

ORIGINAL ARTICLE

# Self-efficacy and self-esteem as predictors of participation in spinal cord injury—an ICF-based study

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**Study design:** A multi-centre cross-sectional study.

**Objective:** To examine the relationship of self-efficacy and self-esteem with participation of persons with spinal cord injury (SCI) from a comprehensive bio-psycho-social perspective, based on the conceptual framework of the International Classification of Functioning, Disability and Health (ICF).

**Setting:** Community-dwelling participants, <5 years post discharge, recruited through three SCI rehabilitation centers in Switzerland.

**Methods:** Data were collected by means of standardized self-report questionnaires sent to the eligible participants by postal mail. The questionnaires covered the different components of the ICF's bio-psycho-social model, namely health conditions, body functions, participation, environmental and personal factors. Bivariate correlations and multivariate linear regression analyses with participation as the dependent variable have been conducted.

**Results:** In all, 102 persons with SCI answered the survey, response rate 25.9%. Self-esteem ( $r=0.61$ ) and self-efficacy ( $r=0.54$ ) correlated highly with participation and were the strongest correlates of participation. They were stronger correlates of participation than symptoms of anxiety, depressive symptoms, pain, health conditions, social support, coping styles or sense of coherence. Participation seemed to be independent of gender, age, level or completeness of injury. Self-efficacy and self-esteem explained together with time since discharge and years of education 48% of the variance in participation adjusting for health condition, depressive symptoms, pain interference and social support.

**Conclusion:** Considering self-efficacy and self-esteem within the comprehensive framework of the ICF can contribute to a better understanding of functioning, disability and health in SCI, which in turn may facilitate the development of interventions to support the persons' adjustment and reintegration.

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**Keywords:** spinal cord injuries; self-efficacy; self-esteem; participation; psychological adaptation

## INTRODUCTION

Spinal cord injury (SCI) is a health condition, which has not only severe physical, but may also have psychological and social consequences. The consequences depend on the level and completeness of the lesion, on facilitators and barriers in the surrounding environment as well as characteristics of the person. Functioning of the affected individuals, even with the same lesion level, may therefore vary considerably.<sup>1</sup>

A conceptual framework that corresponds to the complexity and many-faceted nature of SCI is provided by the World Health Organization's International Classification of Functioning, Disability and Health (ICF).<sup>2</sup> The ICF is based on an integrative bio-psycho-social model and serves as a reference for the description and understanding of functioning. Functioning is an umbrella term referring to body functions and structures, activities and participation. These components interact with the health condition (for example, disease or trauma), as well as with environmental and personal factors (PFs) (Figure 1).

The ICF component '*personal factors*' includes psychological resources, which might serve to buffer negative consequences of and

to enhance adjustment to SCI. Among them, self-esteem and self-efficacy are prominent factors.<sup>3</sup> Self-efficacy relates to 'beliefs in one's capabilities to organize and execute courses of action required to produce given attainments'.<sup>4</sup> In other words, it is the belief '*I can do it*'. Self-esteem is a general evaluation of the self-concept and the 'sense of personal worth or worthiness'.<sup>5</sup> Put in simplified terms, it is the belief that '*I am all right the way I am*'.

According to the findings of previous research in SCI, self-esteem and self-efficacy seem to be associated with different components of the ICF framework. Regarding health conditions, persons with high self-efficacy or self-esteem show better mental health<sup>6</sup> and less secondary physical conditions.<sup>7</sup>

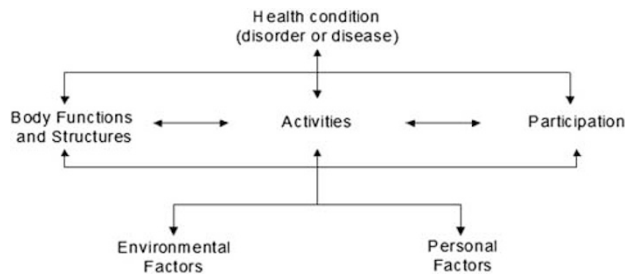
At the body level, high self-esteem and self-efficacy were associated with less impairment<sup>8</sup> and might be compromised by pain.<sup>9</sup> Concerning environmental factors, self-efficacy and self-esteem seem to be associated with social support in SCI, although some findings were contradictory.<sup>10</sup>

