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Participation in Organized Sports Is Positively Associated with Employment in Adults with Spinal Cord Injury

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Abstract

Objective—The aim of this study was to determine the association between participation in organized sports programs and employment in adults with chronic spinal cord injury.

Design—This is a cross-sectional study of 149 adults with chronic spinal cord injury. Motor level and completeness of injury were confirmed by physical examination. Information related to demographics, employment, level of education, body mass index, duration of injury, participation in individually planned exercise, and participation in organized sports was obtained using a standardized questionnaire. Multivariable logistic regression analyses were used to assess factors associated with employment.

Results—In univariate analyses, employment was associated with younger age ($P = 0.001$) and a higher level of education ($P = 0.01$), whereas obesity decreased the likelihood of employment ($P = 0.04$). Participation in organized sports approached significance ($P = 0.06$). In the multivariable analysis and after adjusting for age, education, and body mass index, participation in organized sports was significantly associated with employment (odds ratio, 2.4; $P = 0.04$). Sex, duration of injury, wheelchair use, and participation in individually planned exercise were not significantly associated with employment ($P = 0.16$ – 0.94).

Conclusions—In the adults with chronic spinal cord injury, participation in organized sports was positively associated with employment. Further studies are necessary to determine the causative nature of this association and how various factors related to sports participation may contribute.

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Keywords

Spinal Cord Injury; Employment; Sports; Exercise

In the United States, the Americans with Disabilities Act of 1990 exists to protect the employment rights of individuals with disabilities, to include nondiscrimination in hiring and promotions as well as access to reasonable accommodation for full accessibility of the workplace.¹ Despite this, the rate of employment for adults with spinal cord injury (SCI) remains low as compared with that for the general population. The data from the 2010 Annual Report for the SCI Model Systems reveal that, 5 yrs after injury, approximately 20.7% of adults with SCI were competitively employed. This proportion peaks at 36% for those who are 25 yrs postinjury.² These data are corroborated by the data retrieved from the United States Census Bureau revealing that, in 2008, a total of 28.7% of adults aged 21–64 yrs and with self-report of ambulatory disability were competitively employed.³ In contrast, the data from the United States Department of Labor, Bureau of Labor Statistics, reveal a civilian unemployment rate of 4.9%–10% for the general population older than 16 yrs throughout the years⁴ 2008–2010. Although it is unknown whether these reports define employment uniformly, these data are suggestive of the ongoing disparity in rates of employment for adults with SCI when compared with the general population.

It is commonly accepted that meaningful employment is a cornerstone of achieving self-efficacy and a sense of purpose into adulthood. Employment after SCI has been shown to be a critical component of life satisfaction, subjectively positive quality-of-life,^{5–10} and financial independence.^{11–13} Given this, much emphasis has been placed on the identification of social and demographic factors, in addition to targeted rehabilitation strategies, that may promote employment after SCI. Previous studies uniformly agree on factors such as level of education and functional independence as those positively correlated with employment.^{7,14–17} In addition, independent use of public or private transportation,⁷ white race,^{18,19} fewer medical complications,⁷ lack of concomitant brain injury,¹⁶ and inherently high motivation to work²⁰ have also shown positive correlation. Of interest, neurologic level of injury and ambulatory status have shown mixed results in their association.^{14,16}

In the ongoing effort to identify rehabilitation strategies that may stimulate employment after SCI, organized sports has come under investigation. Studies addressing the relationship between organized sports and employment have thus far shown mixed results. A German study focused on the effect of physical exercise on quality-of-life for adults with SCI reported that individuals involved in sports were also more likely to be employed.⁸ Countering this, Taseimski et al.²¹ found that, although both rates of participation in sports and employment decreased significantly after SCI, there was no association between the two. Similarly, Foreman et al.,²² in a study of the demographic and psychological factors that may influence sport participation, found no association between sports and employment status; however, the study did show that those with higher income were more likely to participate. Although several studies have linked fitness-related parameters to employment such as wheelchair mobility, body composition, power output, functional independence (as

measured by the Functional Independence Measure), number of medical complications, and perceived exertion,^{23–25} few have directly investigated the association between organized sports and employment.

