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EXPLAINING LABOR FORCE STATUS FOLLOWING SPINAL CORD INJURY: THE CONTRIBUTION OF PSYCHOLOGICAL VARIABLES

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Objective: **To investigate the relative influence of demographic, injury and psychological characteristics on the labor force status of people living with spinal cord injury.**
Design: **Cross-sectional survey.**
Subjects: **459 persons who had experienced a traumatic spinal cord injury. All participants were patients of 1 of 2 specialist spinal cord injury services located in south-eastern Australia.**
Methods: **A survey, administered on average of 11.2 years after their injury, was used to collect the data. The study's main outcome measure was labor force status at the time of survey. Of those invited to participate in the study, 73% agreed to do so.**
Results: **Demographic, injury and psychological variables were found to explain 30% of the variance in the employment criterion: "in the labor force" vs "not in the labor force". Psychological variables contributed significantly to the separation of the 2 labor force groups.**
Conclusion: **The inclusion of the selected psychological variables has advanced the understanding of the factors related to return to work following spinal cord injury, however this understanding is still not complete. Future efforts in this field would likely benefit from the inclusion of additional psychological characteristics, as well as environmental factors.**

Key words: employment, rehabilitation, spinal cord injury, return to work.

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INTRODUCTION

The importance of work for persons with disabilities cannot be overestimated. Productive work is one of the cornerstones of adulthood, impacting across all the core dimensions frequently associated with quality of life (1). A person's employment status has been demonstrated to be intrinsically related to the individual's sense of wellbeing (2), self-reported health status (3) and health service usage (4). However, while there are many reasons why productivity is important for those with a disability, employment is an option that is often overlooked, or at least underestimated, in terms of its benefits to the worker and his or her compensation provider.

Since Guttmann's seminal works in spinal cord injury (SCI) rehabilitation (5, 6), employment has been an outcome that has received considerable research attention. To date there have been numerous studies reporting on the employment characteristics of those affected by SCI. A brief review of the recent literature reveals studies describing the situation in a range of countries including Canada, the UK, Australia, Sweden, Italy, The Netherlands, France, Japan and the USA.

With respect to the rates of employment following SCI, previous investigators have reported varying findings. For those with SCI in the USA the rate of employment at the time of assessment has been reported to be 36% (7); in Sweden, 46% (8); in France, 36% (9); in Canada, 42% (10); in The Netherlands, 32% (11); and in Australia, 47% (12). Although rates vary, the argument can be made that all these rates are suboptimal. Whilst, in the pre-World War II context, persons with SCI were described to have "dragged out their lives as useless and hopeless cripples, unemployed and unwanted" (6), today the thinking about return to work is quite different. So much so that in some countries it is argued that vocational rehabilitation efforts should be instituted as early as possible, with return to work being presented as the normal scenario (13).

Although the employment outcomes of persons following SCI have been investigated in numerous studies, relatively little is known about the process by which individuals attain employment or the factors that act as barriers to, or facilitators of, such. In an attempt better to understand return to work following SCI, and inform initiatives aimed at improving rehabilitation outcomes, several researchers have designed multivariate studies aimed at identifying the relationship between various participant characteristics and employment outcomes (14–16). While to date researchers have achieved some success, most still struggle to explain more than a small proportion of the variability in outcome.

In a review of early (1976–91) studies investigating employment following SCI, Murphy & Athanasou (17) identified only 3 variables whose significance had been replicated in a separate study. These were: functional independence, gender and pre-injury employment. Since that review, the more frequent use of multiple correlational analyses has identified additional inde-

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pendent, replicated correlates of post-injury employment, including pre-injury education (18), time since injury (19), age (13), injury level (20) and age at injury (9). One striking feature of these multivariate studies is that they have concentrated on identifying the contribution of particular injury and demographic variables, and little attention has been paid to the investigation of the relative importance of psychological variables.

While the search for psychological correlates of post-injury employment outcome has been less intense than has been the search for corresponding injury and demographic variables, there are at least 2 good reasons for seeking to understand the role that the psychological variables play in post-injury employment outcomes. First, notwithstanding the predictive power of key injury and demographic variables, most studies incorporating these variables explain only a minority of criterion variance. As Levi (13) stated in his extremely thorough population study of SCI patients from the Stockholm area, "The commonly used patient (i.e. injury and demographic) characteristics are insufficient, but not irrelevant, as predictors of employment outcomes" (p. 36). A second reason for studying the role of psychological variables in post-injury employment is that psychological variables, more so than many injury and demographic variables, are amenable to rehabilitation intervention to enhance salient attitudes or behaviors.

