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ORIGINAL ARTICLE

Psychological Resources, Appraisals, and Coping and Their Relationship to Participation in Spinal Cord Injury: A Path Analysis

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Abstract

Objective: To test the Spinal Cord Injury Adjustment Model and gain a better understanding about whether and how the psychological resources general self-efficacy (SE), purpose in life (PIL), appraisals, and coping influence participation in persons with spinal cord injury (SCI).

Design: Cross-sectional data collection within the Swiss Spinal Cord Injury Cohort.

Setting: Community setting.

Participants: Persons with SCI (N=516) who are ≥16 years old and living in the community in Switzerland.

Interventions: Not applicable.

Main Outcome Measures: Participation was measured with the restrictions subscale of the Utrecht Scale for Evaluation of Rehabilitation-Participation, General SE with the General Self-Efficacy Scale, PIL with the Purpose in Life Test-Short Form, appraisals with the Appraisal of Life Events Scale, and coping with the Brief COPE.

Results: General SE (r=.32) and PIL (r=.23) were associated with less participation restrictions. The initial model yielded a poor model fit. The modified final model had an acceptable fit (χ^2_{11}=36.2; P<.01; root mean square error of approximation=.067 [90% confidence interval: .045−.09]; comparative fit index=.98). A total of 15% of the variance of participation was explained. In the final model, general SE had a moderate direct effect (β=.24) and mediated effects via threat appraisal and challenge appraisal and humor on participation, indicating a partial mediation effect. The association between PIL and participation was indirect: challenge appraisal and humor acted as mediators.

Conclusions: The results only partly support the double-mediating effect as suggested in the SCI adjustment model because both direct and indirect effects on participation were observed. Individuals with higher general SE and PIL perceive less participation restrictions. General SE seems an appropriate target to enhance participation. Longitudinal studies are needed to support our findings.

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Participation, defined as the involvement in a life situation,[1] can be severely affected by a spinal cord injury (SCI).[2] SCI may cause restrictions in persons' mobility and self-care and can impact work, leisure, and social activities.[3] Participation is a key rehabilitation target and an indicator of successful adjustment to chronic diseases[4] and, specifically, SCI.[5]

Factors that have been connected with the level of participation of persons with SCI are sociodemographic variables (eg, age, ethnicity, education),[6-9] lesion-related variables (eg, time since injury, lesion severity),[5-9] and activity limitations.[6,10] Environmental factors, including social support, are inconsistently

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associated with participation.[6-8,11-13] In a multivariate study incorporating sociodemographic and lesion-related variables and activity and environmental factors, 40% of the variance in participation was explained.[6] Overall, according to the current state of research, a fair amount of variance in participation remains unexplained. However, other factors, such as psychological resources (eg, self-efficacy, self-esteem, purpose in life [PIL]), might contribute to participation of persons with SCI.

Psychological resources can be conceptualized as inner, health protecting potentials of a person representing a source to deal with difficult situations or obtaining valued ends.[14-16] Knowledge regarding the link between psychological resources and participation in individuals with SCI is limited.[17] Relations between high self-efficacy and higher levels of participation in work or physical activity have been frequently observed, but not without inconsistencies.[8,11,17] Other studies have found links between higher social integration or physical activity with higher self-esteem[8,12] and motivation.[18,19] Associations between other psychological resources (eg, PIL) and participation have not been examined.[17] Overall, evidence warrants further focus on psychological resources and their connection to participation. However, to better support individuals with SCI, we need to know not only whether, but also how psychological resources influence participation. A clear understanding of the underlying mechanism is necessary.

The Spinal Cord Injury Adjustment Model was established to explain adjustment after SCI.[20] It suggests that psychological resources determine adjustment outcomes (eg, participation) via appraisal and coping processes. More concretely, psychological resources, such as general self-efficacy (SE) (general belief that one can respond to contextual demands to produce an outcome[21]) or PIL (degree to which someone perceives life as meaningful[22]), influence how an affected individual perceives SCI (eg, whether a person appraises SCI and its consequences as a threat or a challenge to be dared). These appraisals then have an effect on the coping strategies that are used by the person. Finally, the level of participation results from these prior coping processes. To summarize, the Spinal Cord Injury Adjustment Model proposes a double-mediating process that can be depicted as psychological resources (general SE/PIL) → appraisals → coping → participation.

