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A prospective examination of the impact of a supported employment program and employment on health-related quality of life, handicap, and disability among Veterans with SCI

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Abstract
Purposes To investigate impact of participation in a supported employment program and impact of employment itself on health-related quality of life (HRQOL), disability, and handicap among Veterans with spinal cord injury (SCI).
Methods We used a prospective, randomized, controlled, multi-site trial of supported employment (SE) versus treatment as usual (TAU) for vocational issues. Subjects were 157 Veterans with SCI who received either SE or TAU for vocational issues. Outcomes were examined in terms of type of vocational treatment received and whether competitive employment was obtained. Outcomes investigated were HRQOL as measured by the Veterans RAND 36-item health survey (VR-36), handicap as measured by the Craig Handicap Assessment and Reporting Technique (CHART), and disability as measured by the functional independence measure (FIM). Subjects were assessed at baseline and at 3, 6, 9, and 12 months.
Results There were no significant differences between Veterans who participated in SE compared to those who received TAU in study measures. Participants obtaining competitive employment demonstrated significantly higher scores on the *Social Integration*, *Mobility,* and *Occupation* dimensions of the CHART. There were no observed differences in VR-36 scores or FIM scores for those obtaining competitive employment.
Conclusion(s) This study suggests that employment has a positive effect on an individual's ability to participate in social relationships, move about their home and community, and spend time in productive and usual roles. Inability to detect differences across other domains of handicap or any changes in HRQOL may have been due to several factors including level and intensity of employment, insufficient follow-up period, or measurement limitations.

Keywords Veterans · Quality of life · Supported employment · Spinal cord injury

Abbreviations

CE	Competitive employment
HRQOL	Health-related quality of life
IPS	Individualized placement and support
IRB	Institutional review board
SCI	Spinal cord injury
SCI-VIP	Spinal Cord Injury-Vocational Integration Program
SE	Supported employment
TAU	Treatment as usual

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TAU-IS	Treatment as usual–interventional site
TAU-OS	Treatment as usual–observational site
TBI	Traumatic brain injury
US	United States
VAMC	Veterans Affairs Medical Center
VHA	Veterans Health Administration
VR	Vocational rehabilitation
VRC	Vocational rehabilitation counselor

Introduction

Spinal cord injury (SCI) is a complex condition that involves major life changes and reduced self-reported quality of life. Rehabilitation following spinal cord injury seeks to minimize handicap and maximize participation in meaningful life activities, including employment. There is considerable evidence that employment following SCI is associated with higher quality of life ratings across various domains [1–6]. Health-related quality of life (HRQOL), which specifically refers to how an individual's disease or disability impacts aspects of well-being, shows a demonstrated association with being employed following spinal cord injury [7, 8]. For example, using the 36-item Short-Form Health Survey (SF-36), quality of life was found to be decreased among persons with SCI, but those with SCI who were employed had a better quality of life [7]. To date, the evidence in this area has been limited to correlational data from cross-sectional studies.

Although the association between quality of life and employment following SCI is widely recognized, the majority of individuals with SCI do not return to work following injury. Part of the challenge in addressing employment has been that established evidence-based practices for vocational rehabilitation (VR) with this population are lacking. A recent multi-center randomized trial called the Spinal Cord Injury-Vocational Integration Program (SCI-VIP) has shown that a supported employment program based on the Individual Placement and Support (IPS) model can be effectively used with individuals with SCI [9]. IPS, also known as evidence-based supported employment, is a VR modality that uses an integrated approach to help people obtain and maintain community-based competitive employment in their chosen occupation [10–12]. Our previous work has shown that persons with SCI who received supported employment (SE) based on evidence-based principles were 2.5 times more likely to return to competitive employment than those who were referred for more conventional VR. In addition to employment outcomes, we were interested in whether those SE participants who were able to secure employment experienced changes in subjective mental and physical well-being.

Along with HRQOL impact, we were interested in exploring how participating in SE leading to employment affected the level of handicap or role functioning participants experienced across various life domains. The Craig Handicap Assessment and Reporting Technique (CHART) measures six domains of handicap as described by the World Health Organization. Some are directly related to employment, such as the occupation domain, which describes time spent in usual roles (including student, worker, and homemaker). Other domains may be indirectly related to employment, such as social integration. Finally, although studies show that functional independence at discharge from SCI rehabilitation is related to post-SCI employment [13, 14], there is no clinical or research information to suggest that it would change following employment.

