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Vocational outcome following spinal cord injury

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Study Design: Non-experimental (ex post facto) survey research design involving the use of a fixed alternative format questionnaire.
Objectives: To investigate variables influencing vocational outcome, to identify barriers to gaining and sustaining employment and to identify the effects of variables on the type of work engaged in following spinal cord injury. The two sets of independent variables considered were, individual and injury-related factors (age at onset of injury, time since injury, extent/level of injury, highest educational qualification achieved pre-injury, and pre-injury occupation) and circumstantial factors (means of transport, access difficulties, perceived workplace discrimination, financial disincentives to work and perceived level of skill).
Setting: The Princess Alexandra Hospital Spinal Injuries Unit, Queensland, Australia.
Methods: Data on the variables and the vocational outcomes of having ever worked or studied post-injury, current employment status and post-injury occupation were obtained from survey responses. Demographical and medical data were gathered from medical records.
Results: Forward stepwise logistic regression revealed that having ever worked or studied post-injury was associated with all individual and injury-related factors except pre-injury occupation, and two circumstantial factors, namely means of transport and access difficulties. Current employment was associated with all circumstantial factors as well as age at injury and pre-injury occupation. Standard multiple regression analyses revealed that post-injury occupation was correlated with all individual and injury-related factors as well as means of transport and perceived workplace discrimination.
Conclusions: Tailored rehabilitation programs for individuals with characteristics associated with less successful vocational outcomes may facilitate their employment status after injury.

Keywords: spinal cord injury; vocational outcome; rehabilitation

Introduction

Trauma to the spinal cord may impact substantially on many facets of the individual's life, including social roles, personal goals and future life expectations. Rehabilitation programs aim to enhance adjustment to life following spinal cord injury (SCI) by equipping the individual and his/her family and friends with the skills and resources required for community living.[1,2] An important component of this rehabilitation process is the return to gainful employment,[3–5] especially since life satisfaction[6–8] and a sense of well-being[9–11] have been positively associated with working post SCI.

While most individuals (up to 85%) who sustain SCI are usually either employed or studying at the time of their accident, fewer, that is between 13% and 69%, return to work/study post-injury.[12,13] Fewer again are reported as being currently employed (13% to 56%),[14,15] highlighting that once a position is secured in the workforce, further problems may be experienced in sustaining employment. In terms of the types of occupations in which people are likely to be employed post-SCI, a substantial proportion find jobs in clerical or data entry areas, with fewer people employed in professional or managerial positions.[16,17]

Just as for the process of vocational exploration, planning and decision making in the general population, many factors impact upon an individual's vocational choice and development following SCI.[18–21] There have been some inconsistent findings regarding the impact of factors on vocational outcome, with reasons for this related to differences in methodological design and definitions of 'employment', as well as changing socioeconomic and political climates.[4,16]

A number of specific individual and injury related factors have consistently been associated with return to gainful employment following SCI. A higher level of formal education attained prior to injury[22,23] and pre-injury vocational interests in more cognitive fields,[24,25] have been positively linked to successful vocational outcome. Injury related issues including younger age at onset of injury[11,26,27] and increased length of time since

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injury[28,29] have been similarly related to successfully securing a job. Issues of adjustment and reintegration into the community have been established as important precursors to vocational re-engagement,[30,31] with the interval 2–10 years post-injury proposed as the key time to assess vocational potential.[21,22] The influence of severity of injury on return to gainful employment has been less clearly defined. It would be intuitively expected that the degree of disability resulting from a complete cervical lesion would impact more severely on all life roles including that of worker.[5] While Goldberg and Freed[19] proposed a lack of realistic vocational expectations as contributing to lower work rates of individuals who have sustained complete cervical injuries, Castle[17] and Krause[9] indicated the need for career adjustment, change and retraining as delaying their re-entry into the workforce.

In addition, a number of circumstantial factors or barriers to return to work have been identified. Lack of an independent means of transport;[32,33] and workplace discrimination due largely to negative or naïve employer perceptions about the potential productivity of individuals with SCI,[17] have been negatively correlated with return to employment. Other factors such as financial disincentives to re-engaging in the workforce including loss of pension benefits[34] and a lack of confidence in one's ability to competently carry out work tasks[35] have gained some support as having a detrimental effect on return to work post-injury.

The purpose of this study was to further clarify those factors which exert an influence on vocational outcome following traumatic SCI. Specifically, it was hypothesized that two sets of independent variables, namely those of an individual and injury-related nature and those circumstantial factors perceived as barriers to employment, would affect the rate of return to work or study, current employment status and the type of occupation following SCI.

Method

Hypotheses

The hypothesized directional effects of the dependent variables are that each of:

- being older at onset of injury,
- having a shorter duration of injury,
- sustaining a complete cervical injury,
- having lower levels of pre-injury qualifications, and
- being employed in a lower status pre-injury occupation,

will negatively impact upon both returning to work/study at any stage following injury and being currently employed. For those actually returning to work, the factors noted above will lead to them being employed in positions classified as having lower occupational status.