Our overall project aims to examine how the psychological resources general SE and PIL impact various adjustment indicators. The effects on depressive symptoms and life satisfaction are studied in separate articles (C. Peter et al, Modeling life satisfaction in spinal cord injury: the role of psychological resources, unpublished observations, 2014; C. Peter et al,. Depression in spinal cord injury: assessing the role of psychological resources, unpublished observations, 2014). We investigated these variables because research suggests better adjustment outcomes for individuals with higher general SE or PIL. Building on the Spinal Cord Injury Adjustment Model, the objective of this study is to evaluate the influence of general SE, PIL, appraisals, and coping styles in predicting participation after SCI. More specifically, we test the following hypotheses: higher general SE and PIL are associated with better participation, and appraisals and coping styles mediate the impact of general SE and PIL on participation.

List of abbreviations:

CFI	**comparative fit index**
PIL	**purpose in life**
RMSEA	**root mean square error of approximation**
SCI	**spinal cord injury**
SE	**self-efficacy**
SwiSCI	**Swiss Spinal Cord Injury Cohort Study**

Methods

Study design

A community-based cross-sectional survey was conducted within the nationwide Swiss Spinal Cord Injury Cohort Study (SwiSCI). The responsible ethical committees approved the study. The design of the SwiSCI is described in more detail elsewhere.[23]

Participants

Individuals with a traumatic or nontraumatic SCI, aged ≥16 years, and living in the Swiss community were eligible for participation in the SwiSCI. Persons with congenital conditions (eg, spina bifida), new SCI in the context of terminal illness, or neurodegenerative disorders (eg, multiple sclerosis) were excluded from the study. The SwiSCI recruits participants by screening the medical records of 4 specialized Swiss SCI rehabilitation centers (REHAB Basel, Basel; Spinal Cord Injury Center of the Balgrist University Hospital, Zürich; Clinique Romande de Réadaptation, Sion; Swiss Paraplegic Centre, Nottwil) and member lists of 2 SCI associations (Swiss Paraplegic Association, Nottwil, Parahelp Nottwil). Every participant signed an informed consent form.

Procedures

Self-report questionnaires were sent to all eligible persons by postal mail in 3 waves. First, information about the SwiSCI, the informed consent form, and a brief questionnaire about sociodemographic and lesion-related variables was sent. Persons who completed this questionnaire and agreed to participate in the SwiSCI received a second questionnaire on health, functioning, and well-being. A stratified random sample from the respondents of the second questionnaire was drawn controlling for sex, age, and level of lesion (paraplegia vs tetraplegia). This sample received a third questionnaire, which included the measures used in this study.

Measurement instruments

Psychological resources

PIL was measured with the Purpose in Life Test-Short Form.[24] The Purpose in Life Test-Short Form consists of four 7-point Likert-type items using different anchors for each item. Higher scores stand for a higher PIL. Good internal consistency and validity have been reported.[24]

General SE was measured with the General Self-Efficacy Scale.[21] It consists of ten 4-point Likert-type items. Higher scores denote higher self-efficacy levels. Good internal consistencies[25] and convergent and discriminant validity have been found.[26] The General Self-Efficacy Scale has been frequently used in SCI research.[27-29]

Appraisals and coping

Appraisals were measured with the Appraisal of Life Events Scale.[30] Using 16 adjectives, persons responded how they appraised difficult life events in the last 3 months on a 6-point scale. The adjectives refer to 3 dimensions: threat (eg, terrifying), challenge (eg, stimulating), and loss (eg, pitiful). Higher scores indicate higher appraisal levels. Good internal reliability and convergent validity have been reported.[30,31]

Coping (ie, how persons were dealing with stressful situations in the past) was assessed with the Brief COPE.[32] It consists of 28 items with a 4-item Likert scale and encompasses 14 subscales. Higher scores indicate more use of the specific coping style. Satisfactory internal reliability estimates have been reported.[32]

Adjustment outcome

Participation was measured with the restrictions subscale of the Utrecht Scale for Evaluation of Rehabilitation-Participation.[33] This subscale consists of eleven 5-point items with endpoints ranging from not possible to without difficulty. Items refer to leisure, work, or mobility-related activities (eg, going out). Scores range from 0 to 100, with higher scores indicating less perceived restrictions (better participation). Satisfactory reliability and validity have been reported for rehabilitation populations.[33]

Analyses

Regarding our first hypothesis, Pearson correlations were calculated in SPSS version 18[a] to identify the associations between general SE, PIL, and participation. Coefficients <0.3 are considered weak, coefficients between 0.3 and 0.5 are moderate, and coefficients are strong if they are >0.5.[34] With respect to our second hypothesis, path analysis was conducted using the free statistics environment R[b] and its lavaan package (version 0.5-12).[35]