With the aim of advancing the understanding of the factors related to return to work following disabling injury, this study sought to investigate the contribution of psychological variables, over and above demographic and injury variables, to explaining an individual's employment outcome following SCI. With such, it is suggested that rehabilitation professionals will be in a better position to assist their clients to achieve their best possible employment outcome.

In an effort to identify potential psychological correlates, 3 prominent personal control variables were chosen for examination. These were locus of control, self-efficacy and explanatory style. The focus on personal control variables is based on empirical and theoretical work suggesting that this construct may be useful in explaining post-injury vocational rehabilitation achievement. Based on previous research involving both those with a SCI and wider populations, locus of control was identified as a personal control variable that was likely to be capable of making an independent contribution to the understanding of post-injury employment.

For theoretical reasons (21), it was hypothesized that if locus of control was to be used, a complementary measure of the value to the individual of the behavioural domain might also prove useful. As this study focused on post-injury employment, a measure of work value was deemed appropriate. In studies of non-SCI populations, work values have been found to correlate with employment status (22).

The final psychological variable examined for possible inclusion in this study was social support. However, for various theoretical, empirical and practical reasons, it was decided that there was insufficient support for the inclusion of such a measure. Thus, the final set of psychological variables chosen for inclusion were "locus of control" as described by Rotter (23) and "work attitude" as proposed by Kanungo (24).

PATIENTS AND METHODS

Participants

All study participants had received treatment for a traumatic SCI at 1 of the 2 specialist SCI treatment facilities. These facilities were the sole providers of specialist SCI treatment for people residing in Victoria, Tasmania and the majority of New South Wales. In order to be eligible to participate in the study, individuals needed to: (a) have had at least 18 months lapsed since their injury; (b) be of workforce age (16–65 years); and (c) have experienced a traumatic SCI for which they were admitted to a spinal unit and discharged with persistent neurological damage.

The injury and demographic characteristics of the sample ($n = 459$) follow: the average age of the group at the time of the study was 39.6 years, and age at time of injury averaged 28.4 years; 47% of the sample had paraplegia, and 48% of all injuries were complete; the sample was 85% male, and only a minority (26%) had completed high school; 81% of the sample were employed pre-injury, and 42% were eligible for either workers' compensation or transport accident insurance. Further information in relation to the participants' demographic characteristics is presented in Tables I and II.

Participants had had access to a variety of post-injury vocational services that included vocational counseling, job seeker training and placement services. However, in Australia it is not compulsory that the study population uses these services and employment is not a major focus of most SCI rehabilitation programs.

Measures

Independent variables. Three groups of variables were examined: (a) 7 demographic variables; (b) 5 injury variables; and (c) 4 psychological variables. The demographic and injury variables included all those replicated correlates identified by previous researchers using multiple

Table I. *Descriptive statistics for each of the continuous variables*

Variables	*n*	Min	Max	Mean	SD
Time since injury (months)	459	18.20	521.67	136.39	114.54
Age at survey (years)	459	18.12	64.95	39.57	11.20
Functional independence (FIM)	459	42	126	100.00	24.62
Level of injury	459	1	27	11.68	6.40
Internal RLOC	444	3	18	12.91	3.36
Powerful others RLOC	444	3	18	11.74	2.85
Chance RLOC	444	3	18	9.16	3.07
Work attitude	445	7	36	20.56	5.53

RLOC = Rehabilitation locus of control.

correlation techniques, plus 1 variable (post-injury study) which was suggested by early research to be important (25) and has more recently been shown to be related to post-injury employment outcome (12).