Given these conflicting results and an overall paucity of information, this study aimed to determine the relationship between participation in organized sports and employment in a United States–based sample of adults with SCI.

METHODS

Participant Selection and Assessment of Level and Completeness of SCI

The authors studied participants with chronic SCI who were enrolled in the Boston SCI-Health Study.^{26,27} Participants were recruited from veterans who receive care at the authors' Veterans Affairs (VA) facility. Non-veterans were recruited by advertisement in SCI consumer magazines or by direct mail. Direct mail notifications were sent as follows: (1) to persons who previously received medical care at our non-VA acute rehabilitation facility; (2) to New England subscribers of New Mobility Magazine; and (3) to members of the National Spinal Cord Injury Association. Participants were eligible for the Boston SCI-Health Study if they were 22 yrs or older, were 1 yr after injury or longer, were not ventilator dependent, did not have a tracheostomy, and had no other neuromuscular disease. A total of 196 participants with SCI were enrolled in the Boston SCI-Health Study between August 2009 and January 2011. Because the current study examined factors related to employment status, all participants older than 65 yrs were excluded ($n = 47$). In total, 149 participants of employment age (24–65 yrs) were included in the current analysis. Of these 149 participants, 70 were veterans and 79 were nonveterans. This study was approved by the authors' institutional review boards, and all study participants gave informed consent. Motor level and completeness of injury were confirmed by physical examination by a trained rater according to the American Spinal Injury Association Impairment Scale.²⁸

Variable Selection and Definition

The authors considered sociodemographic factors (age, sex, and ethnicity), employment history, level of education, duration of injury, severity of injury, body mass index (BMI), mobility mode, participation in organized sports, and participation in planned exercise at the time of enrollment. The participants who reported having a full-time job, having a part-time job, or regularly volunteering were considered to be employed. Those who reported a status of unemployed, full-time student, retired, or not working because of disability or illness were considered to be unemployed. The students were considered to be unemployed given that they do not typically engage in income-generating activities. Age was assessed as a continuous variable and a categorical variable (< 55 yrs old or > 55 yrs old). Level of education was considered in two categories: completion of a high school education or lower (reported duration of education of ≤ 12 yrs) and completion of any amount of postsecondary education. For the calculation of BMI, the participants were weighed and supine length was measured. In the participants with severe joint contractures, length was self-reported ($n = 16$). Mobility mode was considered in four categories (use of a motorized wheelchair, use of a hand-propelled wheelchair, walking with an aid, and walking independently) and two

categories (walking and using a wheelchair). The participants were considered to be involved in organized sports if they responded yes to the question “Do you participate in any organized sports?” The participants were also asked in an open-ended fashion to list the type of sports in which they were involved. In addition, the participants were asked “How much time (minutes) in a typical week do you spend doing a planned exercise program?” The participants who reported not being involved in any planned exercise were classified into the “no exercise” category. For participants who reported any amount of regular exercise, the minutes spent per week were categorized into the following tertiles: tertile 1 (< 180 mins/wk), tertile 2 (181–360 mins/wk), and tertile 3 (>360 mins/wk).

Statistical Analysis

All analyses were performed using SAS 9.2 (SAS Institute, Inc, Cary, NC). *t* Tests and χ^2 tests were used to test for differences in subject characteristics on the basis of sports participation. Univariate analyses were conducted to assess associations between employment status and subject characteristics using logistic regression (Proc Logistic). Factors with a *P* value of less than 0.10 in the univariate logistic regression analysis, as well as factors that were deemed clinically significant (duration of injury), were included in the multivariable logistic regression analysis. Factors with a *P* value of less than 0.05 were considered statistically significant.