First, the measurement model for the Brief COPE was examined because several studies reported different factor structures of the measure.[36,37] Using the R software, a parallel exploratory factor analysis (principal axis analysis) using an oblique rotation (promax) was performed on the items, yielding a 6-factor solution with 45.2% explained variance. The 6 factors were labeled as follows: emotional coping and support, avoidance, substance use, religious coping, active coping, and humor. The items of the 6 factors were summed up and treated as observed variables to attain an adequate ratio of the sample size to the number of measured variables included in the model.[38]

Second, the path model was tested. Based on the Spinal Cord Injury Adjustment Model,[20] a double-mediation model was defined as follows: psychological resources (PIL/general SE) → appraisals → coping → participation (fig 1). Robust full information maximum likelihood was used for model estimation based on raw data. Full information maximum likelihood analyses partially missing data without imputing missing values.[39] A nonsignificant chi-square test and root mean square error of approximation (RMSEA) <.05 were used as global fit measures indicating acceptable fit.[40,41] A comparative fit index (CFI) was used as a further model comparison index, with values >.95 indicating good fit. Standardized residuals >2, indicating significant differences between the model and data, were checked to consider model modification.

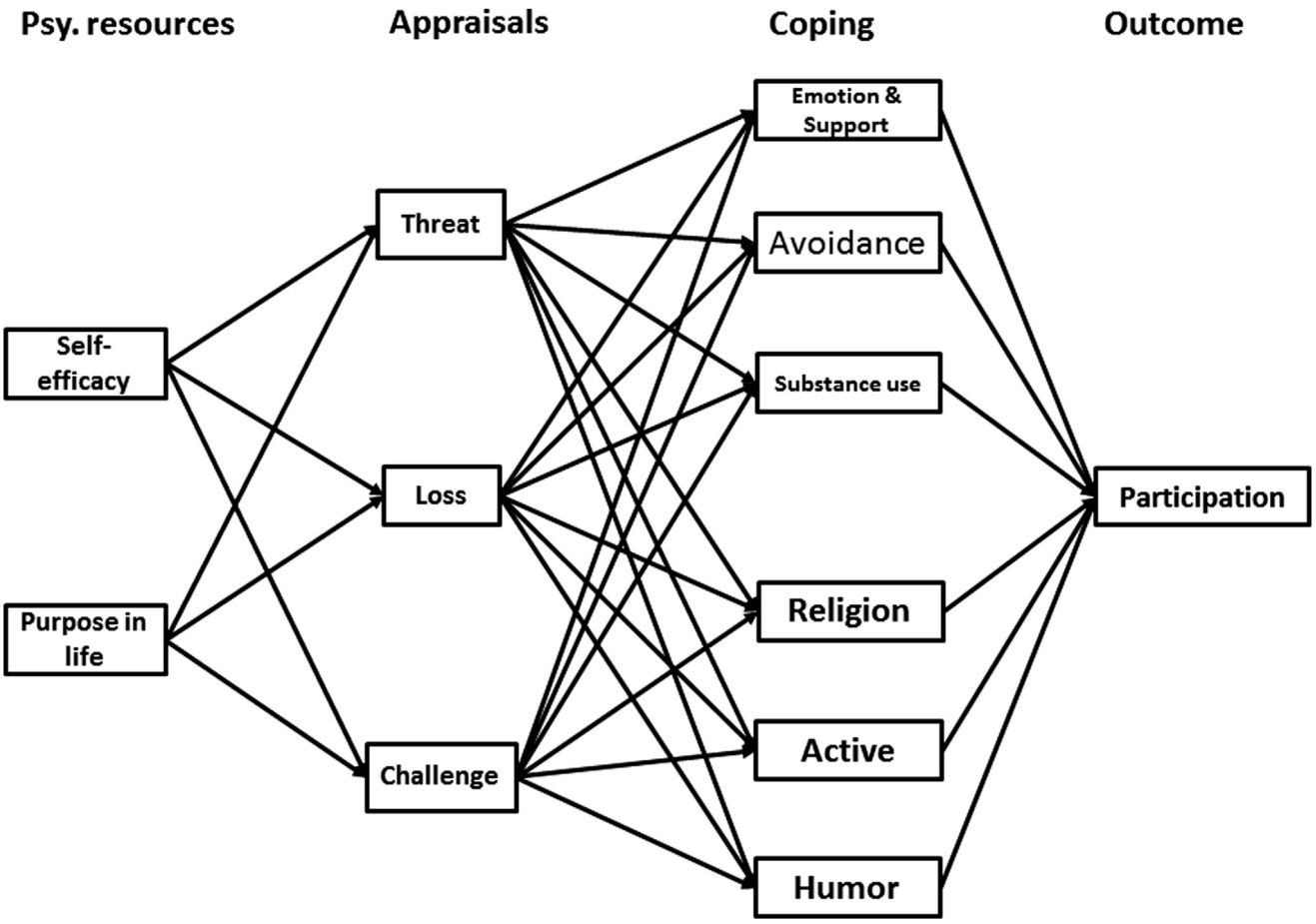

Fig 1 Initial model based on the Spinal Cord Injury Adjustment Model consisting of psychological resources, appraisals, coping, and participation. Adjustment is operationalized with participation. For clarity, the following correlations are not depicted: self-efficacy and PIL, threat and loss, loss and challenge, emotion and support and active, emotion and support and avoidance, active and humor, humor and avoidance, and avoidance and substance use. Abbreviation: Psy, psychological.