To our knowledge, there are no prospective studies examining the effect of employment on HRQOL, functional independence, and handicap following referral or treatment for vocational issues. The purpose of the present paper is to report the secondary employment outcomes of HRQOL, handicap, and functional independence among Veterans with SCI who participated in the SCI-VIP study. We hypothesized that there would be positive changes in HRQOL and handicap following employment, but that functional independence would remain unchanged. The present study analyzed (1) changes in HRQOL, functional independence, and handicap from baseline to 12 months between subject groups engaging in supported employment versus traditional therapy and (2) changes in HRQOL, functional independence, and handicap between participants between subject groups engaging in supported employment versus traditional therapy obtaining competitive employment.

Methods

Participants

Subjects consisted of Veterans with spinal cord injury aged 18–65 years who received health care services in the SCI Centers at one of six participating Veterans Affairs Medical Centers (VAMC). Consideration of a wide variety of factors was used in selecting sites, such as location in a metropolitan geographical region, adequate economic and industrial development, strong management and leadership support at the local medical center, available subject pool, and existing public transportation systems. Each participating site obtained approval of its respective institutional review board. Only Veterans who were not employed or

were employed but not at a substantial income level (defined as earning less than Social Security's definition of substantial gainful activity) were eligible to participate in the study. Veterans who had gainful employment at the time of study enrollment were excluded from the study.

Design

Methods of this clinical trial have been described in depth elsewhere [15]. Briefly, at interventional sites, subjects were randomized using a biased coin design without stratification or adjustment to SE or treatment as usual (TAU-IS). At observational sites, the SE condition was not available and all subjects received treatment as usual (TAU-OS). All study subjects provided written informed consent prior to enrollment. Baseline assessments were conducted following enrollment and randomization.

Treatment conditions

Subjects in the supported employment condition received the Individual Placement and Support (IPS) model of SE. Since the model is considered disability neutral, it was implemented in this population without any modifications. Hence, the study sought to follow the evidence-based principles of SE as closely as possible including: integrated vocational and medical rehabilitation treatment, rapid engagement in job finding, competitive employment, inclusion regardless of severity or type of disability, ongoing job support, and focus on participant preferences. Services were primarily provided in the community, rather than in office or hospital settings, and access to personalized benefits counseling was included. The provision of these services was by a vocational rehabilitation counselor (VRC) who was hired for the study, trained in the IPS SE model, and integrated as provider among the SCI interdisciplinary care team in the SCI Center. The treatment as usual (TAU) condition typically involved referrals to vocational rehabilitation (VR) services outside the VA SCI Center.

In the TAU condition, there was not a single provider of VR services who was part of the SCI interdisciplinary care team at the SCI Center. Rather subjects in the TAU condition were referred by the research coordinator back to their clinical SCI interdisciplinary team members (e.g., physiatrist, psychologist, social worker) who could provide them with a referral to an agency or provider who was not part of the SCI Center (e.g., state VR). Hence, these subjects may or may not have received any additional VR services.

Procedures

Potential participants were referred by SCI treatment providers or self-referred after reading IRB-approved study advertising materials. The research coordinator at the participating VAMC met with each referral to review the study and obtain informed consent. Subjects drawn from the interventional sites who met inclusion criteria were randomized to either SE or the comparison group. Veterans who received health care from the observational sites and met inclusion criteria were not randomized but asked to participate as comparison group subjects.

The study was open for enrollment of new subjects for a 3-year period. Once enrolled, all subjects were followed for 12 months, during which time quarterly face-to-face interviews were conducted by the research coordinator to collect data on both primary employment variables and secondary outcomes measures. Research coordinators and clinical staff were not blinded to treatment condition. Coordinators participated in an intensive 3-day training course on study measures and procedures at study initiation, had 3 additional training workshops throughout the course of the study, and attended weekly and monthly study conference calls where measurement issues were discussed and reviewed.

