

Physical therapy after spinal cord injury: A systematic review of treatments focused on participation

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Abstract

Context

Over the last four decades, the focus of spinal cord injury (SCI) rehabilitation has shifted from medical management to issues that affect quality of life and community participation. Physical therapists (PTs) need to design and implement interventions that result in maximal participation to provide an individual with SCI an effective rehabilitation program.

Objective

The aim of this review is to assess the extent, content, and outcomes of physical therapy (PT) interventions focused on improving the participation of individuals with SCI.

Methods

A search was conducted in Medline, Embase, CENTRAL, CINAHL, PEDro, and PsycINFO. We included studies, of all designs, focused on improving the participation of individuals with SCI using PT interventions. The primary author and a reviewer independently selected articles for inclusion, assessed articles quality, and extracted the data.

Results

Five studies met the inclusion criteria. The interventions applied were 9- and 12-month body weight-supported treadmill training in two studies, a supervised 9-month exercise program, a 12-week home exercise program, and a 10-week multidisciplinary cognitive behavioral program for coping with chronic neuropathic pain. Four of five PT interventions positively impacted the individual's perceived participation and satisfaction with participation.

Conclusion

The body of research by PTs on interventions to improve participation is limited. PTs must document the effects of interventions with a valid outcome tool to enable more

research that examines participation. Expanding participation research will allow PTs to meet the needs of individuals with SCI and identify what interventions best facilitate integration into the community.

Keywords: Physical therapy modalities, Rehabilitation, Review, Social participation, Spinal cord injuries

Introduction

The International Classification of Functioning, Disability, and Health (ICF)¹ defines participation as an individual's involvement in life situations, and describes this concept in relation to the concepts health conditions, body functions and structures (impairments), activities, and contextual factors. The ICF is a comprehensive and widely accepted framework to classify and describe aspects of functioning, disability, and health in people with a broad spectrum of diseases and conditions, including spinal cord injury (SCI).^{2,3} As the social aspect of functioning, participation is achieved through a person's roles in family, community, and the larger society and, as such, is a highly valued rehabilitation outcome for people with disabilities, including those with SCI, their care partners, and society at large.⁴ According to Dijkers,⁵ participation can be considered as a key component of or as a contributor to quality of life (QOL), depending on how the QOL construct is conceptualized. In individuals with SCI, participation is more strongly associated with subjective QOL than are bodily impairments and activity limitations.^{6,7}

Physical therapy (PT) interventions potentially have targets across all three functioning domains of the ICF: body functions/structures, activities, and participation. Modifying specific body impairments such as strength, cardiovascular fitness, joint mobility, muscle extensibility, bone loss, pain, and spasticity may improve the ability to perform activities without assistance from a caregiver, or to perform tasks using compensatory methods with or without equipment. By reducing activity limitations, PT interventions may address the ultimate aim of rehabilitation, namely increased participation and thereby improved overall QOL.⁸

People with SCI nowadays are living longer and achieving greater functional independence as a result of improved medical, rehabilitative, technological, and pharmacological management of SCI.⁹ The research demonstrates that the focus of the rehabilitation for these individuals has shifted from medical management of the acute condition, to the issues of QOL, and community participation, particularly gainful work, community life, interpersonal relationships, and leisure activities, as these are strongly related to the subjective QOL.¹⁰⁻¹² Designing, implementing, and evaluating interventions that result in enhanced participation outcomes is a requirement for the PT profession and for individual PTs who aim to provide individuals with an SCI a successful rehabilitation program.¹³

At a time when PT clinical practice is increasingly based on available evidence, it is necessary to assess the outcomes of clinical interventions systematically through review processes. The purpose of this systematic review is to identify PT treatments with a focus on participation. The specific aims are to (1) assess if PTs design and implement interventions targeted on participation outcomes in individuals with SCI; (2) explore what kind of PT interventions are focused on participation outcomes; and (3) identify which aspects of participation PTs are pursuing in individuals with SCI. No prior systematic review of this topic was identified.

Methods

Search strategy

A literature search was conducted by the primary author in June 2013. Databases included were Medline (1964 to June 2013), Embase (1980 to June 2013), Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, 2012, Issue 2), CINAHL (1982 to June 2013), PEDro (1929 to June 2013), and PsycINFO (1806 to June 2013). The search was not restricted by language, research design, or characteristics of patients or treatments. Keywords used were: spinal cord injury *and* physical therapy *and* (participation *or* social adaptation/integration/roles *or* independent living *or* leisure activities *or* recreation *or* sports *or* work *or* return to work *or* vocational *or* employment, supported *or* family relations *or* parenting). The search strategy was adjusted for each database. We utilized MeSH terms, MeSH subhierarchy terms, thesaurus synonyms, and thesaurus words when the database offered this option. Details of the search strategies are provided in the Appendix 1. In addition, the reference lists of papers identified and of related systematic reviews¹⁴⁻¹⁶ were searched for further references.