Although persons with high self-efficacy and self-esteem consistently report higher life satisfaction and well-being,<sup>11,12</sup> the relation of self-efficacy and self-esteem to participation as a key outcome of

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**Figure 1** The bio-psycho-social model of functioning, disability and health.<sup>2</sup>

rehabilitation has seldom been examined in SCI.<sup>13</sup> So far, only few studies have considered the complex and interactive nature of functioning and the full range of factors that may contribute to participation.

Therefore, the objective of this study is to examine the relationship of self-efficacy and self-esteem with participation of persons with SCI from a bio-psycho-social perspective. In particular, the study aims (1) to explore, if self-efficacy and self-esteem relate to participation, and (2) to analyze the relationships between self-efficacy and self-esteem with participation adjusting for the influence of health conditions, body function impairments, environmental and PFs based on the ICF.

We hypothesize that the PFs self-efficacy and self-esteem are significantly related to participation and remain significant even if relevant covariates from other components of the ICF-model are taken into account.

## METHODS

### Study design

A multi-centre cross-sectional study was conducted including people with SCI living in the community. Recruitment of participants was carried out through three major SCI rehabilitation centers in Switzerland (University Hospital Balgrist, Paraplegic Centre, Zurich; Swiss Paraplegic Centre, REHAB Basel; Swiss Paraplegic Centre (SPZ), Nottwil). The design and materials of the study were approved by the local ethics committees.

### Participants

Persons were eligible for participation if they have sustained a spinal cord lesion due to injury, iatrogenic or comiogenic causes (for example, surgical procedures, radiation or medical complication), or owing to acute non-progressive diseases (for example, infection, bleeding or ischemic event). German-speaking persons 18 years and older were included who have been living in the community between 6 months to 5 years at the beginning of the data collections. The person had to provide a signed informed consent form. Persons were excluded if they had a progressive neurological disorder, a neoplasm of the spine, or a concurrent neurological condition that affected mental functions, for example, traumatic brain injury, cerebral ischemia or intracerebral hemorrhage.

### Instruments, materials and procedures

Data were collected by self-report questionnaires sent to the eligible participants by postal mail. The questionnaires were selected to cover all components of the ICF's bio-psycho-social model: health conditions, body functions, participation, environmental and PFs (Table 1). Standardized questionnaires used were the Brief Pain Inventory,<sup>17</sup> the Hospital Anxiety and Depression Scale,<sup>16</sup> the Short Form Social Support Questionnaire,<sup>18</sup> the General Self-Efficacy Scale,<sup>15</sup> the Rosenberg Self-Esteem Scale,<sup>5</sup> Coping Inventory for Stressful Situations,<sup>19</sup> and the Sense of Coherence Scale.<sup>20</sup> The dependent variable participation was measured by the Reintegration to Normal Living Index<sup>14</sup> covering the domains mobility, self-care, work, leisure, community life, relationships and handling demands. Thus, it addresses topics from 6 out of

9 chapters of the ICF's classification of activities and participation. It focuses on performance according to a subjective norm, and takes into account the use of assistive devices and support for each question.

The Self-report Health Conditions Scale was specifically composed for this study. It contains 19 items that refer to groups of health conditions, diseases and disorders corresponding to the chapters of the ICD-10. The health conditions may exist in consequence of SCI or without relation to SCI and are clarified by accompanying examples in everyday language (for example, 'Infections—such as inflammation of the bladder or kidneys, pneumonia or brain fever'). The questions screen for the existence of health conditions within the past 6 months (yes/no) and the interference of the health conditions with everyday living (no, slight, moderate or severe).