RESULTS

Subject Characteristics

A total of 149 (123 male and 26 female) participants were of employment age (24–65 yrs) and were included in the analysis (Table 1). Sixty-four participants were employed (37 full time, 22 part time, and 5 volunteering), and 85 were unemployed (49 not working because of disability or illness, 15 retired, 12 unemployed, and 9 full-time students). In total, 33 participants (22.2%) were involved in organized sports, whereas 116 (77.9%) were not. Several participants (*n* = 11) reported playing more than one sport, the most common of which were basketball (wheelchair or other) and tennis (wheelchair or other; Table 2). Of note, most participants involved in organized sports (*n* = 28, 84.8%) used a hand-propelled wheelchair as their primary mode of mobility (*P* = 0.006; Table 3). No other factor differed on the basis of sports participation (*P* = 0.13–0.80). Regarding time spent in individually planned exercise, 43 participants (28.9%) reported no exercise at all.

Factors Associated with Employment

The authors examined the association between employment after SCI and age (as both a continuous and a categorical variable), duration of injury, sex, level of education, BMI, severity of injury, wheelchair use, participation in organized sports, and participation in individually planned exercise using univariate logistic regression (Table 4). There was no significant association between employment and duration of injury (*P* = 0.19), sex (*P* = 0.43), wheelchair use (*P* = 0.33), and individually planned exercise (*P* = 0.16–0.94). The odds ratio for employment decreased significantly with age as a continuous variable (*P* = 0.01). However, employment and age were significantly associated only in the highest tertile (>55 yrs), and model fit was improved considering age in two groups: 55 yrs or younger and

older than 55 yrs. Employment was 70% less likely in those older than 55 yrs compared with those 55 yrs or younger ($P = 0.001$). In addition, those participants completing any amount of postsecondary education were 2.6 times more likely to be employed than those participants with a high school education or lower ($P = 0.01$). The participants with obesity were 56% less likely to be employed compared with the participants with a normal weight ($P = 0.04$). Those participating in organized sports were 2.1 times more likely to be employed compared with those who did not participate ($P = 0.06$). In the multivariable model, age of 55 yrs or younger ($P = 0.004$) and a postsecondary education ($P = 0.013$) were positively associated with employment (Table 5). The participants in organized sports were 2.4 times more likely to be employed than were the nonparticipants ($P = 0.04$). The association between employment and BMI approached significance ($P = 0.07$). When adjusting for these factors, duration and severity of injury were no longer associated with employment ($P = 0.08$ – 0.90).

DISCUSSION

In this study of 149 adults with SCI, participation in organized sports was associated with an increased likelihood of employment. This effect was independent of age, level of education, and BMI and was not observed with participation in individually planned exercise.

Several observations taken from these data warrant further discussion. First, the notable disparity between the influence of individually planned exercise vs. organized sports as interventions influencing employment after SCI is of interest (Table 4). This may indicate that factors such as increased socialization, informal peermentoring, and the self-confidence established through team sport participation may, in fact, be the variables most closely associated with the likelihood of returning to work, as opposed to parameters related to individual physical fitness. This concept is further supported by the finding of this study that sports participation does not vary on the basis of age, BMI, duration of injury, or severity of injury (Table 3), arguing against the notion that individual fitness may be the direct causal link between sport and employment. In addition, findings of previous studies note that, for those who return to employment after injury, this typically involves sedentary work that may be more reliant on a high degree self-confidence as opposed to physical fitness parameters. For example, in a recent study of 1329 adults with SCI aged 18–65 yrs, Krause et al.²⁹ found that preinjury employment in a management or professional position led to a greater likelihood of postinjury employment. A similar association was not seen in those with preinjury employment in natural resources, construction, maintenance, production transportation, and material moving. Similarly, Jang et al.,¹⁷ in a Taiwanese study evaluating 169 adults with SCI aged 18–60 yrs, found that most individuals who return to work after SCI do so with the initiation of jobs that are either sedentary in nature or involve light manual labor. Given these findings, in addition to the results of the current study, further investigation is needed regarding whether the personal attributes built through adaptive sport participation, such as self-confidence, may impact the likelihood of employment after SCI to a degree greater than the relative contribution of individual fitness. In addition, there is a notable lack of evidence regarding the association of sports participation and employment in the general population to make further inferences regarding the population of adults with SCI.