Data collection

The primary author and another reviewer independently screened all 879 unduplicated titles and abstracts retrieved to identify potentially eligible studies, looking for the term or concept “physical therapy intervention”, “spinal cord injury”, and “participation”. The full text of 42 articles was obtained and evaluated by the primary author and a second independent reviewer, using the same criteria, now applied to the full text. Information relevant to the topic (design, methodological quality indicators, study purpose, PT treatment, participants, participation outcome measure(s), findings) was extracted independently by the latter pair and then compared to correct any discrepancies.

Quality assessment

The methodological quality of the studies that were found was rated using the Physiotherapy Evidence Database (PEDro) scale.¹⁷ This scale consists of 11 items of which the first is not included in calculating the PEDro score. Scores ranges from 0 to 10 with higher scores indicating a better methodological quality of the study. The

following cut points were suggested by PEDro to categorize studies by quality: excellent (9–10), good (6–8), fair (4–5), and poor (≤ 3).

Inclusion and exclusion criteria

We included studies if participation, as conceptualized in the ICF, was incorporated as an outcome measure to evaluate PT interventions, of individuals with traumatic or non-traumatic SCI, that targeted participation directly. We included as well studies where a measure of the participation was used as an outcome measure to evaluate the PT interventions with a different primary focus. We considered the PT interventions to be treatments carried out by the PTs where the type of procedural intervention was one that is included in the Guide to PT Practice of the American Physical Therapy Association.¹⁸ Papers were rejected for several reasons: disorders other than SCI, interventions delivered by other disciplines, non-intervention studies, articles that applied models such as the ICF to cases or treatment procedures, and articles that only described the validation of outcome measures.

Study outcomes

Both single-item participation outcome measures (e.g. yes/no employed, hours of socializing per week) and indices combining multiple items into a single score (e.g. CHART)¹⁹ were considered. Because some QOL instruments quantify satisfaction with aspects of participation, or score participation components as part of health-related QOL, studies using measures of QOL were also reviewed for relevant outcomes, and reported where they included (satisfaction with) aspects of participation.

Results

Five studies met the inclusion criteria (Table 1). The interventions used in two were 4.5 and 12 months of body weight-supported treadmill training (BWSTT).^{20,21} Two investigations evaluated a supervised 9-month exercise program,²² and a 12-week home exercise program, respectively.²³ The fifth intervention was a 10-week multidisciplinary cognitive behavioral program.²⁴

Table 1 .

Summary of PT intervention studies focusing on participation

Primary author	Design	PEDr score	Purpose: PT treatment and subjects	Participation outcome measures	Findings
Effing ²⁰ (2006)	Controlled single-case design	2	Purpose: investigate the effects of treadmill training (TT) on functional health status and QOL in subjects with a chronic incomplete SCI. First phase: 6 weeks of motor-driven treadmill with static body weight support (BWS) Second phase: 12 weeks of motor-driven treadmill with dynamic BWS Subjects: N = 3	SEIQoL COPM: perceived performance in the areas of self-care, productivity, and leisure Semi-structured interview of subjects and their partners about changes in daily life during and after TT	Positive changes were reported in the majority of the most important problematic activities in daily life (COPM scores: access to public facilities, concentration improvement during work, leisure activities). Reported changes in QOL are relatively small and different in nature for the three subjects
Heutink ²⁴ (2012)	Multicenter RCT	6	Purpose: evaluate the effects of a multidisciplinary cognitive behavioral treatment program on pain intensity and pain-related disability, and secondarily on mood, participation in activities, and life satisfaction. Multidisciplinary	Primary outcome: GPGQ-pain-related disability Secondary outcomes: UAL: participation in activities; and LiSat-9 life satisfaction	UAL: significant differences between the two groups were found after intervention (P = 0.034) and at follow-up (P = 0.008) LiSat-9 scores remained stable over time

Prim

Primary author	Design	PEDr score	Purpose: PT treatment and subjects	Participation outcome measures	Findings
Hicks ²² (2003)	RCT	5	cognitive behavioral therapy program with educational, cognitive, and behavioral strategies targeted at coping with chronic neuropathic pain. Program: 10 weekly sessions, 3 hours per session Subjects: N = 3	11-item PQOL: Participation-relevant items: how often get outside the house (e.g. driving, using public transportation, going into town), work situation, recreation, or leisure SF-36 Pain	The exercise group reported a better QOL than did the control group (P < 0.05)