The psychological measurement instruments used in the study were chosen based on previous research that found that these measures were positively correlated with various criteria of post-injury employment (10, 26, 27) and their being relatively short standardized measures of each construct. Measurement of locus of control was performed using a Rehabilitation Locus of Control (RLOC) scale developed by the first author based on Levenson's Multidimensional Health Locus of Control Scale (28). Consistent with Levenson's measure, the RLOC scale generates 3 sub-scores: Internal RLOC, which measures the extent to which one believes that internal factors are responsible for rehabilitation outcome; Powerful Others RLOC, which relates to the belief that one's rehabilitation outcome is determined by powerful others; and, Chance RLOC, which measures the extent to which one believes that rehabilitation outcome is a matter of fate, luck or chance. The measure as developed by Levenson has demonstrated good reliability and validity (29). In relation to the revised scale, initial validation and test-retest reliability was established when it was used with back-injured workers' compensation claimants (30).

Following a review of the work attitude measures, Kanungo's Work Involvement Scale was identified as a psychometrically sound index of the construct (24). This scale has established reliability in the general literature on unemployment. In studies of those with SCI, work attitude measures have been found to correlate with job seeking (10, 31).

Table II. *Descriptive statistics for each of the categorical variables*

Variables	%
Gender (n = 459)	
Male	85
Female	15
Level of secondary schooling (n = 459)	
Year $\leq$9	28
Year 10	28
Year 11	18
Year 12	26
University qualified at injury (n = 448)	
No	94
Yes	6
Employment situation at injury (n = 459)	
Professional/paraprofessional worker	21
Non-professional worker or student	72
Not working or studying	7
Post-injury education (n = 447)	
None	54
Some, but not completed	14
Completed	32
Impairment type (n = 459)	
Complete tetraplegia	21
Incomplete tetraplegia	25
Complete paraplegia	32
Incomplete paraplegia	23
Vocational situation at survey* (n = 459)	
In paid employment	47
Working voluntarily (not for pay)	18
Student or in training	10
Homemaker	8
Unemployed – in rehabilitation	4
Unemployed – retired	3
Unemployed – looking for work	8
Unemployed – not looking for work	23
Labor force status at survey (n = 459)	
In the labor force	55
Not in the labor force	45

*Percentages total to more than 100 as some respondents endorsed more than 1 category.

Details of the measurement of each variable are presented below.

Demographic variables

- *Gender* (male = 1, female = 0)
- *Level of secondary schooling* – the highest grade of secondary school completed pre-injury (Year 9 or below = 1, Year 12 = 4)
- *University qualified at injury* – whether or not the participant had obtained a university qualification pre-injury (no qualification = 0; some qualification = 1)
- *Employment situation at injury* – professional or paraprofessional worker = 3, student or non-professional worker = 2, not working or studying = 1
- *Post-injury education* – whether the participant had undertaken training or education post-injury (none = 0, commenced but not completed = 1, completed = 2)
- *Age at survey* – the participant's age in years at the time of survey
- *Time since injury* – the time between injury and interview measured in months

Injury variables

- *Level of injury* – the lowest neurologic segment of the cord with normal function (1st cervical = 1; 4th sacral = 29)
- *Tetraplegia or paraplegia* – those with an injury to cervical spine defined as having tetraplegia (1), else = paraplegia (0)
- *Completeness of injury* – those with a grade on the ASIA impairment scale of B, C or D were defined as having an incomplete impairment type (0). Grade A = complete (1)
- *Impairment type* – complete tetraplegia = 1; incomplete tetraplegia = 2; complete paraplegia = 3; incomplete paraplegia = 4
- *Functional independence* – measured using the FIM (FIM score)

Psychological variables

- *Internal RLOC, Powerful Others RLOC, Chance RLOC* – Locus of control measure based on Levenson's work (range 3–18)
- *Work attitude* – Measured using Kanungo's scale (scores range from 6 to 36, higher scores indicate greater valuing of work)

Criterion variable. Consistent with the definitions of the Australian Bureau of Statistics, and in line with the recommendations of Murphy and Athanasou (17) for SCI researchers to use standardized definitions of employment-related variables, "labor force status" was the dichotomous criterion variable used to measure study participants' post-injury employment outcome. Those "in the labor force" include those employed and those looking for work; those defined as not being "not in the labor force" are those not working and not looking for work (In the labor force = 1; Not in the labor force = 0). The rationale for including those looking for work with those employed comes from the finding that those with a SCI who make a concerted effort to find employment are largely successful in their endeavors (32). Categorization of looking for work, as opposed to not looking for work, was based on participants' self-reported activities.