Perceiving environmental barriers, discrimination, financial disincentives to working and a lack of work skills will be associated with not being currently employed and never having worked or studied since injury. However, having independent means of transportation will positively influence return to work/study post-injury as well as being currently employed.

Upon resuming work, not having independent transportation, perceiving workplace discrimination and lack of work skills will lead to employment in positions considered as having lower occupational status. Perceiving financial disincentives to working will lead to undertaking positions considered as having higher occupational status.

Participants

The participants in this study were selected from a population of all individuals who were admitted to the Princess Alexandra Hospital Spinal Injuries Unit for their acute and post-acute inpatient rehabilitation following SCI. Forty patients were randomly selected from each year for the period between 1985–1995 inclusively ($n=440$) by drawing every third person admitted to the Spinal Injuries Unit who met the following eligibility criteria: had sustained a SCI, had been admitted to the Princess Alexandra Hospital Spinal Injuries Unit for the duration of acute care and inpatient rehabilitation between 1985 and 1995 inclusively, were at least 2 years post-injury, were currently between the ages of 15 and 65 years, and were currently living in the community (that is, not living in a nursing home, hostel or other institutional care setting).

Once the initial sample was obtained, participant data for gender, level of injury and residential location were collected to ascertain if the sample replicated population characteristics reported in the 1996 Spinal Injuries Unit Annual Report, namely: 80% male, 50% quadriplegic level of injury and 50% living outside a 200 km radius of Brisbane. This was undertaken to ensure that the sample was as representative as possible of the individuals admitted to the only spinal injuries unit in Queensland, Australia. The initial sample did not demonstrate the annual report trends, requiring the subjects to be returned to the total pool and a new sample drawn by selecting every fourth admission meeting eligibility criteria. This second sample adequately matched the annual report data with the sample consisting of 79.5% ($n=350$) males, 49.5% ($n=218$) individuals with a diagnosis of quadriplegia and 49.8% ($n=219$) of the sample residing outside a 200 km radius of Brisbane.

Eligible individuals ($n=440$) were forwarded an initial package including an information letter, the questionnaire, a consent form and a stamped, return address envelope. The return rate was 40.2% ($n=177$) comprising 126 completed questionnaires and 51

packages which had been returned unopened because the person had changed address. To increase this response, after an interval of 3 weeks, a second copy of the questionnaire was mailed to those who had not responded. For those packages returned to sender, electoral rolls were accessed to gain a current address and packages were resent.

The response rate to the second package was 29% ($n=82$) consisting of 45 completed responses and 37 packages returned to sender. After excluding those subjects who did not receive a questionnaire, that is 'return to sender' packages for whom a current address was not obtained, an overall response rate of 50% ($n=171$) was achieved. Four of the returned surveys (2%) were discarded due to failure to meet community living inclusion criteria, deeming the questionnaire information unusable.

In total, 167 individuals entered the study, representing 38% of the target sample. Of these 167 participants, 129 (77%) were male, 83 (50%) had sustained a cervical injury resulting in quadriplegia and 76 (46%) were living outside a 200 km radius of Brisbane. Therefore the participants appeared to be representative of the population described in the Princess Alexandra Hospital Spinal Injuries Unit Annual Report.

The mean age of respondents was 36 years (range 21–65) and the mean length of time since injury was approximately 7 years (range 2–12). The most common cause of injury was motor vehicle accident (38%). Other medical, demographic and pre-injury employment characteristics of the sample are presented in Tables 1 and 2.

Procedure

A survey research design involving the use of a fixed alternative format questionnaire was utilized.

Table 1 Level, extent and cause of traumatic spinal cord injury

Level of injury	
High cervical (to C4)	14 (8%)
Low cervical	69 (41%)
High thoracic (to T9)	30 (18%)
Low thoracic and below	54 (33%)
Extent of injury	
Incomplete lesion	100 (60%)
Complete lesion	67 (40%)
Cause of injury	
Motor vehicle accident	62 (38%)
Fall	18 (11%)
Diving	17 (10%)
Motor cycle accident	16 (10%)
Horse riding accident	8 (5%)
Football	6 (4%)
Other	40 (23%)

C4 = 4th cervical spinal level; T9 = 9th thoracic spinal level

Table 2 Pre-injury educational and occupational characteristics ($n=167$)

Years of education	
Mean	10.8 (range 1–19)
Standard deviation	2.1
Highest qualification attained	
School (complete or incomplete)	85 (51%)
Certificate	28 (17%)
Trade	36 (21%)
University degree/s	18 (11%)
Occupational category#	
Upper	30 (18%)
Middle	38 (23%)
Lower	72 (43%)
Other	27 (16%)

#Occupational status as per Najman and Brampton's[41] reclassification of ASCO: Upper status – manager/administrator/professional/para-professional; Middle status – tradespersons; Lower status – clerks/salespersons/machine operators/ labourers; Other – home duties/student/volunteers/unemployed

Data collection

Data was collected by a mailed self-administered questionnaire and by accessing information from the participants' medical charts. For respondents consenting to participate in the study, demographic and medical data were gathered from medical records. This task was completed by the first author to ensure accurate and consistent collection of data, particularly regarding the classification of injury level and extent.