This cohort represented a highly educated population because 70.5% reported some degree of participation in postsecondary education. Although the observed association between participation in organized sports and employment was adjusted for level of education, this finding may indicate that concurrent factors such as level of financial independence and amount of expendable income may enable participants to acquire the equipment that is often necessary to participate in organized sports. Further studies are needed to determine whether participation in sports may lead one to be more likely to be employed *vs.* whether employment (and therefore increased financial independence) enables one to participate in organized sports.

The presumed association between organized sports and the ability to maintain a positive state of mental health also warrants further investigation. A recent study by Fann et al.³ revealed a 23% prevalence of probable major depression in adults with SCI, with 9% of respondents reporting symptoms of moderately severe or severe depression. In addition, previous studies have indicated a positive correlation between sports participation and general life satisfaction in adults with SCI.^{31–33} Indeed, it may be the case that those who participate in organized sports are less likely to be depressed, anxious, or currently experiencing adverse mental health symptoms. In this fashion, sports participation may act as a proxy for positive mental health, which, in turn, leads to an increased likelihood of employment. Again, if this were to be the case, it would remain unclear whether participation in sports acted as a treatment of depression and anxiety and therefore stimulated employment *vs.* whether the lack of these mental health comorbidities would lead one to be more likely to participate in sports.

The participants of this study were predominantly men (82.6%). Although this significant difference in sex reflects the distribution of SCI,² this creates difficulty in extrapolating these findings to also determine whether sports participation is an impactful rehabilitative tool for women. Further studies with specific focus on women with SCI are needed to understand whether sex differences may impact factors related to employment. In addition, as noted in Table 3, those participating in organized sports were predominantly users of hand-propelled wheelchairs (84.8%). This finding likely supports a nationwide trend toward the development of adaptive sports that cater specifically to users of manual wheelchairs and indicates an increased need for sports opportunities focused toward users of motorized wheelchairs.

The findings of this study add to the overall body of knowledge regarding the impact of organized sports on employment in adults with SCI, specifically with focus on a United States–based population. Although previous studies have addressed this association, discrepancies in methodology and international variation make it difficult to compare the results of the previous studies to those of this study. Specifically, three studies most directly questioned the relationship between sports participation and employment in adults with SCI. In a retrospective cross-sectional survey of a population of 277 adults with SCI in Germany, Anneken et al.⁸ found that individuals who were employed were more likely to play sports. It should be noted, however, that approximately one-third of these participants were recruited from a German Wheelchair Sport Federation, likely representing a significant sample bias. In addition, because incentives for employment are often inextricably linked to

domestic safety net programs and vocational rehabilitation paradigms, this German study may not be valid for making assumptions regarding a United States–based population. Similarly, in their study of 45 adults with SCI in the United Kingdom, Taseimski et al.²¹ found no significant correlation between participation in sports and likelihood of employment. Again, this United Kingdom–based sample may not be directly comparable with this study’s United States–based population when addressing factors related to employment. Finally, although Foreman et al.²² did find a statistically significant association between level of income and sports participation, this association was not observed between employment and sports. Similar to Anneken et al.,⁸ this Australian study recruited sports participants from a statewide disability sports organization database, whereas nonparticipants were recruited from “self-help and social organizations,”²² possibly leading to sample bias given the background sociocultural differences inherent to these groups.

This study was limited by several factors. It is possible that unmeasured environmental and social factors leading to participation in both employment and organized sports may have confounded these data, such as higher income, greater social support, and living in an urban setting with access to resources such as adaptive sports programming and vocational rehabilitation. In addition, the data regarding the type of organized sport in which the participants were involved showed significant heterogeneity, to include information related to both participation and coaching, sports that are played both indoors and outdoors, and sports played on a large team vs. in small groups. Future studies are needed to determine what factors inherent to these various types of sports may lead to association with employment in adults with SCI. In addition, given that the data regarding participation in organized sports was self-reported in a dichotomous fashion (yes/no), the quantity and the degree of participation was unknown.