Procedure

The sample was drawn from patients scheduled for review at spinal outpatient clinics conducted by the participating SCI units. Invitations to participate in the study were extended to 628 individuals (all of whom fulfilled the study's inclusion criteria). Of these, 459 (73%) agreed to participate. The sampling strategy employed was one that aimed to recruit enough participants to achieve a suitable subjects-to-variables ratio. Data were not collected in relation to those who chose not to participate in the study.

The majority of information relating to participants' injury and pre-injury characteristics, and their work-related activities since leaving the spinal injuries unit was collected using a self-report survey. The survey also contained psychological scales (i.e. measures of "work attitude" and "locus of control"). The survey was designed to be easily completed by individuals with limited fine-motor skill and typically took 15–20 minutes to complete. Functional independence (FIM) scores were obtained either from hospital records of discharge FIM scores or, where these were missing, by an experienced rehabilitation nurse, trained in the use of the scale, who questioned the patients about their capabilities. The comparability of FIM scores obtained by interview as opposed to direct observation has been supported (33).

Data analysis

Logistic regression was used to answer the main research question. A "sequential" or "hierarchical" approach was chosen as there was the desire specifically to evaluate the contribution to the explanation of labor force status by the set of psychological variables when they were entered into the equation after the more frequently studied injury and demographic variables. Logistic regression was chosen over alternative multivariate procedures based on the flexibility it affords due to its lack of assumptions in regards to data distribution (34). Spearman's correlation coefficients and the results from chi-square analysis were interpreted to determine the significance of bivariate associations. All analyses were performed using SPSS v 11.0.1.

RESULTS

Table I contains the range, means and standard deviations for the study's continuous variables. Table II contains the relevant percentages of participants in each category of the study's nominal variables and a detailed description of the study participants' vocational situations at the time of survey. With respect to study participants' vocational situations at the time of survey, the most frequently reported status was employed (47.0%). Of those who were not in paid employment, 15.1% described themselves as "unemployed and looking for work". Voluntary work was relatively common within this group, with more than 1 in 6 respondents reporting working in this way. In terms of the Australian Bureau of Statistics standardized definitions of employment status, 253 respondents were "in the labor force" (i.e. engaged in paid work or available for and looking for paid work). The unemployment rate (i.e. those looking for work as a percentage of those in the labor force) was 14.6%. The labor force participation rate (i.e. those in the labor force as a proportion of the population) was 55.1%.

Bivariate relationships

Table III displays the correlations between study variables. The successful search for improved understanding of post-injury employment outcome is dependent, logically, on finding new variables that, while correlated with the criterion, are not too strongly associated with previously established indicators of post-injury vocational status. Among the independent variables, the highest correlations involved the injury variables (see Table III). The injury variables all have only minimal association with any of the other independent variables. The seven demographic variables are inter-correlated to a modest extent, with 8 of the 21 correlations significant at $p \leq 0.001$. The largest of these correlations (between the 2 time-related variables) is of a medium size ($r = 0.360$), but more importantly, most of these demographic variables are not highly correlated with the injury or personality variables. The strongest relationship is between time since injury and the "powerful others" scale of the RLOC ($r = 0.265$, $p < 0.001$). Among the psychological variables, the RLOC subscales, while they are moderately correlated with each other, appear to be suitably independent in that correlations range from 0.146 to −0.395. Similarly, and most importantly, all of the RLOC scales seem to be essentially independent of "work