Prim

Primary author	Design	PEDr score	Purpose: PT treatment and subjects	Participation outcome measures	Findings
			session Subjects: N = 21		
Hicks ²¹ (2005)	Longitudinal, prospective, within-subject design	3	Purpose: determine the effects of long-term BWSTT on functional walking ability and perceived QOL in persons with chronic incomplete SCI Program: 12 months, 3 sessions a week, 144 sessions Subjects: N = 14	IADL	Following BWSTT, no significant changes were found in perceived ability to perform IADLs. During the follow-up period exercise adherence (BWSTT alone or combined with fitness training) had significant positive correlations with change in perceived ability to perform IADLs ($r = 0.75$ and $r = 0.70$, BWSTT alone or combined with fitness training, respectively).
Mulroy ²³ (2011)	RCT	7	Purpose: determine the effect of an exercise program (shoulder strengthening and stretching	Secondary outcomes: SII, SF-36 role physical (RP) and bodily pain, and the SQOL	Community activity, as measured with the SII, increased more for the exercise/movement optimization group ($P \leq 0.03$). Overall

Prim

Primary author	Design	PEDr o score	Purpose: PT treatment and subjects	Participation outcome measures	Findings
			exercises) and instruction in performance of upper-extremity tasks (transfers, raises, and wheelchair propulsion) on shoulder pain in people with paraplegia 12 weeks shoulder home exercise program Subjects: N = 40		SQOL scores increased following the intervention (P = 0.04). The largest improvements were seen in the SF-36 subscales of RP (physical limitation in fulfilling life roles) (P ≤ 0.05)

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Study characteristics and findings are summarized in Table 1. A total of 191 participants were included in the five studies. Their mean age was 43.8 years, and the majority were males (70.6%) living in the community.

Three studies were randomized controlled trials (RCTs)²²⁻²⁴ with the control groups of between 13 and 40 participants. The intervention groups ranged from 21 to 40 participants. Two of these RCTs used a wait list control design.^{22,24} The third RCT compared two different training methods for a home exercise intervention.²² The other two studies used longitudinal prospective designs (Table 1).^{20,21} The methodological quality scores on the PEDro scale ranged from 1 to 7, with a median of 4,6.

Four different self-report measures of participation were used: the Utrecht Activities List (UAL),²⁴ the Social Interaction Inventory (SII),²³ Lawton's Instrumental Activities of Daily Living (IADL),²¹ and the Canadian Occupational Performance Measure (COPM).²⁰ Five different QOL scales measuring aspects of participation were used: the Schedule for the Evaluation of Individual Quality of Life (SEIQoL),²⁰ the Life Satisfaction Questionnaire (LiSat-9),²⁴ the Perceived QOL scale (PQOL),²² the Short-Form 36-Item Health Survey (SF-36),²³ and the Subjective Quality of Life Scale (SQOL).²³

Meta-analysis was not applicable because of the considerable heterogeneity (clinical and otherwise) of the studies. The overall results of the five studies point to a relationship between PT interventions and improvement in participation. BWSTT and the exercise programs impacted the individuals' perceived participation and QOL positively with statistically significant results (Table 1).

Three of the five studies finding a statistically significant increase in participation strongly suggested that this came about through a decrease in pain.²²⁻²⁴ Two studies included global health measures,^{20,21} which had pain as a component of the scale.

Discussion

The first aim of this study was to assess if PTs design and implement interventions targeted on participation outcomes in individuals with SCI. We found five articles that met the inclusion criteria, indicating a lack of documented research on PT interventions for improving participation. The PT interventions administered to improve participation were (aim 2) ambulation training with BWSTT, supervised exercise, and home exercise. In addition, a goal of one study was to achieve improvements in participation using an interdisciplinary cognitive behavioral approach conducted by a psychologist and a physiotherapist.²⁴ Participation gains identified (aim 3) included access to public facilities, ability to work, leisure time activities (including exercise, sports, hobbies), family life (including housekeeping), and social functioning.

It is somewhat surprising that only five studies were found, and it may seem that PTs are not focusing on improving participation. However, ~200 of the rejected papers included aspects of participation, but they did not meet the inclusion criteria for this review (e.g. studies discussing the creation or validation of participation-related outcome measures, disorders other than SCI, non-intervention studies, and disability models applied to cases). This would suggest that participation is not a concept that is alien to the PTs; however, published research, specifically the research designed to assess the PT interventions' effect on the participation, is limited.