Variables and their measurement

Independent variables The independent variables were divided into two sets according to whether the independent variable related to either factual accounts of the individual's injury and pre-injury achievements or to post-injury perceptions. The use of subsets has been recommended when there are a large number of variables compared to the number of cases.[36]

(1) Individual and injury-related set
   (a) age at onset of injury (measured in years)
   (b) time since injury (measured in months)
   (c) extent and level of injury according to American Spinal Injury Association (ASIA) definitions[37] (measured as a dichotomous variable: complete cervical injury or other)
   (d) pre-injury highest educational level achieved (measured as a categorical variable: school, certificate, trade, university degree/s)
   (e) pre-injury occupation. This was measured according to the Australian Standard Classification of Occupations [ASCO] categories,[38] namely: (1) manager/administrator, (2) profes-

sional, (3) para-professional, (4) tradesperson, (5) clerk, (6) salesperson/personal service worker, (7) plant/machine operator/driver, (8) labourer. For the purpose of this study, an additional category '9' was added for students and others not in paid employment. These categories were recorded into a three-point hierarchical scale, developed by Najman and Bampton,[39] whereby: Upper status – ASCO categories 1–3; Middle status – ASCO category 4; Lower status – ASCO categories 5–8. An additional scale, 'other', was recorded for category 9 above.

(2) Circumstantial issues set

(a) means of transportation (measured as dichotomous variable: independent driver or dependent passenger/public transport user)
(b) environmental issues (measured as dichotomous variable: difficulty accessing/using workplace environment/equipment or not)
(c) perceived discrimination (measured as dichotomous variable: discrimination perceived in work/potential work situations or not)
(d) financial disincentives (measured as dichotomous variable: financial disincentives to working perceived or not)
(e) skills level (measured as dichotomous variable: perceived lack of work skills or not)

Dependent variables

(1) Ever worked or studied post-injury (measured as dichotomous variable). For the purpose of this study, ever worked or studied post-injury was defined as the person's engagement in either paid employment (full-time, part time or casual) or formal study (full-time or part-time) at any point since injury.
(2) Currently working (measured as a dichotomous variable). For the purpose of this study, current employment status defined currently working as being engaged in paid work (full-time, part-time or casual).
(3) Post-injury occupation (measured in four hierarchical categories as previously described for pre-injury occupation).

Data analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS). Medical, demographic, educational and occupational characteristics of the participants were analyzed descriptively in terms of frequencies and percentages for categorical data and means and standard deviations for continuous data. Change in the pre- and post-injury work/study status of participants and the pre- and post-injury occupations in which they were engaged were analyzed using McNemar's chi-square statistic. To address the hypotheses, forward stepwise logistic regression was used to analyze the ability of the independent variables to predict two of the dependent variables, 'ever worked or studied post-injury' and 'currently working'. This method was chosen because these dependent variables were dichotomous and discrete. Both forward and backward stepwise logistic regression were performed on the data and compared to find the best method of prediction. For both dependent variables, forward logistic regression yielded the best model. Standard multiple regression analyses were performed between the independent variables and the hierarchical dependent variable, 'post-injury occupation'.

Eight statistical analyses were performed in this study. Multiple comparisons from a single sample require consideration of the family-wise error rate. Using Ottenbacher's[40] percentage error (PE) formula, it was calculated that 5% of the statistically significant findings were likely due to change. Given that all eight analyses performed were significant, this PE is negligibly low.

Results

Overview of vocational outcome

Comparison of whether the participants had ever worked or studied between pre- and post-injury revealed a significant change, McNemar's chi-square analysis, $\chi^2(1, n=167)=11.5$, $P<.001$. Consistent with previous findings,[18–20] of the 144 (86%) participants working or studying prior to injury, 112 (67%) had worked or studied post-injury or were currently doing so. Of these 112, 73 (44%) were currently in paid employment. Self satisfaction (96), financial incentives (90), and social interaction (50) were identified as

Table 3 Change in frequency of participants in upper, middle, lower and other occupational categories between pre- and post-injury