The power to detect model misspecification and test effects were checked for the final model.[42] To test the effects, a post hoc Monte Carlo power analysis using the simsem package in R software[43] was conducted.

Furthermore, because the impairment level can be connected with participation, post hoc exploratory group comparisons of the final model were carried out to test for differences in the parameter estimates. The impairment-related variables of level and completeness of lesion (paraplegia vs tetraplegia, complete vs incomplete lesion) and time since injury (short vs long, median split with median = 14y) were considered.

Results

In the second SwiSCI questionnaire wave, 38% of the respondents were randomly assigned to the present study. The return rate was 61.4% for the first wave, 82.6% for the second wave, and 89.8% for the present study. A total of 516 persons participated in our study. Study participants were mainly men (72.1%), an average of 53.1 years old, with paraplegia (67.5%). Participants lived, on average, >17 years with their injury (table 1). Table 2 lists the score range and mean for each measured construct.

Regarding our first hypothesis, persons with higher general SE ($r = .32$) and PIL ($r = .23$) perceived less participation restrictions (tables 3 and 4). The strength of these associations was weak. Participation was positively related with challenge appraisal ($r = .21$) and was negatively related with loss and threat appraisals ($r = -.25$ and $-.26$, respectively). Of all original 14 coping subscales, participation had the strongest association with positive reframing ($r = .22$). Threat and loss appraisals were intercorrelated ($r = .71$). Among all 14 original coping subscales, emotional and instrumental support had the highest correlation ($r = .64$).

Regarding our second hypothesis, the initial model (see fig 1) with participation restrictions as the outcome yielded a poor model fit ($\chi^2_{29} = 320$; $P < .01$; RMSEA = .14 [90% confidence interval: .127−.153]; CFI = .73). Considering the size of the standard residuals, the model was modified by adding the following paths: paths from general SE and PIL to active coping, paths from general SE to humor, paths from general SE to participation, paths from PIL to religious coping, paths from threat to participation, paths from PIL to avoidance, and intercorrelations between all 6 coping factors. No paths were deleted. This yielded a final model with acceptable model fit ($\chi^2_{11} = 36.2$; $P < .01$; RMSEA = .067 [90% confidence interval: .045−.09]; CFI = .98). A total of 15% of the variance of participation was explained (fig 2).

In the final model, general SE had a moderate direct effect ($\beta = .24$) and a mediated effect via threat appraisal and challenge appraisal and humor coping on participation, indicating a partial mediation effect. The association between PIL and participation was mediated by challenge appraisal and humor coping. Threat appraisal ($\beta = -.18$) and humor coping ($\beta = .12$) were significantly directly associated with participation, although effects were small.

The final model reached an acceptable power for detection of model misspecification ranging between .66 and .71.[42] The post hoc Monte Carlo power analyses yielded an average effect power of .77.

The post hoc group comparisons yielded a significant group difference for time since injury, but not for level or completeness of injury. Exploring the parameter differences, the direct effects of humor and threat appraisals on participation turned out to be noticeably stronger for individuals with a shorter time since injury (humor → participation for shorter time: $\beta = .18$ vs humor → participation for longer time: $\beta = .05$; threat → participation for shorter time: $\beta = -.25$ vs threat → participation for longer time: $\beta = -.10$). These differences were also present in the unstandardized estimates.

Table 1 Descriptive characteristics of study participants (N = 516)

Characteristic	Participants n (%)
Sex	
Men	372 (72.1)
Women	144 (27.9)
Missing	0
Marital status	
Single (never married)	158 (30.5)
Married	258 (50.0)
Widowed	70 (13.6)
Divorced	23 (4.5)
Regular partnership	2 (0.4)
Missing	5 (1.0)
Age (y)*	53.1±14.6
Missing	28 (5.4)
Education (y)*	13.8±3.3
Missing	12 (2.3)
Time since injury (y)*	17.6±13.6
Missing	44 (8.5)
Type of lesion	
Complete paraplegia	166 (32.2)
Complete tetraplegia	57 (11.0)
Incomplete paraplegia	182 (35.3)
Incomplete tetraplegia	102 (19.8)
Missing	9 (1.7)
Cause of injury	
Traumatic	400 (77.5)
Nontraumatic	88 (17.1)
Unspecified	27 (5.2)
Missing	1 (0.2)
Language of questionnaire	
German	364 (70.5)
French	131 (25.4)
Italian	21 (4.1)
Missing	0

Abbreviation: Missing, missing scores.
* Values are mean ± SD.