All participants were referred for benefits counseling upon enrolling in the study. Social Security benefits information was available through local Work Incentive Planning and Assistance projects, and Veterans benefits information was made available through Paralyzed Veterans of America National Service Officers at the local VAMC SCI Centers. These referrals allowed participants the opportunity to learn about their current benefits, understand the role of work incentives and protections of disability benefits, and evaluate the impact that employment could have on their disability benefits. Veterans were notified that their VA benefits are protected while participating in SE, which was delivered in conjunction with the VAMCs' Compensated Work Therapy programs.

Primary endpoint

The primary endpoint was competitive employment (CE), defined as a paying job earning at least minimum wage in the community. Volunteer work and sheltered employment did not qualify as employment for the purposes of the present study.

Measures

Veterans RAND 36-item health survey (VR-36)

The VR-36 is a 36-item instrument which assesses general health-related quality of life. The VR-36 assesses eight domains of a person's health and functioning: physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, vitality, social

functioning, role limitations due to emotional problems, and mental health. Examples of items include "Does your health limit you in these activities: vigorous activities, such as running, lifting heavy objects, participating in strenuous sports?" Responses are answered on a 3-point response scale, ranging from "Yes, limited a lot" to "No, not limited at all." Items are summed with a standard range of 0–100 with 100 representing maximum health. The domains are summarized into two summary components: physical component summary (PCS) and mental component summary (MCS). Published internal consistency coefficients have ranged from 0.76 to 0.91 for the subscales [16–19].

Craig handicap assessment and reporting technique (CHART)

The CHART contains 32 items assessing six dimensions of a person's handicap: cognitive independence, physical independence, mobility, occupation, social integration, and economic self-sufficiency. It should be noted that the occupation scale is defined broadly in terms of usual and customary roles, which includes gainful employment. It also measures schooling and homemaking, recreational pursuits, volunteering, and self-improvement activities. A score of 100 indicates no handicap in a given dimension. Sample items include "Who takes responsibility for instructing and directing your attendants and/or caregivers?" and "How much of your money do you control?" Published test–retest coefficients for the six domains have ranged from 0.80 to 0.95 [20].

Functional independence measure (FIM) instrument

The FIM is an 18-item instrument that assesses disability in terms of what level of assistance an individual needs to perform various activities. The FIM assesses independence in functional skills such as dressing, bathing, eating, mobility, locomotion, communication, and social interaction. In terms of construct validity, the FIM instrument measures two unidimensional domains of motor and cognitive function. Each item is assessed by a clinician on a scale of 1 (total assistance) to 7 (complete independence). Published inter-rater reliability kappa coefficients were 0.53 (Memory) to 0.66 (stair climbing) in a sample of medical rehabilitation inpatients [21, 22].

The individual placement and support (IPS) fidelity scale [23]

Used to measure the adherence to the supported employment model, this scale is a 15-item instrument with three sub-divisions (staffing, organization, and services) to assess several domains of supported employment. Each item was rated on a scale of 1–5, with higher numbers indicating closer adherence to supported employment. The total score for the scale is calculated by summing the item values, for a maximum value of 75. Programs scoring greater than 65 are consistent with IPS (good implementation), those scoring between 56 and 65 are partially consistent with IPS (fair implementation), and those scoring less than 56 are not IPS programs (not SE) [24]. The published internal consistency coefficient for the whole instrument is 0.83, and the four subscales' coefficients have ranged from 0.55 to 0.70 [24]. Reviews were conducted every 6 months at each study site by experts in the tenets of evidence-based supported employment.

Statistical analysis

All scales were scored according to developer guidelines. VR-36 scores are reported as t-scores t (50, 10). Data were explored for departures from normality and detection of outliers. Continuous parameters are reported as mean $\pm$ SD, and discrete parameters are reported as a percent (%). Group comparisons were made with Student's t test or Wilcoxon rank sum tests with normal approximation, where appropriate, for continuous data and Pearson's χ^2 test or Fisher's exact test, where appropriate, for categorical data. Changes in selected instruments were assessed using two separate linear repeated measures mixed models with a primary fixed effect (group designation [3 groups] or competitive employment [2 groups]) with participants considered as the nested effect. To account for the within subject correlated nature of the data, an autoregressive correlation matrix (AR [1]) was chosen as the best fitting matrix. Analyses were performed with SAS (Ver. 9.2, Cary, NC).

