median (Range)	7.0 (1–40)		8.0 (1–40)	
Neurological classification[d]				
Tetraplegios: ASIA A,B,C	83	32.5	50	31.8
Paraplegios: ASIA A,B,C	86	33.7	56	35.7
All levels: ASIA D	85	33.3	51	32.5

Due to rounding error, percentages for some variables do not equal 100% in total. [a–b]Only available for a subsample of participants ([a]six and [b]one missing value); [d]one missing value

Ratings are summed and range between 0–3, where higher scores indicate more perceived social support.

Psychological outcome The SCL-related psychological outcome scale is a psychometrically valid and reliable scale measuring psychological impact of SCL. It was developed in an SCL sample and consists of two psychological distress factors and a third positive morale factor.[1] Helplessness (six items) measures perplexion, lack of control, and loss of self-esteem. Intrusion (three items) includes bitterness and brooding. Personal growth (three items) reflects crisis growth, ie positive outcomes of life crises. Items are rated on a scale from 1–4. Scores represent the mean of the ratings, with higher scores indicating greater affirmation of the factor in question.

Coping strategies The SCL-related coping scale is a psychometrically valid and reliable coping scale developed in a SCL-sample.[1] The scale consists of three factors: Acceptance (four items) is revaluation of life values; Fighting spirit (five items) includes efforts to minimise the effects of the lesion; and Social reliance (three items) reflects a tendency towards dependent behaviour. Items are rated on a scale from 1–4. Scores represent the mean of the ratings, with higher scores indicating greater use of the strategy in question.

Statistical methods
The shape of the scoring distribution of each variable was inspected. Duration of disability showed the greatest skewness (1.46) and kurtosis (2.71). The distribution approximated normal distribution after logarithmic transformation. All other variables were approximately normally distributed. Parametric (Pearson) and non-parametric (Spearman) correlations were calculated for all variables.

A series of stepwise multiple regression analyses were performed. A $P \leqslant 0.05$ level was used for entering independent variables and only variables with $P \leqslant 0.05$ were accounted for in the total R^2. Cases with missing data were deleted listwise. Standardised residuals for the difference between observed and predicted values >3 were considered outliers.

In the first analysis ($n=255$), the three SCL-related psychological outcome factors were treated as dependent variables. Independent variables were sociodemographic, disability-related, social support and coping variables. This means that two psychological outcome factors were excluded in each of the three regressions. Three additional regression analyses were performed by adding the two excluded psychological outcome variables to the list of independent variables.

In the second analysis ($n=157$), residential area, working hours per week and personal finances were added to the list of independent variables. The analysis was extended in the same way as the first analysis.

Results

Correlation analyses
Table 2 shows mean scores and confidence intervals of the social support, psychological outcome and coping variables. Neither non-parametric nor parametric correlations between sociodemographic, disability-related, social support, psychological outcome and coping variables indicated collinearity. Only parametric correlations are shown (Table 3). In view of the number of significant correlations performed, the minimum level of significance was adjusted to $P<0.01$. Coping factors acceptance and fighting spirit correlated negatively with the psychological distress factors helplessness and intrusion, while they were positively correlated with the positive morale factor personal growth. The coping factor social reliance was positively correlated with psychological distress. The distress factors helplessness and intrusion were positively correlated, and both were negatively correlated with personal growth. The social support variables Availability of attachment (AVAT) and availability of social integration (AVSI) were negatively correlated with helplessness and positively correlated with personal growth. AVSI was also negatively correlated with Intrusion.

Due to missing values, *n* ranged between 252–250 in the first regression analysis and 133–131 in the second regression analysis.

Table 2 Means and 95% confidence intervals for social support, psychological outcome and coping variables ($n=255$)

Variable	*Mean (95% CI)*
Social support	
(Min–max score = 0–3)	
Availability of attachment	2.40 (*2.28–2.52*)
Availability of social integration	1.49 (*1.34–1.63*)
Psychological outcome	
(Min–max score = 1–4)	
Helplessness[a]	2.05 (*1.97–2.14*)
Intrusion[b]	2.07 (*1.94–2.19*)
Personal growth	2.60 (*2.51–2.69*)
Coping	
(Min–max score = 1–4)	
Acceptance	2.53 (*2.45–2.62*)
Fighting spirit[c]	3.22 (*3.15–3.28*)
Social reliance[b]	2.69 (2.59–2.78)

[a]Three, [b]one and [c]two missing values

Predicting helplessness
Results from the multiple regression analyses with helplessness as the dependent variable are presented in Table 4. Total R^2 ranged between 0.55–0.64 in the four analyses. Excluding two outliers appearing in the second extended analysis raised the total R^2 to 0.66 (predictors unchanged; data not shown). In all analyses, persons who scored low on acceptance, low on social support, high on social reliance and were less neurologically disabled tended to score higher on helplessness. Consequently, persons scoring high on acceptance, high on social support, low on social reliance and who were more neurologically disabled tended to score lower on helplessness. Sociodemographic variables were weak predictors, although women scored higher on helplessness than men in two analyses. Persons scoring higher on intrusion also scored higher on helplessness than those who scored lower on intrusion.