Discussion

This study examined whether and how general SE and PIL influence perceived restrictions in participation in persons with SCI. The first hypothesis was supported: individuals with higher general SE and PIL perceived less participation restrictions. The second hypothesis relating to the Spinal Cord Injury Adjustment Model and the proposed double-mediating mechanism was partially supported. Appraisals and coping largely mediated the effect of psychological resources on participation. However, general SE and threat appraisals had a direct effect on participation level.

Persons with higher general SE and PIL perceived less participation restrictions. The strength of these bivariate associations, however, is weak.[34] The positive relation of general SE with

Table 2 Descriptive characteristics of psychological resources, appraisals, coping, and participation (N=516)

Variable (measure)	Range	Mean ± SD	Missing, n (%)	Cronbach α
Psychological resources				
General SE (General Self-Efficacy Scale)	10–40	30.4±5.6	28 (5.4)	.91
PIL (Purpose in Life Test-Short Form)	4–28	21.3±4.6	17 (3.3)	.89
Mediating variables				
Appraisals (Appraisal of Life Events Scale)				
Challenge	0–30	12.9±7.0	50 (9.7)	.85
Loss	0–20	6.9±4.9	47 (9.1)	.82
Threat	0–30	9.5±6.7	47 (9.1)	.86
Coping (Brief COPE)				
Self-distraction	2–8	5.0±1.6	15 (2.9)	.46
Active coping	2–8	6.1±1.5	13 (2.5)	.71
Denial	2–8	3.3±1.5	22 (4.3)	.55
Substance use	2–8	2.6±1.2	10 (1.9)	.92
Emotional support	2–8	4.0±1.6	12 (2.3)	.77
Instrumental support	2–8	4.4±1.5	16 (3.1)	.78
Behavioral disengagement	2–8	3.1±1.3	13 (2.5)	.41
Venting	2–8	3.9±1.4	17 (3.3)	.60
Positive reframing	2–8	5.6±1.6	15 (2.9)	.62
Planning	2–8	5.4±1.5	22 (4.3)	.47
Humor	2–8	4.1±1.7	17 (3.3)	.70
Acceptance	2–8	6.4±1.5	18 (3.5)	.70
Religion	2–8	3.8±2.0	17 (3.3)	.89
Self-blame	2–8	3.7±1.5	18 (3.5)	.57
Coping (Brief COPE, exploratory factor analysis-based subscales)				
Emotion and support	6–24	12.3±3.7	20 (3.9)	.83
Avoidance	8–32	14.3±3.7	35 (6.8)	.67
Substance use	2–8	2.6±1.2	10 (1.9)	.92
Religion	2–8	3.8±2.0	17 (3.3)	.89
Active	5–20	14.4±3.0	29 (5.6)	.71
Humor	3–12	6.8±2.2	17 (3.3)	.67
Adjustment outcome				
Participation (Utrecht Scale for Evaluation of Rehabilitation-Participation, restrictions subscale)	0–100	70.1±21.4	6 (1.2)	.92

NOTE. Little missing completely at random test was significant ($P<.001$), indicating that data were not missing completely at random. After additional analyses of the pattern of missing data, the data were treated as missing at random.
Abbreviation: Missing, missing total scores.

participation corresponds with findings of past SCI studies linking control-related variables (eg, perceived control) to better participation.[17,44-46] Weak to moderate correlations of general SE with work and recreation activity[47] or social functioning[10] have been observed. A recent study even found a strong positive association between general SE and participation ($r=.54$).[8] However, the participation measure used, the Reintegration to Normal Living Index,[48] contains an item on dealing with life events that conceptually overlaps with the General Self-Efficacy Scale, which might have amplified the strength of the association.

We are not aware of any study that has examined the relation between PIL and participation in individuals with SCI; however, positive associations of PIL with other adjustment indicators (eg, high well-being, good mental health) have been demonstrated.[49,50] Outside SCI research, findings regarding the link between PIL and participation are inconclusive: a strong link was found in persons with arthritis,[51] whereas a weak association was found in women of the general population.[52]

General SE had a direct positive effect on participation. This corresponds with the findings of a cross-sectional multivariate study in which general SE together with self-esteem, education, and time since discharge predicted participation of persons with SCI.[8] The effect of PIL on participation was mediated by challenge appraisals and humor coping, which corresponds to the Spinal Cord Injury Adjustment Model. These path coefficients, however, are small and indicate an overall weak indirect effect of PIL on participation.