In addition, socio-demographic and injury-related variables were documented: age, gender, marital status, level of education, employment status, date of event, etiology, level and completeness of injury.

## Analyses

Descriptive statistics are reported about the recruitment of participants, socio-demographic and lesion-related variables. The raw scores of the questionnaire variables are summarized. The study participants and the non-responders were compared according to age, gender, level and completeness of injury, time since onset and discharge from first rehabilitation using independent *t*-test,  $\chi^2$ -test, or Mann-Whitney *U*-test.

To explore if there is a relationship between self-efficacy and self-esteem with participation in persons with SCI, and to determine the strength of the relationships, bivariate Pearson's correlation coefficients were calculated. The strengths of the correlations is interpreted according to the classification by Cohen (1988) as low between 0.10 and 0.29, as moderate between 0.30, 0.49 and high above 0.50.<sup>21</sup>

To analyze the relationship between self-efficacy and self-esteem with participation adjusting for the influence of health conditions, body function impairments, environmental and PFs, multivariate linear regression models were set up, guided by the ICF's bio-psycho-social framework. Independent variables from each ICF component were pre-selected based on the significance of the bivariate correlation coefficients. These preselected variables entered in separate models per ICF component first, that is, one model for health conditions, one model for body functions and so on. The final model enclosed all those variables, which were significant in the previous separate models, and covers all ICF components.

For the independent variables, the standardized regression coefficients with *P*-values are reported. For all models, explained variance is given by the adjusted *R*<sup>2</sup>-value, significance of the model is examined using *F*-tests. Model diagnostics included examining the number of outliers ( $>3$  s.d.), influential data points (based on Cook's distance), testing for multicollinearity with the variation-inflation-factor, for independence of residuals with the Durbin-Watson test, homogeneity of the residuals with Q-Q plots (heteroscedasticity), and for normal distribution of residuals with the Kolmogoroff-Smirnoff test.

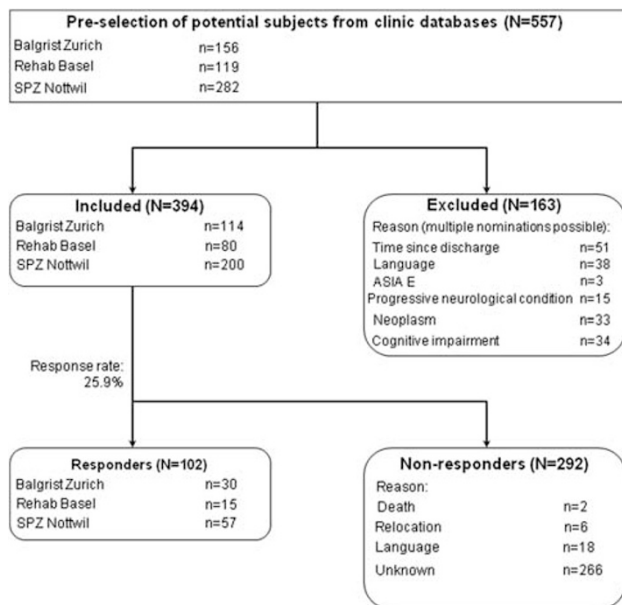
## RESULTS

In the three-study centers, 557 persons with SCI were screened for eligibility, 394 persons were invited to participate in the study and 102 responded to the questionnaires (response rate: 25.9%) (Figure 2). The socio-demographic and lesion-related characteristics of the study participants are shown in Table 2. Participants were 57 years of age on average, 75% were male, 64% married or cohabiting. They had a median of 13 years of formal education and 45% were in paid employment or self-employed. SCI resulted from a traumatic event in 82% of the cases, in 14% from non-traumatic aetiology, 62% were paraplegic and 75% incomplete lesions. The lesion occurred on average 44 months ago, time since discharge from first rehabilitation was 38 months on average.