Predicting intrusion
Results from the multiple regression analyses with intrusion as the dependent variable are presented in Table 5. Total R^2 ranged 0.38–0.47 in the four analyses. Excluding one outlier appearing in the first extended analysis raised the total R^2 to 0.49 (predictors unchanged; data not shown). In all analyses, less educated persons tended to score higher on intrusion than persons with higher education. Persons scoring low on acceptance coping, high on social reliance coping and having a short duration of disability tended to score higher on intrusion than persons scoring high on acceptance, low on social reliance and having long duration of disability in three of the four analyses. Persons scoring high on helplessness had higher scores on intrusion than those scoring low on helplessness. Social support variables showed little predictive power.

Table 3 Correlations between coping, sociodemographic, disability-related, social support and psychological outcome variables ($n=255$)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
1. Acceptance		0.37**	−0.14*	0.02	0.02	0.01	0.11	0.11	0.10	−0.20**	0.20**	0.02	0.27**	0.34**	−0.57**	−0.48**	0.64**
2. Fighting spirit			−0.14*	−0.00	0.07	0.16*	−0.01	−0.08	0.00	−0.07	0.03	0.12	0.31**	0.22**	−0.33**	−0.17**	0.30**
3. Social reliance				0.10	−0.27**	0.00	−0.28**	−0.01	−0.14	0.30**	−0.11	−0.29**	0.00	−0.15*	0.42**	0.39**	−0.02
4. Gender					−0.09	−0.12	0.07	−0.09	0.12	0.11	−0.16**	0.14*	0.16*	0.01	0.12	0.03	0.06
5. Education						0.01	0.20*	0.18*	0.12	−0.32**	0.03	−0.02	−0.02	0.09	−0.15*	−0.29**	0.00
6. Marital status							0.05	−0.02	−0.22**	0.18**	−0.05	0.04	0.27**	0.12	−0.03	0.02	0.04
7. Residential area[a]								0.15	0.01	−0.18*	0.18*	0.08	−0.05	0.00	−0.03	−0.13	0.12
8. Working hours[a]									0.21*	−0.30**	−0.05	0.16	0.11	0.12	−0.29**	−0.31**	0.17*
9. Finances[b]										0.01	0.11	−0.14	−0.08	0.13	−0.15	−0.19**	0.09
10. Age at lesion											−0.30**	0.07	0.07	−0.13*	0.26**	0.33**	−0.13*
11. Duration												−0.21**	−0.13*	0.12	−0.21**	−0.26**	0.04
12. Neurological deficit													0.17**	−0.03	0.03	−0.01	0.11
13. AVAT[c]														0.29**	−0.29**	−0.05	0.26**
14. AVSI[d]															−0.47**	−0.24**	0.23**
15. Helplessness																0.59**	−0.26**
16. Intrusion																	−0.24**
17. Personal growth																	

*$P<0.05$; **$P<0.01$. [a−b]Only available for a subsample of participants ($n_a=151$; $n_b=156$); [c]Availability of attachment; [d]Availability of social integration

Table 4 Results of the stepwise multiple regression analyses with helplessness as the dependent variable

Dependent variable	*Cumulative R^2 and predictor variables (direction of relation)*			
	First analysis ($n=250$)	First extended analysis ($n=250$)	Second analysis ($n=131$)	Second extended analysis ($n=131$)
Helplessness	0.32 Acceptance (−) 0.44 Social reliance (+) 0.51 AVSI[a] (−) 0.52 Neurological deficit (+) 0.54 AVAT[b] (−) 0.55 Gender (+)	0.35 Intrusion (+) 0.47 AVSI[a] (−) 0.53 Acceptance (−) 0.57 Social reliance (+) 0.58 AVAT[b] (−) 0.60 Neurological deficit (+) 0.61 Gender (+) 0.61 Personal growth (+)	0.38 Acceptance (−) 0.46 AVSI[a] (−) 0.52 Social reliance (+) 0.55 Working hours (−) 0.57 Neurological deficit (+) 0.58 AVAT[b] (−)	0.38 Acceptance (−) 0.53 Intrusion (+) 0.59 AVSI[a] (−) 0.61 AVAT[b] (−) 0.63 Social reliance (+) 0.64 Neurological deficit (+)

Only significant estimates are shown ($P\leqslant0.05$). [a]Availability of social integration; [b]Availability of attachment

Table 5 Results of the stepwise multiple regression analyses with intrusion as the dependent variable

Dependent variable	*Cumulative R^2 and predictor variables (direction of relation)*			
	First analysis ($n=252$)	First extended analysis ($n=250$)	Second analysis ($n=133$)	Second extended analysis ($n=131$)
Intrusion	0.22 Acceptance (−) 0.33 Social reliance (+) 0.37 Education (−) 0.39 Duration of disability (−)	0.35 Helplessness (+) 0.40 Education (−) 0.43 Acceptance (−) 0.45 AVAT[a] (+) 0.46 Social reliance (+) 0.47 Duration of disability (−)	0.19 Acceptance (−) 0.28 Social reliance (+) 0.32 Education (−) 0.35 Duration of disability (−) 0.38 Working hours (−)	0.38 Helplessness (+) 0.42 Education (−) 0.45 AVAT[b] (+)