Threat and challenge, but not loss appraisals, mediated the relation of the psychological resources on participation. Their effect, however, remains weak. Support for the influence of appraisals (eg, helplessness) on participation has also been found in another study.[10]

Our study found very weak support for the contribution of coping to participation. Only humor coping was connected to perceived participation restrictions. Other studies showed inconsistent results.[53] For example, emotion-focused coping strongly predicted social reintegration of individuals with SCI living in Korea,[12] whereas no effect was found for coping in a Swiss study.[8]

In the present study, humor coping consisted of the 2 original humor items and 1 item of the positive reframing subscale, which has been repeatedly linked to better adjustment after SCI.[54,55] Humor can be interpreted as a cognitive devaluation strategy that mitigates the impact of SCI on perceived participation.

Table 3 Pearson correlations between psychological resources, appraisals, coping (14 original subscales), and participation (N=516)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Participation	1.00																			
2. Self-efficacy	0.32*	1.00																		
3. PIL	0.23*	0.55*	1.00																	
4. Challenge	0.21*	0.32*	0.35*	1.00																
5. Loss	−0.25*	−0.40*	−0.31*	−0.22*	1.00															
6. Threat	−0.26*	−0.34*	−0.24*	−0.08	0.71*	1.00														
7. Self-distraction	−0.04	−0.01	0.05	0.02	0.24*	0.19*	1.00													
8. Active	0.14*	0.39*	0.46*	0.17*	−0.13*	−0.09	0.22*	1.00												
9. Denial	−0.09†	−0.16*	−0.15*	−0.06	0.25*	0.20*	0.26*	−0.09†	1.00											
10. Substance use	0.00	−0.13*	−0.14*	0.01	0.15*	0.11†	0.11†	−0.16*	0.13*	1.00										
11. Emo. support	−0.03	−0.06	0.00	0.07	0.27*	0.26*	0.21*	0.14*	0.14*	0.13*	1.00									
12. Instr. support	−0.04	−0.03	0.09	0.07	0.25*	0.23*	0.24*	0.22*	0.03	0.02	0.64*	1.00								
13. Behav. disengagement	−0.07	−0.17*	−0.28*	−0.12*	0.16*	0.12*	0.14*	−0.16*	0.29*	0.10†	0.03	−0.03	1.00							
14. Venting	−0.04	−0.02	−0.03	0.05	0.20*	0.20*	0.12*	0.02	0.07	0.10†	0.50*	0.42*	0.04	1.00						
15. Pos. reframing	0.22*	0.46*	0.42*	0.35*	−0.19*	−0.17*	0.05	0.36*	−0.15*	−0.12*	0.00	0.12*	−0.10†	−0.01	1.00					
16. Planning	0.00	0.26*	0.27*	0.15*	0.11†	0.11†	0.26*	0.47*	0.00	−0.05	0.23*	0.33*	−0.10†	0.18*	0.38*	1.00				
17. Humor	0.18*	0.34*	0.24*	0.28*	−0.16*	−0.13	0.04	0.16*	−0.12	0.11†	0.00	0.01	−0.10†	0.13*	0.35*	0.18*	1.00			
18. Acceptance	0.19*	0.45*	0.37*	0.20*	−0.35*	−0.28*	−0.10†	0.35*	−0.39*	−0.12*	−0.15*	−0.06	−0.13*	−0.08	0.45*	0.16*	0.33*	1.00		
19. Religion	−0.07	−0.11†	0.11†	0.08	0.27*	0.26*	0.19*	0.13*	0.10†	−0.08	0.16*	0.22*	0.10†	0.10†	0.16*	0.16*	−0.07	0.03	1.00	
20. Self-blame	−0.01	−0.08	−0.04	0.11†	0.19*	0.27*	0.22*	0.06	0.24*	0.19*	0.25*	0.16*	0.04	0.18*	−0.06	0.26*	0.02	−0.16*	0.07	1.00

Abbreviations: Behav., Behavioral; Emo., emotional; Instr., instrumental; Pos., positive.

* $P<.01$.

† $P<.05$.