Comparing the study participants (*n*=102) with the eligible non-responders (*n*=292) shows that among the non-responders were significantly more women, and that time since onset and time since discharge were 4 months longer for the non-responders than for the

**Table 1** Study variables and measurement instruments

ICF-component	Measurement instrument	Subscale	Abbreviation	Variable type	Number of items	Scoring	Scoring range
Participation	Reintegration to Normal Living Index <sup>14</sup>	—	RNLI	Dependent variable	11	Summary score	10–100
Personal factors	General Self-Efficacy Scale <sup>15</sup>	—	GSE	Independent variable	10	Summary score	10–40
Personal factors	Rosenberg Self-Esteem Scale <sup>5</sup>	—	RSES	Independent variable	10	Summary score	0–30
Health condition	Self-report Health Conditions Scale	Number of health conditions	SHCS-N	Control variable	19	Summary score	0–19
		Limitations due to health conditions	SHCS-L	Control variable	19	Mean	1–4
Body functions	Hospital Anxiety and Depression Scale <sup>16</sup>	Anxiety symptoms	HADS-A	Control variable	7	Summary score	0–21
Body functions	Brief Pain Inventory <sup>17</sup>	Depressive symptoms	HADS-D	Control variable	7	Summary score	0–21
		Pain intensity	BPI-Intens	Control variable	4	Mean	0–10
		Pain interference	BPI-Interf	Control variable	7	Mean	0–10
Environmental factors	Short-Form Social Support Questionnaire—6 <sup>18</sup>	Number of support persons	SSQ-N	Control variable	6	Mean	0–9
Personal factors	Coping Inventory for Stressful Situations—21 <sup>19</sup>	Satisfaction with support	SSQ-S	Control variable	6	Mean	1–6
		Task-oriented coping	CISS-T	Control variable	7	Mean	1–5
		Emotion-oriented coping	CISS-E	Control variable	7	Mean	1–5
Personal factors	Sense of Coherence Scale 13 <sup>20</sup>	Avoidance-oriented coping	CISS-A	Control variable	7	Mean	1–5
		—	SOC	Control variable	13	Summary score	13–91

**Figure 2** Recruitment of study participants.

study participants. Table 3 summarises the scores from the 15 questionnaire variables in the study group.

To explore if self-efficacy and self-esteem are related with participation of persons with SCI, bivariate Pearson's correlation coefficients were calculated. Self-esteem ( $r=0.61$ ) and self-efficacy ( $r=0.54$ ) cor-

related highly with participation and were overall the strongest correlates of participation. Table 4 shows the correlation matrix among all study variables.

The results of the multivariate linear regression analyses guided by the bio-psycho-social model are summarized in Table 5. In the separate models for each ICF component, none of the assessed health condition variables was significantly related to participation. Within the component body functions, depressive symptoms ( $\beta=-0.47$ ,  $P=0.00$ ) and pain interference ( $\beta=-0.20$ ,  $P=0.05$ ) were significant predictors, explaining 26% of variance in participation. From the component of environmental factors, the amount of social support and the satisfaction with social support were both not significant. With respect to the PFs, self-efficacy ( $\beta=0.24$ ,  $P=0.02$ ) and self-esteem ( $\beta=0.46$ ,  $P=0.00$ ) were significant, with the model explaining 41% of variance. Finally, from the socio-demographic and lesion-related variables, education ( $\beta=0.28$ ,  $P=0.01$ ) and time since discharge ( $\beta=0.23$ ,  $P=0.02$ ) were significant in the separate models.

All significant variables from the separate models entered the final regression analyses. In addition, the limitations owing to health conditions and the number of persons providing social support were also included in the final model to represent the health conditions and the environmental factors of the ICF, although they were not significant. From the eight variables, which entered the final model, four proved to be significant predictors of participation, namely self-efficacy ( $\beta=0.22$ ,  $P=0.02$ ), self-esteem ( $\beta=0.27$ ,  $P=0.02$ ), years of education ( $\beta=0.23$ ,  $P=0.00$ ) and time since discharge ( $\beta=0.18$ ,  $P=0.02$ ). This final model was significant ( $F=11.79$ ,  $df=8$ ,  $P=0.00$ ) and explained 48% of variance in participation ( $R^2_{adj}=0.48$ ). According to the model diagnostics, the final model did not display violations of the presumptions of linear regression.