There may be several reasons for the shortage of research in this area. According to Geyh *et al.*,²⁵ the concentration on the biomedical problems in the SCI rehabilitation, to the exclusion of the psychosocial issues, distorts the perspectives and even interferes

with patient care.^{25,26} The ICF model is based on the “biopsychosocial” paradigm to provide a comprehensive view of the different dimensions of health from a biological, psychological, and social perspective.²⁷ While the ICF as an integrative paradigm is still not fully assimilated into clinical practice,^{2,28} many efforts are underway to incorporate the ICF framework in the thinking and operations of disciplines such as PT.^{4,29–32}

A second possible explanation for the paucity of investigations in this field is the lack of a universally accepted participation measure used by PTs in their treatment documentation. In the inpatient rehabilitation setting, the Functional Independence Measure^{15,33} and the Spinal Cord Independence Measure³⁴ may be implemented from admission to discharge, but these do not include the items of participation. The consistent use of measures of participation such as the CHART or the Impact on Participation and Autonomy,^{15,35} would help PTs to describe participation needs and further explore the efficacy of interventions aiming to enhance participation. The taxonomy of the SCI PT interventions developed in 2009 as a part of the SCIREhab Project³⁶ may provide a starting point for the PTs to evaluate which of the 19 treatment activities identified most effectively improves the participation.

Silver *et al.*³⁷ have identified barriers to community reintegration encountered by individuals with SCI during the first year after discharge from inpatient rehabilitation. The major categories of self-reported barriers were mobility issues (e.g. problems with transfers, balance), spasticity, lack of support transitioning to another living situation (e.g. acquiring the personal care assistance needed), poor skills needed for wheelchair maintenance, and access to wheelchair accessible transportation. Many of the barriers are issues that PTs address in their interventions and are included in the taxonomy. Measuring participation outcomes would provide PTs with a clearer understanding of which interventions effectively improve participation by helping persons with SCI overcome barriers that are acknowledged by this population.

Another possible explanation for the paucity of research is that PTs (similar to other rehabilitation specialists) typically do not work on improving “participation” directly; instead, they influence participation indirectly by improving aspects of body structure, body function, or activities that, in turn, have effects on “participation”. The lack of both a clear definition of “Participation” and “Participation restrictions” in the ICF and a lack of differentiation in the ICF’s taxonomy of activities and participation (the d-codes) both make it difficult to argue one way or another, if one uses ICF as one’s guidebook.³⁸ But even if PTs only work on impairments and activity limitations after SCI, it would be helpful to include measures of participation in their data collection so that the connection between basic functioning and activities, on the one hand, and participation on the other can be assessed.^{4,35} Only in that way can they determine whether the changes in body functions and activity limitations their treatments achieve are sufficiently large and well-targeted to actually bring about significant improvements in participation—the area that really counts for patients.

A last reason for the scarcity of investigations could be the fact that, in the USA, the decreased length of stay (LOS) for individuals with SCI in inpatient rehabilitation is not sufficient for participation-oriented treatment and evaluation of any resulting participation changes. Many patients may be medically restricted from practicing skills, such as wheelchair mobility, that would provide for participation opportunities,^{39,40} although in many cases it is followed by extensive outpatient rehabilitation.⁴¹ The median length of acute rehabilitation hospitalization in the USA from 2005 to 2010 was 37 days.⁴² Individuals with SCI may perform be discharged without the knowledge and the functional skills necessary for community level participation. However, a study by Whiteneck *et al.*⁴² examining inpatient and outpatient hours of rehabilitation services received during the first year after SCI revealed that a significant proportion of PT services were received after discharge from the inpatient setting. In fact, the estimated total number of hours of post-discharge PT was greater than the number of hours of inpatient therapy. In this situation, there certainly is sufficient opportunity for PTs to teach skills relevant to community functioning; in fact, all five of the studies included in this review involved community-resident persons with SCI. In Western Europe and the rest of the world, inpatient LOS tends to be much longer than in the USA, and is followed by often extensive outpatient treatment. Generally, the outpatient setting presents more challenges for research by PTs. The comprehensive interdisciplinary approach to patient care may be less consistently applied in the outpatient setting, and there are usually fewer resources to support research. However, given the fact that outpatients are already living in the community, one might ask: what a better place than outpatient to address participation issues. Future studies should examine the impact of post-discharge care on participation outcomes in greater detail.⁴²

Recently, community participation issues have been highlighted as a research priority for people with SCI.^{43,44} PTs need to consider contextual factors (personal and environmental features) and their impact on all three functioning categories of the ICF model (impairments, activities, and participation).³³ The relationship between the three domains of the ICF is clear: impairments impact activities and activities have an impact on participation. Integrating validated participation measures will provide a means to research how effective various PT interventions are in targeting participation.

Personal factors that influence participation, such as motivation, may be enhanced by including mentors during individual and group PT sessions to facilitate the process of community participation.^{45,46} Cognitive and behavioral strategies used by PTs also plays a key role in physical activity in this population, along with enhancing motivation.⁴⁷ A study by Sand *et al.*⁴⁶ found that having clear information during the hospital stay about the injury, patient participation in planning the rehabilitation program, and emotional support were important factors influencing the rehabilitation process. Strategies such as accepting assistance and finding a role model (another person with SCI who already was physically active) had a positive effect on participation in physical

activities following rehabilitation.^{46,47} Educational sessions can be used to enhance coping strategies and problem solving skills for the patient and the family.⁴⁶ Papadimitriou⁴⁸ describes how the interactions between the patient and the PT are crucial for people with SCI to transition to a new framework or perspective, named “newly abled”. Acquiring this new perception of one's self is a collaborative process between the patient and the PT and reinforces patients' involvement in their rehabilitation.