Table 4 Pearson correlations between psychological resources, appraisals, coping (6 exploratory factor analysis-based subscales), and participation (N = 516)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Participation	1.00											
2. Self-efficacy	0.32*	1.00										
3. PIL	0.23*	0.55*	1.00									
4. Challenge	0.21*	0.32*	0.35*	1.00								
5. Loss	−0.25*	−0.40*	−0.31*	−0.22*	1.00							
6. Threat	−0.26*	−0.34*	−0.24*	−0.08	0.71*	1.00						
7. Support	−0.05	−0.04	0.03	0.08	0.30*	0.28*	1.00					
8. Active coping	0.11†	0.45*	0.48*	0.24*	−0.04	−0.02	0.23*	1.00				
9. Avoidance	−0.14*	−0.32*	−0.28*	−0.08	0.42*	0.38*	0.27*	−0.11†	1.00			
10. Humor	0.23*	0.42*	0.32*	0.35*	−0.19*	−0.17*	0.06	0.35*	−0.23*	1.00		
11. Religion	−0.07	−0.11†	0.11†	0.08	0.27*	0.26*	0.19*	0.19*	0.10†	0.01	1.00	
12. Substance use	0.00	−0.13*	−0.14*	0.01	0.15*	0.11†	0.10†	−0.14*	0.24*	0.04	−0.08	1.00

* $P<.01$.
† $P<.05$.

Humor can also be seen as a proxy for trait humor, which facilitates the development of interpersonal relations and social attraction and hence relates to participation.[56,57]

The effect of humor on participation was an effect for which a group difference was found for time since injury. However, our approach of testing group differences was exploratory and needs to be complemented by a theoretically guided examination.

The variance in participation explained in our study was low (15%) compared with other studies, which have reported variances up to 48%.[8] The differences in the amount of explained variance