**Table 2** Socio-demographic and spinal cord injury related characteristics of the study participants (n=102) and in comparison with the non-responders (n=292)

	Participants	Non-responder	Comparison			
			Test	Test value	df	P
Socio-demographic characteristics						
Years of age			t-test	1.928	223.04	0.06
Mean (s.d.)	56.5 (16.7)	52.6 (21.1)				
Gender			χ <sup>2</sup> -test	4.438	1	0.04*
% Male	74.5	62.3				
Years of education						
Median (IQR)	13 (3)					
% Missing	6.9					
Marital status						
% Never married	18.6					
% Married or cohabiting	63.7					
% Separated, divorced, widowed	15.7					
% Missing	2.0					
Occupational situation						
% Paid work, self-employed	45.1					
% Unemployed	8.8					
% Retired	33.3					
% Other (student, house-maker, etc.)	10.8					
% Missing	2.0					
Spinal cord injury characteristics						
Aetiology						
% Sports injury	19.6					
% Traffic accident	18.6					
% Work accident	12.7					
% Fall	21.6					
% Other traumatic	9.8					
% Non-traumatic	13.7					
% Other	2.0					
% Missing	2.0					
Level of injury			χ <sup>2</sup> -test	0.026	1	0.87
% Paraplegia	61.8	62.6				
% Tetraplegia	38.2	37.4				
Completeness of injury			χ <sup>2</sup> -test	0.002	1	0.96
% Complete	26.5	26.7				
% Incomplete	73.5	73.3				
Time since onset						
Mean (s.d.) in months	43.6 (13.5)	48.0 (14.1)	t-Test	−2.824	184.35	0.01*
% Missing	0.0	1.0				
Time since discharge from first rehabilitation						
Mean (s.d.)/median (IQR) <sup>a</sup> in months	38.4 (13.9)	42.5 (22.8) <sup>a</sup>	MWUT	12 410.00		0.02*
% Missing	1.0	0.0				

Abbreviation: IQR, interquartile range; MWUT, Mann-Whitney *U*-test.\**P*<0.05.<sup>a</sup>Median and interquartile range are reported due to a significant Kolmogorov-Smirnov test ( $\alpha < 0.01$ ).

## DISCUSSION

This study examined the relationship of self-efficacy and self-esteem with participation of persons with SCI from a bio-psycho-social

perspective based on the ICF. Both, self-efficacy and self-esteem were strongly related to the level of participation. They were stronger correlates of participation than symptoms of anxiety, depressive

**Table 3** Questionnaire results

Variable	Scale	n	M	s.d.
Health conditions—number	SHCS-N	76	5.0	3.1
Health conditions—limitations	SHCS-L	37	1.8	0.8
Anxiety symptoms	HADS-A	97	5.9	4.2
Depressive symptoms	HADS-D	96	5.9	3.6
Pain intensity (last 24 h)	BPI-Intens	38	1.7	1.8
Pain interference	BPI-Interf	98	2.9	2.1
Participation	RNLI	94	78.2	19.1
Social support—number	SSQ-N	93	2.7	2.0
Social support—satisfaction	SSQ-S	90	5.5 <sup>a</sup>	1.2 <sup>b</sup>
Self-efficacy	GSE	101	30.2	6.9
Self-esteem	RSES	96	21.4	5.7
Task-oriented coping	CISS-T	100	3.6	0.8
Emotion-oriented coping	CISS-E	100	2.7	0.9
Avoidance-oriented coping	CISS-A	100	2.8	0.9
Sense of coherence	SOC	100	57.5	6.9

Abbreviations: BPI-Intens, Brief Pain Inventory-pain intensity; BPI-Interf, Brief Pain Inventory-pain interference; CISS-A, Coping Inventory for Stressful Situations-avoidance oriented coping; CISS-E, Coping Inventory for Stressful Situations-emotion oriented coping; CISS-T, Coping Inventory for Stressful Situations-task oriented coping; GSE, General Self-Efficacy Scale; HADS-A, Hospital Anxiety and Depression Scale-anxiety symptom; HADS-D, Hospital Anxiety and Depression Scale-depression symptom; RNLI, Reintegration to Normal Living Index; RSE, Rosenberg Self-Esteem Scale; SHCS-N, Self-report Health Conditions Scale-number of health conditions; SHCS-L, Self-report Health Conditions Scale-limitations due to health conditions.