Finally, the participation gains identified in this review related to work, access to public facilities, leisure time activities, and social functioning may also reduce the incidence of secondary medical problems. According to Hammell,⁴³ individuals with SCI identify pain-related disability, depression, fatigue, pressure sores, spasticity, and the management of bladder and bowel as research priorities. In this review, three of the five studies measured pain-related disability as an outcome.²²⁻²⁴ High levels of pain and spasticity have been associated with lower QOL in individuals with SCI.^{36,49-51} Both are impairments in the ICF model and may impact mobility activities negatively, which would decrease participation. Moreover, perceived participation restrictions are determinants of life satisfaction in people with SCI.^{52,12} Research is needed to address the complexities of the secondary conditions of people living with SCI, what interventions are used to prevent them, and their relationship to the participation restrictions.

The main limitation of our systematic review is the low number of studies available for analysis, making drawing conclusions on the (relative) effectiveness of various PT interventions difficult. Another limitation to be considered is posed by the quality of the studies included. Two of the five are not RCTs, limiting the strength of the conclusions that can be drawn as to treatment effectiveness.

Conclusions

We did find five studies on PT interventions with a focus on participation allowing a preliminary conclusion supporting exercise and gait training both have a positive effect on participation after SCI. The specific aspects of participation that were impacted included work, social, family, and leisure participation.

However, the fact that PT research does not include measures of participation does not mean that PTs are not addressing participation in their interventions. We can only identify the effectiveness of these interventions by conducting more research. Including valid participation outcome measures will provide a better understanding of how community participation may be increased and lead to identifying effective interventions for this population. As participation represents a key outcome of rehabilitation, further research by PTs is required to provide evidence for interventions

measured with valid participation outcome tools that enhance participation in individuals with a SCI.

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Appendix 1 Search strategies for various databases

Databases Search strategy

MEDLINE (PubMed)

Spinal cord injuries [MeSH] or spinal cord inj* [tw] or tetrap* [tw] or quadrip*[tw] or quadriplegia [MeSH] or parapl*[tw] or paraplegia [MeSH]

Physical therap* [tw] or physiotherap*[tw] or physical therapy modalities [MeSH] or physical therapy specialty [MeSH]

Social participation [MeSH] or social support [MeSH] or consumer participation [MeSH] or patient participation [MeSH] or interpersonal relations [MeSH] or independent living [MeSH] or leisure activities [MeSH] or job satisfaction [MeSH] or sports [MeSH]

Employment [MeSH] or employment supported [MeSH] or work [MeSH] or return to work [MeSH]

Parenting [MeSH] or family relations [MeSH] or family health [MeSH] or family [MeSH]

1 and 2 and (3 or 4 or 5)

EMBASE (Ovid)

Spinal cord injuries.mp. or spinal cord injury/ or spinal cord inj*.mp or paraplegia/ or parapl*.mp or quadriplegia

Physical therapy modalities.mp or physiotherapy/ or physical therap*.mp or physiotherapy practice/ or physiotherapist/

Consumer participation.mp or social support.mp or independent living.mp or social adaptation.mp or social interaction.mp or social functioning.mp or International Classification of Functioning, Disability, and Health.mp

Work/ or work.mp or vocational rehabilitation/ or return to work.mp or employment/ or employment.mp or employment supported.mp

Parenting/ or parenting.mp or family relations.mp or family.mp or family health.mp

1 and 2 and (3 or 4 or 5)

PEDro (website)

Abstract & Title: spinal cord injury and (participation or return to work or family)

Databases Search strategy

**CENTRAL
(CLib)**

Spinal cord injury [MeSH] or spinal cord inj* [tw] or parapl* [tw] or paraplegia [MeSH] or tetrap* [tw] or quadrip* [tw] or quadriplegia [MeSH]

Physical therapy modalities [MeSH] or physical therap* [tw] or physiotherap* [tw] or physical therapy specialty [MeSH]

Social participation [MeSH] or social support [MeSH] or independent living [MeSH] or interpersonal relations [MeSH] or patient participation [MeSH] or consumer participation [MeSH] or leisure activities [MeSH] or sports [MeSH] or job satisfaction [MeSH]

Employment [MeSH] or employment supported [MeSH] or work [MeSH] or return to work [MeSH]

Parenting [MeSH] or family relations [MeSH] or family health [MeSH] or family [MeSH]

1 and 2 and (3 or 4 or 5)