Results

A total of 201 participants, age 48.3 (SD = 9.9), were enrolled and completed baseline interviews in the SCI-VIP study, but only 157 from the randomized groups (SE and TAU-IS) are included in these results. We excluded the non-randomized observational group (TAU-OS) as only one participant obtained competitive employment. The characteristics of the study sample are shown in Table 1. Participants were primarily men (95.5 %) with 13.4 (SD = 2.2) years of education, and 12.4 years (SD = 11.2) had passed since their SCI. Forty-three percent of the participants were divorced, 26.7 % were married, 19.3 % were never married, and the remaining 11.4 % were either separated, widowed, or cohabitating. Thirteen percent of the sample received supplemental security income, and 59.9 % received Social Security disability income. Over

Table 1 Demographic characteristics ($N = 157$)

	SE $N = 81$	TAU-IS $N = 76$	p
Age, y *M* (SD)	48.7 (9.8)	49.8 (9.8)	0.483
Education, y *M* (SD)	13.1 (2.3)	13.5 (1.9)	0.238
Race			
White	37 (45.7)	33 (43.4)	–
African American	29 (35.8)	37 (48.7)	–
Hispanic	5 (6.2)	1 (1.3)	–
Native American/Alaskan native	2 (2.5)	1 (1.3)	–
Other	8 (9.9)	4 (5.3)	0.251
Marital status			
Married	30 (37.0)	15 (19.7)	–
Divorced	28 (34.6)	34 (44.7)	0.057
Separated	5 (6.2)	7 (9.2)	–
Widowed	2 (2.5)	2 (2.6)	–
Cohabitate w/partner	3 (3.7)	1 (1.3)	–
Never married	12 (14.8)	17 (22.4)	0.196
AIS & neurological (%)			
High tetraplegia, AIS A, B, C	12 (15.0)	13 (17.1)	–
Low tetraplegia, AIS A, B, C	5 (6.3)	10 (13.2)	–
Paraplegia, AIS A,B, C	38 (47.5)	27 (35.5)	–
AIS D/E	25 (31.3)	25 (32.9)	0.333
A	26 (32.5)	20 (26.3)	–
B	11 (13.8)	13 (17.1)	–
C	18 (22.5)	18 (23.7)	–
D	25 (31.3)	21 (27.6)	–
E	0 (0.0)	4 (5.3)	0.268
Medical history			
Diabetes	13 (16.1)	12 (15.8)	0.965
Hypertension	26 (32.1)	22 (29.0)	0.668
Spinal cord stenosis	14 (17.3)	11 (14.5)	0.631
Cervical spondylosis	8 (9.9)	7 (9.2)	0.887
Depression	28 (34.6)	26 (34.2)	0.962
Substance abuse	23 (28.4)	24 (31.6)	0.663
Prior work history w/in 5 years	35 (43.2)	36 (47.4)	0.601

Unless otherwise noted, expressed values frequency and percent

SE Supported employment, *TAU-IS* treatment as usual–intervention site, *SD* standard deviation, *AIS* American spinal injury association impairment scale

* $p < 0.05$ for SE versus TAU-IS

half of the study sample received VA benefits (57.4 %), and of those participants, 83.7 % received service-connected benefits. Among those receiving VA benefits, 42.2 % was receiving service-connected benefits for SCI. At 1 year, overall subject retention was 89.2 % with no statistically significant differences observed between groups (SE 87.7 vs. 90.8 %, $p < 0.527$).

Approximately half of participants presented with paraplegia (47.3 %), with the remainder having either high (C1–4) tetraplegia (34.3 %) or low (C5–8) tetraplegia (16.4 %). A plurality of participants were classified as being "Complete" on the American Spinal Injury Association's (ASIA's) ASIA Impairment Scale (AIS), meaning no motor strength or sensation below the level of injury (AIS A; 33.7 %), followed by motor incomplete—high muscle strength (AIS D; 29.2 %), motor incomplete—low muscle strength (AIS C; 18.3 %), sensory incomplete (AIS B; 13.4 %), and normal (AIS E; 5.0 %). Over one-third of the participants' spinal cord injury was caused by a motor vehicle accident (39.1 %), followed by a gunshot wound (16.3 %), and a fall (14.9 %). The most common medical co-morbidities were hypertension (28.7 %) and diabetes mellitus (13.9 %). The most common psychiatric co-morbidities were depression (32.2 %) and substance abuse or dependence (28.2 %). No statistically significant differences were observed between cause of injury and medical or psychological co-morbidities.