Table III. *Correlations between study variables*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Gender	–	−0.132[b]	−0.075	−0.086	−0.074	0.033	−0.046	−0.042	0.065	−0.011	−0.056	−0.057	0.001	0.059	0.028	0.028	0.049
2 Level of secondary schooling		–	0.314[c]	0.221[c]	0.136[b]	−0.164[c]	−0.149[b]	0.071	−0.064	−0.035	0.079	0.109[a]	−0.154[b]	−0.088	0.143[b]	−0.038	0.178[c]
3 University qualified at injury			–	0.302[c]	−0.048	0.066	−0.088	0.029	−0.030	−0.051	0.053	0.074	−0.103[a]	−0.081	0.024	−0.106[a]	0.103[a]
4 Employment situation at injury				–	0.028	0.201[c]	−0.020	0.002	0.020	−0.076	0.013	0.102[a]	−0.176[c]	−0.124[b]	0.155[c]	0.125[b]	0.174[c]
5 Post-injury education					–	−0.170[c]	0.156[c]	0.017	−0.001	−0.001	0.002	0.026	−0.116[b]	−0.027	0.101[a]	0.011	0.201[c]
6 Age at survey						–	0.364[c]	−0.018	0.018	−0.053	0.009	−0.028	0.100[a]	0.129[b]	−0.049	0.164[c]	0.087
7 Time since injury							–	−0.005	−0.016	0.153[c]	−0.056	−0.129[b]	0.195[c]	0.265[c]	−0.131[b]	0.079	0.080
8 Level of injury								–	−0.859[c]	0.007	0.818[c]	0.589[c]	−0.112[a]	0.006	0.066	0.114[a]	0.134[b]
9 Tetraplegia vs paraplegia									–	−0.129[b]	−0.893[c]	−0.596[c]	0.056	−0.016	−0.038	−0.075	−0.094[a]
10 Completeness of injury										–	−0.329[c]	−0.245[c]	0.119[a]	0.072	−0.053	−0.048	−0.073
11 Impairment type											–	0.670[c]	−0.107[a]	−0.019	0.057	0.095[a]	0.124[b]
12 Functional independence												–	−0.204[c]	−0.129[b]	0.171[c]	0.115[a]	0.198[c]
13 Chance RLOC													–	0.346[c]	−0.395[c]	−0.181[c]	−0.334[c]
14 Powerful others RLOC														–	−0.222[c]	0.060	−0.064
15 Internal RLOC															–	0.146[b]	0.305[c]
16 Work attitude																–	0.351[c]
17 Labor force status																	–

[a] $p < 0.05$; [b] $p < 0.01$; [c] $p \leq 0.001$. RLOC: Rehabilitation Locus of Control.

attitude". RLOC-work attitude correlations range from 0.060 to −0.181.

With respect to the correlation of independent variables with the study's criterion variable, 11 were found to correlate significantly with the criterion (i.e. being "in" or "not in" the labor force at the time of survey). These correlations were, while statistically significant, still quite small. The three psychological variables, work attitude, Chance RLOC and Internal RLOC, were most highly correlated with the labor force at $r = 0.351$, −0.334 and 0.305, respectively. Labor force status was found to be related to eight other independent variables, these being, in order of magnitude of association: post-injury education (0.201); level of secondary schooling (0.178); functional independence (0.198); employment situation at injury (0.174); level of injury (0.134); impairment type (0.124); university qualified at injury (0.103); and whether or not the individual had tetraplegia (−0.094).

Multivariate findings

Logistic regression was performed to assess the incremental contribution of each of the 3 sets of variables to the explanation of labor force status. Initially the demographic variables were entered (Step 1), then the injury variables were included (Step 2) and finally, the psychological variables were entered (Step 3). The results from this analysis are presented in Table IV. The final set of data retained for the regression analysis was 435 as there were 24 cases with missing data. Hosmer and Lemeshow's goodness-of-fit testing revealed that the model was a good fit for the data at all steps of the analysis: Step 1, $p = 0.154$; Step 2, $p = 0.154$; Step 3, $p = 0.820$.

Step 1. While 7 demographic variables were initially selected for inclusion in the multivariate analysis, issues to do with the distribution of gender (85% of cases were male) meant that in several instances the cases-to-cell ratio was low. As gender was not found to be related to employment status at a bivariate level, and the findings from past research have been mixed, the decision was made to exclude gender from the final analysis. Using the 6 demographic variables, separation between the 2 labor force groups was achieved (Table IV). In all, 62.8% of participants were correctly classified. Three variables significantly added to the prediction. These were, pre-injury level of secondary schooling ($p < 0.005$), employment situation at the time of injury ($p < 0.05$) and the undertaking of training or education post-injury ($p < 0.001$). With the inclusion of the demographic variables only, approximately 11% of the variance in labor force status could be explained (Cox & Snell $R^2 = 0.108$).

Table IV. *Classification results from hierarchical logistic regression analysis*

	Step 1	Step 2	Step 3
Correctly classified			
Not in the labor force	114 (57.0%)	115 (57.4%)	134 (67.0%)
In the labor force	166 (68.3%)	171 (70.4%)	202 (83.1%)
Total	280 (63.2%)	286 (64.6%)	336 (75.8%)
Chi Square (df)	50.514* (6)	60.878* (9)	156.694* (13)
Cox & Snell R^2	0.108	0.128	0.298

*$p < 0.001$.