**CINAHL
(Ovid)**

Spinal cord injuries.mp or spinal cord inj*[tw] or parapl* [tw] or quadrip* [tw] or tetrap*[tw]

Physical therapy.mp or physical therapy practice.mp or physical therapy practice, evidence-based.mp or physical therapy assessment.mp, physical therapy.mp or home physical therapy.mp or physical therap*[tw]

Community role.mp or interpersonal relations.mp or consumer participation.mp or leisure activities.mp or social support.mp or sports.mp or community living.mp or International Classification of Functioning, Disability, and Health.mp

Work.mp or job Re-entry.mp or employment.mp or employment, supported.mp or employment of disabled or return to work [tw]

Databases Search strategy

Family.mp or family relations.mp or parenting.mp or parents, disabled.mp

1 and 2 and (3 or 4 or 5)

PsycINFO
(Ovid)

Spinal cord injuries.mp or exp Spinal cord injuries/ or spinal cord inj*.mp or paraplegia.mp or exp paraplegia/ or quadriplegia.mp or exp quadriplegia/ or tetraplegia.mp

Physical therapy.mp or exp physical therapy/ or physical therap*.mp or physiotherapy.mp or physical therapy modalities.mp or exp physical therapy methods/

Participation/ or exp interpersonal relations/ or exp group participation or exp relationship satisfaction/ or exp community involvement/ or exp interpersonal interaction/ or exp social adjustment/ or exp social support/ or exp self care skills/ or exp leisure time/ or exp recreation/ or exp sports/ or “sports (attitudes toward)”

Return to work.mp or work.mp or employment.mp or “work (attitudes toward)”/ or “Quality of Work life”/ or Reemployment/Employment status/ or Vocational rehabilitation or Supported employment/ or employment supported.mp

Parenting.mp or parenting skills.mp or parenting style.mp or family relations.mp or family.mp

1 and 2 and (3 or 4 or 5)

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References

1.World Health Organization. International classification of functioning, disability and health. Geneva: World Health Organization; 2001 [[Google Scholar](#)]

2.Post MW, Kirchberger I, Scheuringer M, Wollaars MM, Geyh S. Outcome parameters in spinal cord injury research: a systematic review using the International Classification of Functioning, Disability and Health (ICF) as a reference. Spinal Cord 2010;48(7):522–8 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]

3. Wee J An international comparative study assessing impairment, activities, and participation in spinal cord injury rehabilitation – a pilot study. *Asia Pac Disabil Rehabil* 2004;15(2):43 [[Google Scholar](#)]
4. Magasi SR, Heinemann AW, Whiteneck GG; Quality of Life/Participation Committee. Participation following traumatic spinal cord injury: an evidence-based review for research. *J Spinal Cord Med* 2008;31(2):145–56 [[DOI](#)] [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
5. Dijkers MP Individualization in quality of life measurement: instruments and approaches. *Arch Phys Med Rehabil* 2003;844 Suppl 2:S3–14 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
6. Whiteneck G, Meade MA, Dijkers M, Tate DG, Bushnik T, Forchheimer MB. Environmental factors and their role in participation and life satisfaction after spinal cord injury. *Arch Phys Med Rehabil* 2004;85(11):1793–803 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
7. Dijkers M Quality of life after spinal cord injury: a meta-analysis of the effects of disablement components. *Spinal Cord* 1997;35(12):829–40 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
8. Harvey LA, Lin CW, Glinsky JV, De Wolf A. The effectiveness of physical interventions for people with spinal cord injuries: a systematic review. *Spinal Cord* 2009;47(3):184–95 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
9. Ragnarsson KT Medical rehabilitation of people with spinal cord injury during 40 years of academic physiatric practice. *Am J Phys Med Rehabil* 2012;91(3):231–42 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
10. Sipski ML, Richards JS. Spinal cord injury rehabilitation: state of the science. *Am J Phys Med Rehabil* 2006;85(4):310–42 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
11. Hammell KW Exploring quality of life following high spinal cord injury: a review and critique. *Spinal Cord* 2004;42(9):491–502 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
12. Whalley Hammell K Quality of life after spinal cord injury: a meta-synthesis of qualitative findings. *Spinal Cord* 2007;45(2):124–39 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
13. Noreau L, Fougere P, Post M, Asano M. Participation after spinal cord injury: the evolution of conceptualization and measurement. *J Neurol Phys Ther* 2005;29(3):147–56 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
14. Van Asbeck FW, Raadsen H, van de Loo ML. Social implications for persons 5–10 years after spinal cord injury. *Paraplegia* 1994;32(5):330–5 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
15. Hill MR, Noonan VK, Sakakibara BM, Miller WC; SCIRE Research Team. Quality of life instruments and definitions in individuals with spinal cord injury: a systematic review. *Spinal Cord* 2010;48(6):438–50 [[DOI](#)] [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