Fidelity assessments

The 3 SCI-VIP sites providing SE were evaluated at 6, 12, 18, 24, 30, and 36 months using the 15-item IPS Fidelity Scale. Results of bi-annual visits were compared across time. A review of each site's fidelity ratings suggests significant achievement toward good supported employment implementation. As a whole, site fidelity scores ranged from 61 to 64, which falls within the upper portion of the "fair" range.

Comparison of treatment groups on employment

Among the 157 participants, 33 participants (21.0 %) accounted for 88 total jobs. Twenty-four participants in the SE group accounted for 60/88 jobs (68.2 %). The rate of employment for SE participants was significantly greater (29.6 %; 95 % CI: 20.8–40.4) than the TAU-IS group (11.8 %; 95 % CI: 4.6–19.1; $p < 0.003$). When employment was restricted to competitive employment only, SE participants accounted for 50 of 72 (69.4 %) jobs and were significantly more likely to achieve employment (25.9 %; 95 % CI: 17.6–36.5) compared to TAU-IS participants (10.5 %; 95 % CI: 3.6–17.4; $p < 0.008$). Compared to TAU-IS participants, SE participants worked significantly more hours per week (22.0 vs. 17.0, $p < 0.05$), averaged significantly fewer wages ($233.9 vs. $267.3, $p < 0.05$), and missed fewer hours per week (0.3 vs. 1.8, $p < 0.05$).

Overall HRQOL, handicap, and disability

Average scores for both treatment groups for baseline and 6- and 12-month assessments and percent change from baseline to 12 months are presented in Table 2 and

graphically in Fig. 1. The SE group demonstrated the most improvement on study measures over the study period, as evidenced by 10/11 measured indices demonstrating a positive change, compared to 8/11 for the TAU-IS group. Increases were observed within each study group from baseline to 12 months, but few statistically significant differences were observed. For each treatment group, the greatest positive and negative changes were observed for the *CHART, Economic Self-sufficiency* scale (ESS): for SE, the change was 51.5 versus 56.8, % change 10.3 % ($p < 0.444$); for TAU-IS, 52.6 versus 59.1, 12.4 % ($p < 0.908$); and for TAU-OS, 52.3 vs. 61.8, 18.2 % ($p < 0.023$).

Competitive employment, HRQOL, handicap, and disability

Average scores for all the SE and TAU-IS treatment groups for baseline and 6- and 12-month assessments stratified by competitive employment (yes/no) are presented in Table 3. Percent change by employment and treatment group from baseline to 12 months is presented graphically in Fig. 2. Among the SE group, participants obtaining CE demonstrated a positive increase from baseline on 5/11 indices compared to 7/11 among SE participants never obtaining CE. However, among the TAU-IS group, participants obtaining CE demonstrated an increase from baseline on 8/11 indices, compared to 6/11 TAU-IS participants without CE.

In general, increases were observed within each study group from baseline to 12 months. However, few statistically significant differences were observed. The greatest positive change observed for CE participants was the *CHART, Economic Self Support* (50.0 vs. 57.7; 17.4 %; $p < 0.246$); for non-CE participants, the greatest positive change was the *CHART, Occupation* (60.3 vs. 68.9; 14.3 %; $p < 0.499$).

Among the TAU-IS group, the greatest observed negative changes for both CE (28.2 vs. 26.2; −7.1 %; $p < 0.993$) and non-CE (28.1 vs. 27.8; −1.1; $p < 0.218$) groups were for the *VR-36 Physical* scale. The greatest positive change observed among CE participants was for the *CHART, Mobility* (81.4 vs. 88.7; 9.0 %; $p < 0.067$).