<sup>a</sup>Median is reported due to a significant Kolmogorov-Smirnov test ( $P < 0.01$ ).

<sup>b</sup>Interquartile range is reported due to a significant Kolmogorov-Smirnov test ( $P < 0.01$ ).

symptoms, pain, health conditions, social support, coping styles or sense of coherence. Participation seemed to be independent of gender, age, level or completeness of injury. Self-efficacy and self-esteem explained together with time since discharge and years of education about half of the variance in participation in multivariate analyses adjusting for health condition limitations, depressive symptoms, pain interference and social support.

From the perspective of the ICF, the results can be seen as an indication for the relevance of PFs within the WHO's bio-psycho-social framework, which suggests that PFs could influence functioning, activities and participation. A current literature review indicates that PFs are an important and underestimated part of the ICF.<sup>3</sup> It points out that considering PFs can enhance the understanding of functioning, improve services for people with disabilities, and strengthen the individual's perspective in health care.

Participation is a key outcome in SCI rehabilitation and might be influenced by the beliefs of the person. Positively influencing these beliefs by tailored support and interventions could promote participation. However, in this study it remains unclear if positive beliefs are cause or effect of a high level of participation. Complex mediated or circular relationships can be hypothesized. Further studies, especially with experimental designs, or using more sophisticated analyses approaches, for example, structural equation modeling, would be necessary to clarify the relations. The significance of time since discharge also points to the need of longitudinal studies to elucidate the impact of potential influencing factors on participation and changes in the course of time.

The findings showed a positive association between self-efficacy and self-esteem on the one hand and participation on the other. In SCI, self-efficacy and self-esteem have seldom been examined in relation to participation. Small-to-moderate associations have been found between self-efficacy or perceived control with certain aspects of participation, such as physical activity, mobility, work, school, recreation or social integration.<sup>13</sup>

While the role of self-efficacy and self-esteem is supported by the findings, other psychosocial resources, like social support, sense of coherence or coping styles did not contribute to participation. Social support is an important predictor of physical and mental health as well as quality of life in SCI.<sup>10</sup> In contrast to our findings, it has also been reported to be related to certain aspects of participation, independence, functioning, mobility and productivity.<sup>10</sup> Sense of coherence has been examined in relation to psychological well being and psychosocial adjustment,<sup>22,23</sup> but has not yet been associated with participation in SCI. Coping in SCI has been studied in relation to adjustment.<sup>24</sup> Coping intervention had beneficial effects on leisure-time physical activity, one aspect of participation. However, in line with our results, Anderson *et al.*<sup>25</sup> found that coping strategies do not contribute significantly to participation. In the face of these sparse and mixed results, the question remains open, how psychosocial factors contribute to behavioral outcomes, such as activities and participation in SCI, and further study of these interrelations is warranted.

In this study, depressive symptoms correlated strongly with self-efficacy and self-esteem, stronger than with participation. But controlling for self-efficacy and self-esteem, depressive symptoms did not appear to be independent predictors of participation. Low self-efficacy and self-esteem can be considered as symptoms of depression according to the ICD-10. Thus, it could be hypothesized that self-efficacy and self-esteem work as mediators between depression and participation.