CONCLUSIONS

In this study of 149 working-aged non–ventilator dependent adults with SCI, participation in organized sports was positively associated with employment. This effect was independent of age, level of education, and BMI and was not observed with participation in individually planned exercise. To further identify factors impacted by participation in organized sports, a longitudinal, prospective study using an intervention of organized sports as a novel rehabilitative strategy in adults with SCI is needed. By comparing an intervention group with controls who do not participate in sports, further data regarding the impact of sports participation on variables such as return to employment, level of income, rate of depression/anxiety, rate of medical comorbidities, and self-perceived quality-of-life can be more fully examined.

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TABLE 1

Participant characteristics

Variable	Employed (n = 64)	Unemployed (n = 85)	Total (N = 149)
Demographics			
Age, mean $\pm$ SD, yrs	46.7 $\pm$ 9.8	51.6 $\pm$ 10.5	49.5 $\pm$ 10.5
Age, range, yrs	25.2–64.1	24.0–64.7	24.0–64.7
55	50 (78.1)	44 (51.8)	94 (63.1)
>55	14 (21.9)	41 (48.2)	55 (36.9)
White	58 (90.6)	71 (83.5)	129 (86.6)
Duration of injury, mean $\pm$ SD, yrs	20.5 $\pm$ 10.8	17.9 $\pm$ 12.0	19.1 $\pm$ 11.6
Duration of injury, range, yrs	4.0–42.7	1.6–61.1	1.6–61.1
Sex			
Male	51 (79.7)	72 (84.7)	123 (82.6)
Female	13 (20.3)	13 (15.3)	26 (17.4)
Level of education			
High school or lower	12 (18.7)	32 (37.7)	44 (29.5)
More than high school	52 (81.3)	53 (62.3)	105 (70.5)
BMI, mean $\pm$ SD, kg/m ²	25.5 $\pm$ 5.0	27.4 $\pm$ 6.5	26.6 $\pm$ 5.9
Normal, <25	34 (53.1)	33 (38.8)	67 (44.9)
Overweight, 25–29	17 (26.6)	23 (27.1)	40 (26.9)
Obese, 30	13 (20.3)	29 (34.1)	42 (28.2)
Severity of injury			
Motor complete	43 (67.2)	44 (51.8)	87 (58.4)
Motor incomplete	21 (32.8)	41 (48.2)	62 (41.6)
Wheelchair use			
No wheelchair	15 (23.4)	26 (30.6)	41 (27.5)
Wheelchair	49 (76.6)	59 (69.4)	108 (72.5)
Participation in organized sports			
Participating	19 (29.7)	14 (16.5)	33 (22.1)
Not participating	45 (70.3)	71 (83.5)	116 (77.9)
Exercise time tertiles (mins/wk)			
No exercise	16 (25.0)	27 (31.8)	43 (28.9)
Tertile 1, 180	22 (34.4)	20 (23.5)	42 (28.1)
Tertile 2, 181–360	14 (21.9)	17 (20.0)	31 (20.8)
Tertile 3, >360	12 (18.7)	21 (24.7)	33 (22.2)

Values are expressed as number (percentage) unless otherwise indicated.

TABLE 2

Characterization of organized sports

Type of Sport	Study Subjects Participating, <i>n</i> (<i>n</i> = 33) [*]
Basketball (wheelchair or other)	7
Tennis (wheelchair or other)	6
Snow skiing	5
Sailing	4
Rowing	4
Bowling	4
Softball	3
Coaching (any sport)	3
Handcycling	3
Fishing	2
Wheelchair rugby	2
Racquetball	1
Swimming	1
Canoeing	1
Wheelchair racing	1
Air rifle	1
Curling	1
Golf	1
Hunting	1
Martial arts	1
Kayaking	1

* Several subjects participated in multiple sports.