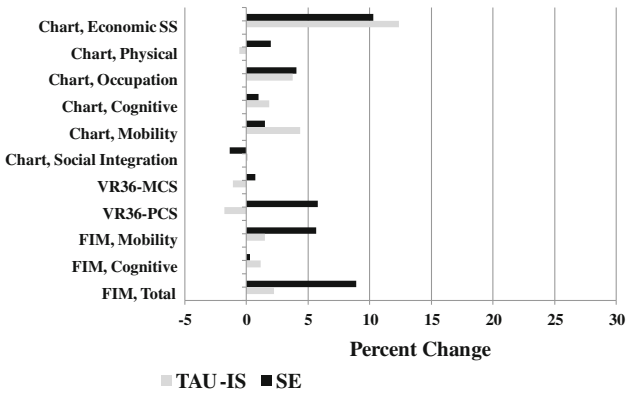

Fig. 1 Percent change in indices scores from baseline to 12 months, all treatment groups. *SE* supported employment, *TAU-IS* treatment as usual, intervention site, *TAU-OS* treatment as usual–observation site, *VR36-PCS* Veterans RAND 36-physical component score, *VR36-MCS* Veterans RAND 36-mental component score, *SI* social integration, *SS* social support

Table 2 Average QOL indices scores by treatment group ($N = 157$)

	SE $N = 81$			TAU-IS $N = 76$		
	Baseline $n = 81$	6 months $n = 71$	12 months $n = 71$	Baseline $n = 76$	6 months $n = 72$	12 months $n = 69$
FIM total	98.9 (23.8)	–	104.7 (17.9)	98.2 (23.7)	–	100.4 (21.5)
FIM cognitive	33.8 (2.3)	–	33.9 (2.2)	33.7 (2.8)	–	34.1 (1.5)
FIM mobility	66.9 (21.6)	–	70.7 (17.4)	66.4 (22.2)	–	67.4 (20.8)
VR36-PCS	27.7 (7.5)	27.9 (7.9)	29.3 (7.7)	28.1 (8.4)	27.8 (8.0)	27.6 (7.9)
VR36-MCS	54.7 (13.8)	56.3 (11.6)	55.1 (14.3)	55.6 (12.9)	55.6 (13.0)	55.0 (14.2)
CHART, SI	82.0 (13.6)	79.9 (15.9)	80.9 (16.4)	84.7 (12.7)	83.5 (13.7)	84.8 (14.0)
CHART, Mobility	80.4 (17.0)	83.4 (17.6)	81.6 (19.9)	80.4 (22.4)	83.0 (21.9)	83.9 (20.9)
CHART, Cognitive	89.4 (16.6)	92.0 (19.2)	90.3 (17.4)	90.8 (14.9)	90.3 (17.2)	92.5 (14.5)
CHART, Occupation	51.5 (32.9)	55.4 (35.5)	53.6 (33.9)	50.4 (30.6)	51.9 (32.9)	52.3 (33.0)
CHART, Physical	85.7 (20.9)	88.9 (18.7)	87.4 (20.3)	87.2 (22.1)	88.1 (21.0)	86.7 (23.8)
CHART, Economic SS	51.5 (37.8)	55.3 (36.1)	56.8 (36.1)	52.6 (36.9)	53.5 (33.7)	59.1 (3.8)

Values expressed are *M* (SD)

SE Supported employment, *TAU-IS* treatment as usual–intervention site, *FIM* functional independence measure, *VR36-PCS* Veterans RAND 36-physical component score, *VR36-MCS* mental component score, *SI* social integration, *SS* social support

Table 3 Average indices scores by treatment group and competitive employment, SE and TAU-IS Groups Only ($N = 157$)