16. Wilson JR, Hashimoto RE, Dettori JR. Spinal cord injury and quality of life: a systematic review of outcome measures. *Evid Based Spine Care J* 2011;2(1):37–44 [[DOI](#)] [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
17. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther* 2003;83(8):713–21 [[PubMed](#)] [[Google Scholar](#)]
18. American Physical Therapy Association. Guide to physical therapy practice. Alexandria: American Physical Therapy Association; 2003 [[Google Scholar](#)]
19. Alexander MS, Anderson KD, Biering-Sorensen F, Blight AR, Brannon R, Bryce TN, et al. Outcome measures in spinal cord injury: recent assessments and recommendations for future directions. *Spinal Cord* 2009;47(8):582–91 [[DOI](#)] [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
20. Effing TW, van Meeteren NL, van Asbeck FW, Prevo AJ. Body weight-supported treadmill training in chronic incomplete spinal cord injury: a pilot study evaluating functional health status and quality of life. *Spinal Cord* 2006;44(5):287–96 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
21. Hicks AL, Adams MM, Martin Ginis K, Giangregorio L, Latimer A, Phillips SM, et al. Long-term body-weight-supported treadmill training and subsequent follow-up in persons with chronic SCI: effects on functional walking ability and measures of subjective well-being. *Spinal Cord* 2005;43(5):291–98 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
22. Hicks AL, Martin KA, Ditor DS, Latimer AE, Craven C, Bugaresti J, et al. Long-term exercise training in persons with spinal cord injury: effects on strength, arm ergometry performance and psychological well-being. *Spinal Cord* 2003;41(1):34–43 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
23. Mulroy SJ, Thompson L, Kemp B, Hatchett PP, Newsam CJ, Lupold DG, et al. Strengthening and optimal movements for painful shoulders (STOMPS) in chronic spinal cord injury: a randomized controlled trial. *Phys Ther* 2011;91(3):305–24 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
24. Heutink M, Post MWM, Bongers-Janssen HMH, Dijkstra CA, Snoek GJ, Spijkerman DCM, et al. The CONECISI trial: results of a randomized controlled trial of a multidisciplinary cognitive behavioral program for coping with chronic neuropathic pain after spinal cord injury. *Pain* 2012;153(1):120–8 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
25. Geyh S, Nick E, Stirnimann D, Ehrat S, Muller R, Michel F. Biopsychosocial outcomes in individuals with and without spinal cord injury: a Swiss comparative study. *Spinal Cord* 2012;50(8):614–22 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
26. Dorsett P, Geraghty T. Health-related outcomes of people with spinal cord injury – a 10 year longitudinal study. *Spinal Cord* 2008;46(5):386–91 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]

27. Mathew KM, Ravichandran G, May K, Morsley K. The biopsychosocial model and spinal cord injury. *Spinal Cord* 2001;39(12):644–9 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
28. Escorpizo R, Stucki G, Cieza A, Davis K, Stumbo T, Riddle DL. Creating an interface between the International Classification of Functioning, Disability and Health and physical therapist practice. *Phys Ther* 2010;90(7):1053–63 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
29. Rauch A, Escorpizo R, Riddle DL, Eriks-Hoogland I, Stucki G, Cieza A. Using a case report of a patient with spinal cord injury to illustrate the application of the International Classification of Functioning, Disability and Health during multidisciplinary patient management. *Phys Ther* 2010;90(7):1039–52 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
30. Herrmann KH, Kirchberger I, Stucki G, Cieza A. The comprehensive ICF core sets for spinal cord injury from the perspective of physical therapists: a worldwide validation study using the Delphi technique. *Spinal Cord* 2011;49(4):502–14 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
31. Mulroy SJ, Winstein CJ, Kulig K, Beneck GJ, Fowler EG, DeMuth SK, et al. Secondary mediation and regression analyses of the PTClinResNet database: determining causal relationships among the International Classification of Functioning, Disability and Health levels for four physical therapy intervention trials. *Phys Ther* 2011;91(12):1766–79 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
32. Cieza A, Kirchberger I, Biering-Sorensen F, Baumberger M, Charlifue S, Post MW, et al. ICF core sets for individuals with spinal cord injury in the long-term context. *Spinal Cord* 2010;48(4):305–12 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
33. Vocaturo LC Psychological adjustment to spinal cord injury. In: Sisto SA, Druin E, Sliwinski M. *Spinal cord injuries. Management and rehabilitation*. St. Louis: Mosby Elsevier; 2009, 104–120 [[Google Scholar](#)]
34. Catz A, Itzkovich M. Spinal Cord Independence Measure: comprehensive ability rating scale for the spinal cord lesion patient. *J Rehabil Res Dev* 2007;44(1):65–8 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
35. Ullrich PM, Spungen AM, Atkinson D, Bombardier CH, Chen Y, Erosa NA, et al. Activity and participation after spinal cord injury: state-of-the-art report. *J Rehabil Res Dev* 2012;49(1):155–74 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]
36. Natale A, Taylor S, LaBarbera J, Bensimon L, McDowell S, Mumma SL, et al. SCIRehab Project series: the physical therapy taxonomy. *J Spinal Cord Med* 2009;32(3):270–82 [[DOI](#)] [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
37. Silver J, Ljungberg I, Libin A, Groah S. Barriers for individuals with spinal cord injury returning to the community: a preliminary classification. *Disabil Health J* 2012;5(3):190–6 [[DOI](#)] [[PubMed](#)] [[Google Scholar](#)]