Step 2. Given the high correlations between the injury variables, the decision was made to include only tetraplegia vs paraplegia, completeness of injury, and functional independence, in the multivariate model. After addition of these 3 injury variables, significant separation was maintained but the percentage of cases correctly classified (65.5%) was only minimally improved. While the percentage of cases correctly classified increased only marginally, the inclusion of the variables contributed significantly to the model, χ^2 (3) = 10.364, $p < 0.05$. In addition to level of secondary schooling, employment situation at injury, and the undertaking of training or education post-injury, time since injury was found to be significantly related to labor force status ($p < 0.05$). Individually, none of the injury variables were found to add significantly to prediction. With the inclusion of the demographic and injury variables the explained variance in outcome increased to 13% (Cox & Snell $R^2 = 0.128$).

Step 3. When the 4 psychological variables were added, 75.4% of cases were correctly classified. The final model was more efficient at classifying those in the labor force (82.4%) than it was at classifying those not in the labor force (67.0%). The addition of the psychological variables contributed usefully to the more accurate classification of those who were members of the labor force (see Table V). The inclusion of the psychological variables also reliably improved the prediction model, χ^2 (4) = 95.816, $p < 0.001$. With the inclusion of the demographic, injury and psychological variables, 30% of the variance in labor force status could be explained (Cox & Snell $R^2 = 0.298$). In the final model, level of secondary schooling, the undertaking of training or education post-injury, time since injury, Chance RLOC, Internal RLOC and Work Attitude were the variables that significantly contributed to prediction (see Table V for further details).

DISCUSSION

This study aimed to examine the contribution made by 3 sets of factors, but particularly the psychological, to the post-injury employment outcomes of those with SCI. Results are discussed with respect to the findings about (a) participants' actual labor force status at the time of the survey and (b) those variables which were found to correlate significantly with post-injury labor force status. With respect to labor force status at the time of survey, the study found that the majority of respondents were either engaged in paid work or actively looking for paid work. The percentage of respondents reporting being in paid work (47%) is comparable to percentages reported as being "employed" in previous studies (7, 13), although it is recognized that an employment rate of 47% is probably one of the higher rates found in studies of similar size and breadth (14, 18).

While most of the independent variables were significantly associated with labor force status at time of survey, most of these

Table V. *Logistic regression analysis of labor force status as a function of demographic, injury and psychological variables*

Variable	β	SE β	Wald	Odds Ratio	95% CI	
Level of secondary schooling	0.250	0.111	5.089*	1.284	1.033	1.596
University qualified at injury	0.900	0.551	2.668	2.460	0.835	7.246
Employment situation at injury	0.189	0.256	0.548	1.208	0.732	1.993
Post-injury education	0.464	0.140	11.080**	1.591	1.210	2.092
Age at survey	0.007	0.013	0.309	1.007	0.982	1.033
Time since injury	0.004	0.001	8.500**	1.004	1.001	1.006
Tetraplegia or paraplegia	−0.100	0.262	0.144	0.905	0.541	1.514
Completeness of injury	−0.182	0.354	0.264	0.834	0.417	1.669
Functional independence (FIM)	0.004	0.007	0.349	1.004	0.990	1.019
Chance RLOC	−0.151	0.045	11.187**	0.859	0.786	0.939
Powerful others RLOC	−0.010	0.044	0.051	0.990	0.908	1.080
Internal RLOC	0.170	0.043	15.635**	1.185	1.089	1.289
Work attitude	0.125	0.024	28.192**	1.134	1.082	1.187

*$p < 0.05$, **$p < 0.005$. RLOC: Rehabilitation Locus of Control.

zero-order correlations were small, with the largest ($r = 0.351$) being the correlation between work attitude and labor force status. Even though the labor force criterion variable was dichotomous, the correlations suggested that individual variables explain only a small percentage of criterion variance. When the variables were used in combination, 6 (including 3 of the 4 psychological variables) contributed usefully to the discrimination between those who would be "in" as opposed to "not in" the labor force at follow up. Results from the logistic regression suggest that characteristics of the individual (be they related to patient demographic, injury or personality factors) explain only about a third of the variance in post-injury labor force status.