	SE $N = 81$				TAU-IS $N = 76$			
	No-CE $n = 57$		CE $n = 24$		No-CE $n = 67$		CE $n = 9$	
	Baseline $n = 57$	12 months $n = 47$	Baseline $n = 24$	12 months $n = 24$	Baseline $n = 67$	12 months $n = 60$	Baseline $n = 9$	12 months $n = 2$
FIM, total	93.8 (25.0)	100.8 (18.9)	110.1 (16.5)	111.8 (13.6)†	98.2 (24.3)	99.8 (20.7)	98.5 (19.5)	104.0 (27.6)*
FIM, cognitive	33.3 (2.6)	33.7 (2.6)	34.8 (0.4)	34.4 (1.1)	33.6 (2.8)	34.1 (1.5)	34.7 (0.5)	34.0 (1.7)
FIM, mobility	62.4 (23.0)	67.2 (18.3)	76.8 (13.8)	77.4 (13.7)	66.1 (22.6)	67.0 (19.9)	68.1 (18.9)	70.0 (27.5)*
VR36-PCS	26.8 (7.3)	29.5 (7.8)	29.5 (7.8)	29.0 (7.8)	28.1 (8.5)	27.8 (7.2)	28.2 (8.2)	26.2 (12.2)
VR36-MCS	55.0 (13.0)	54.6 (15.0)	54.6 (15.0)	56.0 (13.0)	56.6 (12.9)	56.1 (13.9)	47.9 (10.6)	47.8 (14.7)
CHART, SI	80.1 (14.1)	78.6 (17.7)*	86.4 (9.7)	85.1 (12.9)†	84.5 (12.4)	83.9 (14.4)	85.6 (15.0)	91.2 (8.5)*
CHART, Mobility	78.6 (18.0)	77.7 (22.2)	84.5 (14.1)	89.3 (11.2)	49.3 (30.1)	51.1 (33.6)	81.4 (23.2)	88.7 (16.3)
CHART, Cognitive	86.8 (18.7)	89.6 (17.7)	95.6 (7.4)	91.6 (17.0)	53.0 (36.5)	60.0 (32.9)	92.9 (7.9)	90.9 (14.4)
CHART, Occupation	47.8 (33.1)	45.6 (32.8)	60.3 (31.5)	68.9 (31.2)	86.7 (23.3)	85.9 (25.1)	57.2 (34.9)	60.1 (28.8)
CHART, Physical	83.7 (22.6)	85.9 (19.6)	90.2 (16.0)	90.2 (21.7)	84.5 (12.4)	83.9 (14.4)	90.7 (8.8)	92.3 (12.4)
CHART, Economic SS	50.0 (39.0)	58.7 (33.8)	55.2 (35.3)	53.1 (40.6)	80.3 (22.5)	83.1 (21.5)	50.0 (41.5)	52.8 (40.4)

Values expressed are *M* (SD)

FIM Functional independence measure, *VR36-PCS* Veterans RAND 36-physical component score, *VR36-MCS* Veterans RAND 36-mental component score, QIDS, *SS* social support

* $p < 0.05$, within group and CE paired *t* test; † $p < 0.05$, within group, *t* test comparing % change in no-CE versus CE

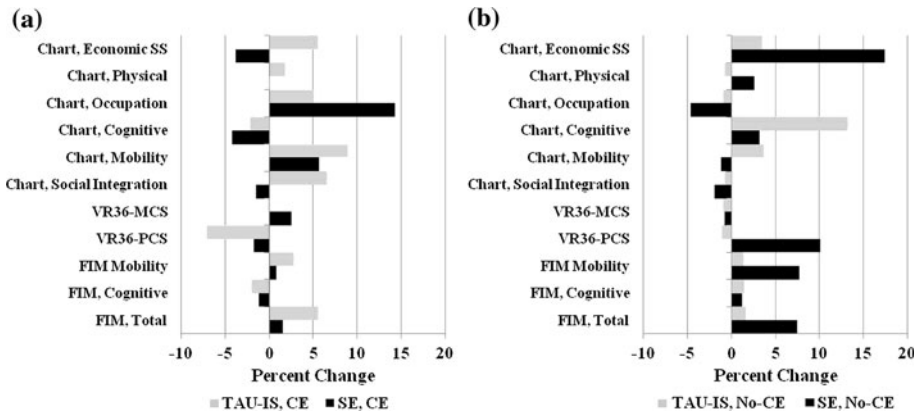

Fig. 2 Percent change in indices scores among SE and TAU-IS groups by competitive employment (**a**) and non-competitive employment (**b**)

For non-CE participants, the greatest positive change was the *CHART, Cognitive* (53.0 vs. 60.0; 13.2 %; $p < 0.173$).

Lastly, we used independent linear mixed models to predict scale scores after adjusting for the effects of time (baseline, 12 months), obtaining competitive employment (yes/no) and treatment group participation (SE vs. TAU-IS). No statistically significant changes were observed between SE and TAU-IS participants for any scale. However, participants obtaining competitive employment were statistically significantly different on some indices. After adjustment for time and SE status, participants obtaining employment demonstrated increased scores on the *CHART, Social Integration* ($\beta = 7.4 \pm 5.3$, $p < 0.035$), *CHART, Mobility* ($\beta = 5.5 \pm 7.1$, $p < 0.050$) and *CHART, Occupation* ($\beta = 8.9 \pm 11.5$, $p < 0.023$).