Several limitations of the current study need to be noted. The representativity of the study sample and the generalizability of the results can be questioned owing to the low response rate. The comparison of the responders and non-responders showed that age, level and completeness of injury did not differ. But non-responders were more frequently women and their injury dated back longer. The measurement of bio-psycho-social factors relied on generic instruments, which might have missed issues specific to SCI. The measurement of health conditions relied on a not validated instrument. Similar to the pain questionnaire, responses were frequently missing, which might have lead to underestimation due to lacking variance.

The rationale behind the modeling strategy in this study was to select for each of the components of the ICF representative variables that are frequently examined in current research as potential influencing factors of participation, and may also have a relation to the PFs self-efficacy and self-esteem. However, it is important to note that any selected variable does not totally represent the ICF components. For example, although social support is known as an important environmental factor that has a favorable influence on functioning and health, it does not represent the full scope of environmental factors. Especially, social support does not enclose paid or professional support, nor support by the social system, services and policies, nor influences of the physical environment, assistive devices or the accessibility of buildings. In our study, social support means personal support in the form of emotional support, comfort, care and acceptance. Data collection, which is more comprehensive in terms of the bio-psycho-social model, would be beneficial for future studies to better understand functioning following SCI.

Although participation is an essential construct in rehabilitation and the ICF is widely used as a reference to define it, participation remains the subject of heated debate. The lacking clarity of conceptualization and the shortcomings in operationalization are lamented in the scientific community.<sup>26</sup> Thus, for this study we chose a pragmatic approach towards capturing participation by using a measurement instrument that addresses a variety of topics across six chapters of the ICF's classification of activities and participation through a minimum number of items.



**Table 4 Statistically significant correlations among the study variables (Pearson's *r*)**

Variable	Abbreviation	SHCS-L	HADS-A	HADS-D	BPI-Intens	BPI-Interf	RNLI	SSQ-N	SSQ-S	GSE	RSES	CISS-T	CISS-E	CISS-A	SOC	Age	Gender	Education	Level	Compl	Time-I	Time-D
Health conditions—number	SHCS-N	0.39	0.21	0.23																		
Health conditions—limitations	SHCS-L		0.41	0.37		0.39	−0.29	−0.20	−0.25	−0.29			0.30		−0.34							
Anxiety symptoms	HADS-A			0.83		0.52	−0.42	−0.30	−0.38	−0.61	−0.62	−0.25	0.54		−0.54							
Depressive symptoms	HADS-D					0.47	−0.50	−0.32	−0.31	−0.57	−0.64	−0.25	0.54		−0.53							
Pain intensity	BPI-Intens																					
Pain interference	BPI-Interf						−0.38	−0.23	−0.30	−0.24	−0.45		0.40									
Participation	RNLI							0.26	0.20	0.54	0.61	0.38	−0.24		0.35			0.28			0.23	
Social support—number	SSQ-N										0.23											
Social support—satisfaction	SSQ-S								0.44		0.39		−0.31									
Self-efficacy	GSE										0.57	0.48	−0.27		0.41							
Self-esteem	RSES											0.40	−0.50		0.37							
Task-oriented coping	CISS-T													0.29	0.29							
Emotion-oriented coping	CISS-E													0.22								
Avoidance-oriented coping	CISS-A														0.20							
Sense of coherence	SOC															0.20						
Age	Age																	−0.22				
Gender	Gender																			0.26		
Education	Education																					
Level of injury	Level																			−0.39	0.21	
Completeness of injury	Compl																					
Time since injury	Time-I																				0.98	
Time since discharge	Time-D																				1.00	

Abbreviations: BPI-Intens, Brief Pain Inventory-pain intensity; BPI-Interf, Brief Pain Inventory-pain interference; CISS-A, Coping Inventory for Stressful Situations-avoidance oriented coping; CISS-E, Coping Inventory for Stressful Situations-emotion oriented coping; CISS-T, Coping Inventory for Stressful Situations-task oriented coping; GSE, General Self-Efficacy Scale; HADS-A, Hospital Anxiety and Depression Scale-anxiety symptom; HADS-D, Hospital Anxiety and Depression Scale-depression symptom; RNLI, Reintegration to Normal Living Index; RSE, Rosenberg Self-Esteem Scale; SHCS-N, Self-report Health Conditions Scale-number of health conditions; SHCS-L, Self-report Health Conditions Scale-limitations due to health conditions.