Perhaps the most striking finding from the multivariate analysis was the comparatively influential role the psychological factors played. Largely ignored in previous multivariate analyses of post-injury employment outcome, the set of psychological variables added a great deal to the classification efficiency of the model. Both work attitude and aspects of locus of control seem to play a part in job seeking following SCI.

Although the current study used a novel criterion measure, the level of classification efficiency obtained in the current study (75.4%) can be compared with the overall accuracy of classification previously obtained. The studies of DeVivo & colleagues (15, 16) are perhaps representative of the early investigations into employment status following SCI. DeVivo & Fine (15) achieved an overall correct classification rate of 90%. However, a problem exists with respect to trying to interpret the degree of equivalence in results because DeVivo & Fine used a confounded employment-grouping variable, "gainful employment", that included those employed, in training, in sheltered workshop activity, and homemakers and students. In addition, because of the small number of subjects ($n = 60$) involved in the analyses conducted to develop the model, the accuracy achieved when the variables were used with a new, cross-validating sample is probably a more reliable guide to its classification efficiency. When DeVivo & Fine applied their model to a new set of patients, the overall classification accuracy dropped to 71%.

In comparison with the results of Krause et al. (19) who found that they could correctly classify 69% of cases based using 7 biographical and injury related variables (gender, race, level of injury, injury completeness, years of education, age at injury and time since injury), current findings indicate that a higher rate of accurate classification can be achieved through the inclusion of psychological variables.

The results from the current analysis suggest that psychological factors are not just important correlates of post-injury labor force status, but they may also be among the most important in terms of explaining return-to-work outcome. This importance is suggested by the fact that when entered last, they still managed to raise significantly the classification efficiency of the model.

In terms of previous research findings, one surprising aspect was the relatively low percentage of variance explained. Using a more restricted set of variables, DeVivo and colleagues (16) were able to explain more than 50% of the variance in outcome. However, De Vivo et al. defined their groups somewhat differently than in the present study, which used the Australian Bureau of Statistics' definitions of labor force status.

As a set, the demographic variables made a significant contribution to the model. With respect to the injury variables, it was found that the inclusion of these variables did significantly improve prediction, however, individually, no variable was found to be significant. Traditionally, the degree of impairment has been found to significantly relate to various indices of rehabilitation outcome (35, 36); however, more recent studies have identified no significant employment differences when comparing those with paraplegia and tetraplegia using multivariate statistical techniques (7, 13).

Because of the known limitations associated with the use of simple injury categories in explaining employment outcomes, the FIM was also used. Unfortunately the FIM was of limited explanatory value. The present results suggest that, in employment studies, the FIM and other measures of SCI, might be better substituted by alternative measures such as the Motor Index Score (37), which is believed to represent a functional interaction between injury level and completeness.

Study limitations

The current results need to be interpreted in the light of the study methodology. Thus, as a cross-sectional survey, the current research had the inevitable limitations associated with lack of control over the temporal sequence of events or phenomena being examined. Because of the low incidence of SCI, estimated to be as low as 15 per million, a prospective study was not considered practical. Further, it was thought that as the current study's aim was to explore the contribution of psychological variables (over and above previously examined injury and demographic variables), in order to achieve a desirable subjects-to-variables ratio, an initial, large cross-sectional design was appropriate. Research using a prospective design would further illuminate the impact of psychological variables on return-to-work outcome.

While the majority of people who were invited to participate in the study agreed to do so (i.e. 73%) it may be the case that the current findings are not representative of the entire population with SCI. While sample demographics are similar to those of the Australian population with SCI (38), the extent to which current results can be generalized to other countries is not easy to ascertain, particularly given that the social security legislation obtaining in different counties may play a role in the employment outcomes achieved by those living with a SCI.

Directions for future research

The current results suggest 2 clear paths for future researchers wishing to understand better the factors that influence the employment outcomes of people following SCI. First, psychological factors appear to explain significant amounts of criterion variance, over and above that explained by injury and demographic variables. Replication and extension of the psychological variables examined in the present study needs to be undertaken. Second, the fact that only a minority of criterion variance was explained by the use of the full set of patient characteristics suggests that, in addition to researching patient characteristics, there is a need for researchers to take up the recommendation of Krause & Anson (14) to broaden the set of independent variables to include environmental factors when making further attempts to better understand the gaining of employment following SCI.

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