Only significant estimates are shown ($P \leqslant 0.05$). [a]Availability of attachment

Table 6 Results of the stepwise multiple regression analyses with personal growth as the dependent variable

Dependent variable	*Cumulative R^2 and predictor variables (direction of relation)*			
	First analysis ($n=252$)	First extended analysis ($n=250$)	Second analysis ($n=133$)	Second extended analysis ($n=131$)
Personal growth	0.42 Acceptance (+) 0.43 Duration of disability (−)	0.41 Acceptance (+) 0.43 Helplessness (+) 0.44 AVAT[a] (+)	0.36 Acceptance (+) 0.38 Duration of disability (−)	0.34 Acceptance (+) 0.38 Intrusion (+) 0.39 Working hours (+)

Only significant estimates are shown ($P \leqslant 0.05$). [a]Availability of attachment

Predicting Personal growth
Results from the multiple regression analyses with Personal growth as the dependent variable are presented in Table 6. Total R^2 ranged 0.38 – 0.44 in the four analyses. No outliers emerged. In all analyses, persons who scored high on acceptance had much higher scores on personal growth than persons with lower scores on acceptance. Newly lesioned tended to score higher on personal growth than the long-term disabled in two analyses. However, in the extended analyses this effect was not sustained. Instead, there were some persons who scored higher on psychological distress that also had higher scores on personal growth in the extended analyses. Social support and sociodemographic variables showed little predictive power.

Discussion

In a previous study we found that SCL-related coping factors were distinctly associated to levels of SCL-related psychological outcome. However, other potentially confounding variables were not taken into account.[1] In this study SCL-related coping factors clearly predicted psychological outcome in SCL even when sociodemographic, disability-related and social support variables were controlled for. Unlike the study by Wineman *et al*.,[3] coping factors remained significant predictors of emotional well being when control variables were entered in the regression analyses. This is especially true for the coping factor acceptance, where higher acceptance scores were associated with less psychological distress and more positive morale. Others have also reported that acceptance predicts psychological well being in SCL when controlling for a few control variables.[9,10]

The coping factor Social reliance was associated with elevated psychological distress. One possible explanation might be that this strategy involves externalising control, and elevated external control attributions have been associated with higher levels of psychological distress and depression in SCL.[2]

The third coping factor, fighting spirit, did not significantly contribute to psychological outcome, although high levels of internal control have been linked to less psychological distress[2,20] and better well being among persons with SCL.[13] A partial explanation for the lack of effect regarding Fighting spirit might be related to the extreme positive skewness of the scoring distribution (Table 2). This in turn might reflect the fact that fighting spirit represents a highly valued attitude of independence in western cultures.

We found higher levels of social support to predict reduced helplessness. This is consistent with the findings that persons with SCL who report high levels of social support also report little depression.[12,13]

In general, sociodemographic and disability-related variables were weak predictors of psychological outcome with one exception: educational level predicted intrusion, where the higher the educational level the lower the intrusion. Education has previously been found to predict emotional well being in SCL.[3] It seemed surprising at first that the less neurologically disabled reported more helplessness than those who were more neurologically disabled. However, this might reflect the 'hidden disability' that persons who are able to manage without a wheelchair might have. It has been our experience that these persons, or those closest to them, tend to strive to live in the same manner as non-disabled individuals without really considering the lasting impact of the lesion (eg in bowel or bladder functioning). Consistent with the view that SCL represents a possible onset of life crisis, newly lesioned reported more intrusion as well as more positive outcomes of life crisis (personal growth) than long-term disabled did. Increased time since lesion has been found to be associated with higher life satisfaction in a number of areas,[21] although it has been a weak predictor compared to emotional distress and feelings of control.[22] As may be expected, our two psychological distress factors (helplessness and intrusion) proved to be notable predictors of psychological well being. In accordance with the transactional theory of stress and coping,[14,15] this indicates an interactive process, i.e. how the individual is coping influences her/his emotional reactions and the emotional reactions influence the individual's coping. Our results also harmonise with the hypothesis made in the transactional theory of stress and coping that coping strategies can be thought of as having a buffering effect on psychological outcome.

The SCL-related coping and psychological outcome scales need cross-validation in other samples as well as against other outcome measures, such as well-established health-related quality of life measures. Until then interpretations of the factors remain tentative. Strengths of the study in comparison to other studies of coping and mental well being in SCL are the large sample size and the wide range of control variables. A further strength is that our sample appears to be representative of the Swedish SCL population with respect to disability-related and most sociodemographic variables.[23–25] The higher ratings of financial satisfaction in our sample might be attributable to many factors, for example, the economic growth Sweden has had during the years between the prevalence study and our study was done.

In conclusion, SCL-related coping remained the most important predictor of psychological outcome even when a wide range of variables were controlled for. This means that psychosocial interventions aimed at helping individuals develop their coping strategies might be of substantial value in the adjustment process after SCL.

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