Note: correlations are significant at alpha <0.05 level. Correlations  $r \geq |0.26|$  are significant at alpha <0.01 level.

**Table 5** Results of the linear regression analyses guided by the ICF-model with participation as dependent variable (*n*=102)

Independent variables	Scales	Health conditions		Body functions		Environmental factors		Personal factors		Socio- demographic		Lesion- related		Final model	
		$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P
Health conditions—limitations	SHCS-L	-0.10	0.34											-0.05	0.54
Anxiety symptoms	HADS-A			0.08	0.62										
Depressive symptoms	HADS-D			-0.47	0.00									-0.10	0.36
Pain interference	BPI-Interf			-0.20	0.05									-0.13	0.15
Social support—number	SSQ-N					0.21	0.06							0.11	0.18
Social support—satisfaction	SSQ-S					0.11	0.31								
Self-efficacy	GSE							0.24	0.02					0.22	0.02
Self-esteem	RSES							0.46	0.00					0.27	0.02
Task-oriented coping	CISS-T							0.05	0.58						
Emotion-oriented coping	CISS-E							0.06	0.55						
Sense of coherence	SOC							0.24	0.35						
Education										0.28	0.01			0.23	0.00
Time since discharge												0.23	0.02	0.18	0.02
$R^2_{adj}$		0.00		0.26		0.06		0.41		0.07		0.04		0.48	
<i>F</i>		0.93		12.60		4.05		15.26		8.14		5.28		11.79	
df		1		3		2		5		1		1		8	
<i>P</i>		0.34		0.00		0.02		0.00		0.01		0.02		0.00	

Abbreviations: BPI-Intens, Brief Pain Inventory-pain intensity; BPI-Interf, Brief Pain Inventory-pain interference; CISS-A, Coping Inventory for Stressful Situations-avoidance oriented coping; CISS-E, Coping Inventory for Stressful Situations-emotion oriented coping; CISS-T, Coping Inventory for Stressful Situations-task oriented coping; GSE, General Self-Efficacy Scale; HADS-A, Hospital Anxiety and Depression Scale-anxiety symptom; HADS-D, Hospital Anxiety and Depression Scale-depression symptom; RNLI, Reintegration to Normal Living Index; RSE, Rosenberg Self-Esteem Scale; SHCS-N, Self-report Health Conditions Scale-number of health conditions; SHCS-L, Self-report Health Conditions Scale-limitations due to health conditions.  
 $\beta$ , standardized regression coefficient; *P*, error probability;  $R^2_{adj}$ , adjusted coefficient of determination; *F*, *F*-test value; df, degrees of freedom.

Considering the analyses, the regression diagnostics showed some problems in the model for health conditions, which was not significant, seven influential observations (Cook's  $d > 1$ ) and the homogeneity of the residuals were questionable (Q-Q plots). The model for the socio-demographic variables, with education as only independent variable, two outliers and some indication for heteroscedasticity were detected.

Although self-efficacy and self-esteem share one third of variance in the bivariate analyses and, thus, pose the risk of multicollinearity when entered together in a regression model, the checks for multicollinearity using the variation inflation factor did not indicate a problem in this regard.

## CONCLUSIONS

As only few studies considered the influence of psychosocial resources on participation, our results on the relevance of self-efficacy and self-esteem require replication. Quality of life, participation, physical and mental health are related, but not exchangeable outcomes. The role of psychosocial predictor variables might be specific to the particular outcome. Depending on the aims, interventions might focus on various targets, for example, self-efficacy and self-esteem to enhance participation, sense of coherence to enhance mental health, social support to enhance quality of life. It is to be stressed that all of these outcomes are important and should be continuously addressed by health professionals as they all together determine the immediate, everyday experience of living with SCI.

## DATA ARCHIVING

There were no data to deposit.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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