Discussion

To our knowledge, this is the first study to utilize a randomized controlled trial design to compare changes in HRQOL, handicap, and disability (1) from baseline to 12 months between participant SCI groups engaging in supported employment versus traditional therapy and (2) between groups engaging in supported employment versus traditional therapy among participants obtaining competitive employment.

The hypothesis that the VR-36 would show HRQOL changes among Veterans with SCI who became employed was not supported. There are several factors to consider in understanding the lack of change in HRQOL. First of all, positive correlations occur between quality of life and other

markers of adjustment besides employment. For example, income, education, and other avocational pursuits are associated with increased quality of life and life satisfaction among persons with SCI [6, 25]. It is possible that those who are already experiencing their own personal maximum level of health and well-being are more likely to become employed. In this case, employment could affect their use of time, usual roles, and preferred activities, but if they were already satisfied with their lives, it may not change how they rate their overall sense of well-being. Another possibility is that there is a threshold for the level of employment activity that impacts HRQOL. In this study, nearly all the employment was part time and participants earned well below substantial gainful activity as defined by Social Security. Hence, the participants in this study would not have been earning a level of income that would have resulted in a higher standard of living that might be associated with a meaningful difference in HRQOL. At least one study has shown that HRQOL is higher among full time but not part time workers with SCI [1]. Time of measurement might be another reason for not observing differences in HRQOL following employment that resulted from SE. There are studies indicating that economic and life satisfaction changes accrue over time [4, 26, 27], in which case longer follow-up periods would be needed to demonstrate meaningful change in non-vocational measures.

The hypothesis that there would be a positive impact on level of handicap was partially supported, given observed improvements in 3 of the 6 CHART domains (social integration, mobility, and occupation) among subjects obtaining employment. These positive changes were observed irrespective of treatment group. Employment would be expected to increase social networks, community involvement, and time spent in productive roles. Not surprisingly, cognitive independence and physical independence did not change. This is consistent with the expected finding that was observed, in that FIM scores remained unchanged following employment. The FIM measures what a person does, which may not be the same as what they are able to do. A small number of persons may rely on others for a task (for example, lower extremity dressing) that they can actually complete themselves, albeit with difficulty. For example, it may be faster to have a caregiver carry out the task. The prospect of employment might actually favor expediency rather than independence. Overall, functional abilities for tasks would not be expected to change in either group in this chronic stable sample. Further, over a much longer period of time, some persons could experience functional decline due to aging. Economic self-sufficiency did not change probably because wage earnings were low among study participants, and, at this level of earning, they would still be qualified for disability benefits.

The findings discussed above are largely consistent with studies of the IPS model compared to other types of treatment in terms of non-employment outcomes in the mental health field. By and large, studies do not show differences between IPS and other treatment modalities in non-vocational outcomes such as psychiatric symptoms and quality of life indicators among persons who have serious mental illness [28–32].

While this study suggests that employment has a positive effect on an individual's ability to participate in social relationships, move about their home and community, and spend time in productive and usual roles, it did not show any changes in HRQOL. The failure of this clinical trial to detect differences in HRQOL could also have been due to measurement limitations or sample size issues. Both the SF-36 and the CHART have been noted to have floor and ceiling effects that may limit the ability to detect change over time [23, 24]. Future research should focus on either the utilization of more sensitive instruments, the development of population-specific instruments, or supplementing information gathered with qualitative information regarding the effects on these areas by obtained employment.

Limitations

Potential limitations of this study include the study population and geographical regions selected for enrollment. The study included primarily male Veterans living in relative proximity to a large VAMC, which may or may not be reflective of the general SCI population regarding potential for employment. It is possible that the experience of females or those living in more rural areas with SCI may not be accurately represented by our study outcomes. Lastly, as noted above, the use of the VR-36 may not be the optimal instrument to assess HQOL within this population. A more technical and disease-specific instrument for use in the assessment of quality of life and the effects of employment on specific aspects of QOL may be warranted.

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