TABLE 3

Characteristics of the participants in organized sports

	Participating (<i>n</i> = 33)	Not Participating (<i>n</i> = 116)	<i>P</i>
Demographics			
Age, mean $\pm$ SD, yrs	48.5 $\pm$ 10.3	49.8 $\pm$ 10.49	0.53 ^a
Age, range, yrs	27.1–64.1	24.0–64.7	
55	23 (69.7)	71 (61.2)	0.37 ^b
>55	10 (30.7)	45 (38.8)	
Duration of injury, mean $\pm$ SD, yrs	19.5 $\pm$ 11.8	18.9 $\pm$ 11.5	0.80 ^a
Duration of injury, range, yrs	1.7–40.8	1.6–61.1	
Sex			
Male	30 (90.9)	93 (80.2)	0.15 ^b
Female	3 (9.1)	23 (19.8)	
Level of education			
High school or lower	12 (36.4)	32 (27.6)	0.33 ^b
More than high school	21 (63.6)	84 (72.4)	
BMI, mean $\pm$ SD, kg/m ²	26.3	26.6	0.80 ^a
Normal, <25	16 (48.5)	51 (44.0)	0.71 ^b
Overweight, 25–29	7 (21.2)	33 (28.5)	
Obese, 30	10 (30.3)	32 (27.6)	
Severity of injury			
Motor complete	23 (69.7)	64 (55.2)	0.13 ^b
Motor incomplete	10 (30.3)	52 (44.8)	
Mode of mobility			
Motorized wheelchair	2 (6.9)	27 (23.3)	0.006 ^b
Hand-propelled wheelchair	28 (84.8)	51 (43.9)	
Walk with aid	2 (9.5)	19 (16.4)	
Walk independently	1 (5.0)	19 (16.4)	

Values are presented as number (percentage) unless otherwise indicated.

^a *t* test.^b χ^2 test.

TABLE 4

Univariate factors associated with employment

Predictor	Odds Ratio (95% CI)	P
Age, yrs	0.95 (0.92–0.99)	0.01
Age		
55 yrs	Reference	
>55 yrs	0.30 (0.15–0.62)	0.001
Duration of injury, yrs	1.02 (0.99–1.05)	0.19
Sex		
Male	Reference	
Female	1.41 (0.60–3.30)	0.43
Level of education		
High school or lower	Reference	
More than high school	2.62 (1.22–5.63)	0.01
BMI, kg/m ²		
Normal, <25	Reference	
Overweight, 25–29	0.72 (0.33–1.58)	0.41
Obese, 30	0.44 (0.19–0.98)	0.04
Severity of injury		
Motor complete	Reference	
Motor incomplete	0.52 (0.27–1.03)	0.06
Wheelchair use		
Wheelchair	Reference	
No wheelchair	0.70 (0.33–1.46)	0.33
Participation in organized sports		
Not participating	Reference	
Participating	2.14 (0.98–4.69)	0.06
Exercise time tertiles (mins/wk)		
No exercise	Reference	
Tertile 1, 180	1.86 (0.78–4.41)	0.16
Tertile 2, 181–360	1.39 (0.54–3.56)	0.49
Tertile 3, >360	0.96 (0.38–2.47)	0.94

CI indicates confidence interval.

TABLE 5

Multivariable model of employment

Predictors	Odds Ratio (95% CI)	P
Age		
55 yrs	Reference	
>55 yrs	0.32 (0.15–0.70)	0.004
Level of education		
High school or lower	Reference	
More than high school	2.88 (1.26–6.60)	0.013
BMI, kg/m ²		
Normal, <25	Reference	
Overweight, 25–29	0.76 (0.33–1.77)	0.53
Obese, 30	0.44 (0.19–1.06)	0.07
Participation in organized sports		
Not participating	Reference	
Participating	2.44 (1.04–5.72)	0.04

CI indicates confidence interval.