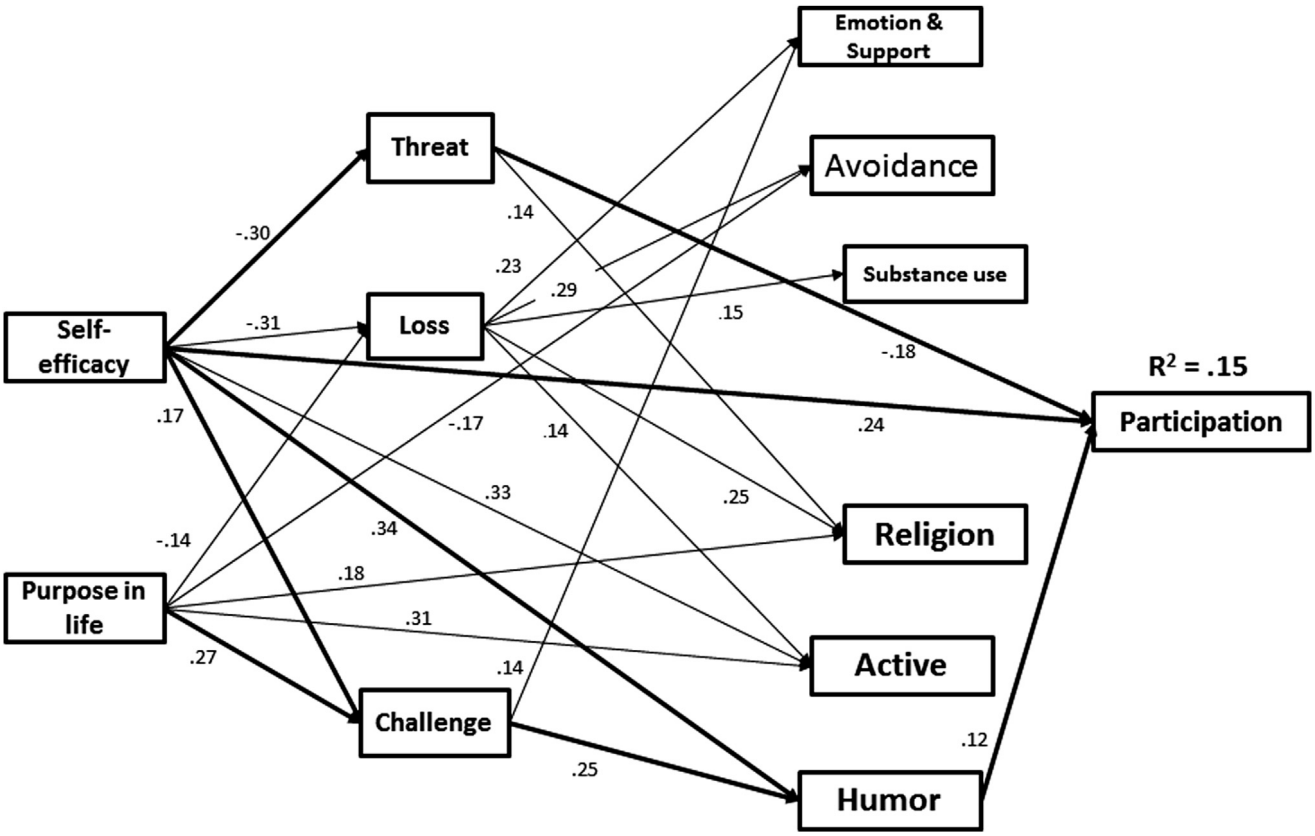

Fig 2 Final model with participation as the adjustment outcome variable ($\chi^2_{11}=36.2$; $P<.01$; CFI = .98; RMSEA = .067 [90%-confidence interval: .045−.09]). For clarity, the following nonsignificant paths are not depicted: PIL to threat, threat to emotion, threat to support, threat to substance use, threat to active, threat to humor, loss to humor, challenge to avoidance, challenge to substance use, challenge to religion, challenge to active, emotion to participation, avoidance to participation, substance use to participation, religion to participation, and active to participation. The correlations between all 6 coping subscales and between threat and loss, loss and challenge, and self-efficacy and PIL are not depicted. Abbreviation: R^2, proportion of explained variance.

across studies may be caused by study design, conceptual issues, or measurement issues. First, differences arise because studies included different predictor variables. Our study's main focus was on psychological resources and their relation to participation. To attain an adequate ratio between sample size and number of model variables, we did not include other potential predictors (eg, functional limitations), which might explain the overall low amount of explained variance found here. Future research should test a multidimensional model, including a broader range of common predictors of participation simultaneously (eg, including self-efficacy, social support, functional limitations, lesion-related variables). Second, participation is a broad concept and comprises various aspects ranging from self-care and mobility to work, leisure, and social life. If different studies focus on different aspects of participation, the amount of explained variance cannot be meaningfully compared. Third, different measurement instruments are used to assess participation. The use of standardized measures with uniform operationalization is needed to facilitate generalizability across studies.[58]

Similar to a study with life satisfaction as the outcome, our study provides partial support of the Spinal Cord Injury Adjustment Model because both direct and indirect effects on participation were observed. However, findings need to be interpreted under consideration of our operationalization of the Spinal Cord Injury Adjustment Model and its components.

First, we operationalized participation as dependent on psychological factors. However, participation can also be a source of high general SE and PIL and influence appraisals.[10] For example, being able to participate can enable performance accomplishments, which are a main source for strengthened self-efficacy.[59] Similarly, participation can set the basis for an engaged and meaningful life and, hence, fuel PIL.[60]

Second, we did not specifically inquire how individuals with SCI appraise and cope with SCI because SwiSCI-internal pretests indicated that persons living in the community do not necessarily perceive their injury as a stressor anymore. Therefore, more general tendencies of appraising and coping with stressful situations were investigated. Future studies conducted in the early acute phase and assessing SCI-related cognitions and coping are needed to confirm our findings.

Clinical implications

Strengthening general SE could be a promising way to enhance participation. Interestingly, self-efficacy has been frequently enhanced by interventions promoting participation, which underlines the close tie between these 2 concepts. For example, improvements in self-efficacy of persons with SCI have been achieved by an active/independent living program,[61,62] physical activity or sports programs,[29] or a wellness workshop intervention.[63] Primary characteristics of successful self-efficacy interventions in persons with chronic health conditions compose, for example, the utilization of a variety of learning strategies or the involvement of significant others supported by trained educators.[64,65]

Study limitations

This study is subject to several limitations. First, the study design is cross-sectional and causality cannot be inferred. Second, study results are based on a community sample of the Swiss population of persons with SCI and are not generalizable to the entire SCI population. Third, we focused on psychological resources, appraisals, and coping, but we did not consider environmental or functional factors as potential participation predictors. However, exploratory group analyses showed that level and completeness of injury did not have a significant impact on the parameter estimates in the final model. Fourth, modified models are, to some extent, data driven and cannot be generalized. The final model should therefore be cross-validated.

Conclusions

Psychological resources contribute to the extent individuals with SCI perceive restrictions in participation. General SE seems an appropriate target to enhance participation. Our findings provide partial support for the Spinal Cord Injury Adjustment Model and its double-mediating process. To support our findings, a multidimensional model integrating environmental, biological, and psychological factors should be tested, using longitudinal data and focusing on how newly injured persons with SCI adjust to their lesion.

Suppliers

a. IBM Corp, 1 New Orchard Rd, Armonk, NY 10504-1722.
b. R Development Core Team, R software. Available at: http://www.r-project.org/.

Keywords

Adaptation, psychological; Models, structural; Rehabilitation; Self efficacy; Social participation; Spinal cord injuries

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