38. Piskur B, Daniels R, Jongmans MJ, Ketelaar M, Smeets RJ, Norton M, et al. Participation and social participation: are they distinct concepts? *Clin Rehabil* 2014;28(30):211–20 [DOI] [PubMed] [Google Scholar]
39. Taylor-Schroeder S, LaBarbera J, McDowell S, Zanca JM, Natale A, Mumma S, et al. The SCIRehab project: treatment time spent in SCI rehabilitation. Physical therapy treatment time during inpatient spinal cord injury rehabilitation. *J Spinal Cord Med* 2011;34(2):149–61 [DOI] [PMC free article] [PubMed] [Google Scholar]
40. Whiteneck G, Gassaway J, Dijkers M, Backus D, Charlifue S, Chen D, et al. The SCIRehab project: treatment time spent in SCI rehabilitation. Inpatient treatment time across disciplines in spinal cord injury rehabilitation. *J Spinal Cord Med* 2011;34(2):133–48 [DOI] [PMC free article] [PubMed] [Google Scholar]
41. National Spinal Cord Injury Statistical Center. Annual report for the Spinal Cord Injury Model Systems 2010. Birmingham: University of Alabama; 2011 [Google Scholar]
42. Whiteneck GG, Gassaway J, Dijkers MP, Lammertse DP, Hammond F, Heinemann AW, et al. Inpatient and postdischarge rehabilitation services provided in the first year after spinal cord injury: findings from the SCIRehab Study. *Arch Phys Med Rehabil* 2011;92(3):361–8 [DOI] [PubMed] [Google Scholar]
43. Hammell KR Spinal cord injury rehabilitation research: patient priorities, current deficiencies and potential directions. *Disabil Rehabil* 2010;32(14):1209–18 [DOI] [PubMed] [Google Scholar]
44. Kennedy P, Sherlock O, McClelland M, Short D, Royle J, Wilson C. A multi-centre study of the community needs of people with spinal cord injuries: the first 18 months. *Spinal Cord* 2010;48(1):15–20 [DOI] [PubMed] [Google Scholar]
45. Van Leeuwen CM, Kraaijeveld S, Lindeman E, Post MW. Associations between psychological factors and quality of life ratings in persons with spinal cord injury: a systematic review. *Spinal Cord* 2012;50(3):174–87 [DOI] [PubMed] [Google Scholar]
46. Sand A, Karlberg I, Kreuter M. Spinal cord injured persons' conceptions of hospital care, rehabilitation, and a new life situation. *Scand J Occup Ther* 2006;13(3):183–92 [DOI] [PubMed] [Google Scholar]
47. Kerstin W, Gabriele B, Richard L. What promotes physical activity after spinal cord injury? An interview study from a patient perspective. *Disabil Rehabil* 2006;28(8):481–8 [DOI] [PubMed] [Google Scholar]
48. Papadimitriou C 'It was hard but you did it': the co-production of 'work' in a clinical setting among spinal cord injured adults and their physical therapists. *Disabil Rehabil* 2008;30(5):365–74 [DOI] [PubMed] [Google Scholar]

49.Westerkam D, Saunders LL, Krause JS. Association of spasticity and life satisfaction after spinal cord injury. Spinal Cord 2011;49(9):990–4 [DOI] [PMC free article] [PubMed] [Google Scholar]

50.Donnely C, Eng JJ. Pain following spinal cord injury: the impact on community reintegration. Spinal Cord 2005;43(5):278–82 [DOI] [PMC free article] [PubMed] [Google Scholar]

51.Putzke JD, Richards JS, Hicken BL, DeVivo MJ. Interference due to pain following spinal cord injury: important predictors and impact on quality of life. Pain 2002;100(3):231–42 [DOI] [PubMed] [Google Scholar]

52.Lund ML, Nordlund A, Bernspang B, Lexell J. Perceived participation and problems in participation are determinants of life satisfaction in people with spinal cord injury. Disabil Rehabil 2007;29(18):1417–22 [DOI] [PubMed] [Google Scholar]