$n=167$	*Post-injury occupations*				
Pre-injury occupations	*Upper*	*Middle*	*Lower*	*Other*	*Total*
Upper	17 (10.2%)	1 (0.6%)	4 (2.4%)	8 (4.8%)	30 (18%)
Middle	3 (1.8%)	6 (3.6%)	9 (5.4%)	20 (12%)	38 (22.8%)
Lower	8 (4.8%)	1 (0.6%)	19 (11.4%)	44 (26.2%)	72 (43%)
Other	3 (1.8%)	2 (1.2%)	7 (4.2%)	15 (9%)	27 (16.2%)
Total	31 (18.6%)	10 (6%)	39 (23.4%)	87 (52%)	167 (100%)

reasons for working. Proving one's self worth, being a productive member of society, and gaining some sense of normality in life, were other reasons nominated for working post-injury. There was a significant change in the type of occupations participants were employed in from pre- to post-injury, McNemar's $\chi^2(1, n=165) = 37.0$, $P<.001$. Inspection of Table 3 shows that of 140 participants in paid employment pre-injury, 72 moved to the category of unemployed, study or volunteer work after injury.

Predicting vocational outcome

Prior to the multiple regression analyses, inspection of histograms and z-scores revealed a number of variables with a skewed distribution. The independent variable of age at injury and the dependent variable of post-injury occupation were transformed using square root transformations. These transformations reduced skewness and removed all outliers. The dichotomous outcomes of having ever returned to work or study since injury and currently working post-injury were dummy coded, thereby attaching a numerical value to the level of a categorical variable for the purpose of statistical analysis.[36]

Logistic regression analysis does not require multivariate normality and homogeneity of variance. Therefore, predictor variables in the logistic regression analyses were not transformed.

Ever worked or studied post-injury

Forward stepwise logistic regression was performed with 'ever worked or studied' as the dependent variable and the individual and injury-related set of independent variables. After exclusion of five cases with missing values, data from 162 cases was analyzed. One of the independent variables, pre-injury occupation, was eliminated from the analysis as insignificant. Age at time of injury, time since injury, whether the injury involved a complete cervical lesion, and highest pre-injury qualification achieved remained in as predictors in the final analysis. A test of the goodness-of-fit of the model with these four predictors yielded a highly significant model chi-square, χ^2 (4, $n=162) = 35.4$, $P<.001$, which indicated that the retained predictors together significantly distinguished between those who returned to work or study post-injury and those who did not.

After exclusion of one case with missing values, forward stepwise logistic regression for the independent variables in the circumstantial issues set on the outcome of having 'ever worked or studied post-injury' for the remaining 166 cases eliminated three of the independent variables (perceived discrimination, financial disincentives to work and perceived lack of work skills). A test of the goodness-of-fit of the model with the remaining two independent variables yielded a highly significant model chi-square, $\chi^2(2, n=166) = 21.9$, $P<.001$. This indicated that the retained predictors, lack of independent transport and perceived environmental barriers, significantly distinguished between those who returned to work or study post-injury and those who did not.

Table 4 shows the regression coefficients (B), the Wald statistics, levels of significance and the initial correlation (R) between that predictor and the outcome, for Wald values >2.00.

Currently working post-injury

After the exclusion of five cases with missing values, forward stepwise logistic regression for the independent variables in the individual and injury-related set on the outcome of currently employed for the remaining 162 cases saw the elimination of three independent variables (time since injury, complete cervical lesion and highest pre-injury qualification). A test model of the goodness-of-fit of the model with the remaining two independent variables yielded a significant model chi-square, $\chi^2(2, n=162) = 19.4$, $P<.001$). This indicated that the retained predictors, age at injury and pre-injury occupation, significantly distinguished between those who were currently employed and those who were not.

After the exclusion of one case with missing values, forward stepwise logistic regression for the circumstantial issues subset of independent variables for 166 cases retained all five independent variables in the equation and yielded a significant chi-square model, χ^2

Table 4 Forward stepwise logistic regression analyses of 'ever worked or studied post-injury' as a function of the retained predictors in the final two equations

Predictors	*B*	*Wald statistic*	*Df*	P	r
Individual/injury related subset:					
Age at injury	−0.08	17.74	1	0.001	−0.28
Time since injury	0.01	5.33	1	0.02	0.13
Complete cervical lesion	1.10	4.30	1	0.04	0.11
Pre-injury qualification	0.71	11.56	1	0.001	0.22
Circumstantial subset:					
Lack of independent transport	−1.40	14.64	1	0.001	−0.25
Perceived environmental barriers	−1.37	6.43	1	0.01	−0.15

(5, $n=166$) = 36.4, $P<.001$. Lack of independent transport, perceived lack of work skills, perceived discrimination in the work place, perceived environmental barriers and financial disincentives to work significantly distinguished between those who were currently employed and those who were not.

Table 5 shows the regression coefficients (B), the Wald statistics, levels of significance and the initial correlation (R) between the predictor and the outcome, for Wald values >2.00.

Post-injury occupation

After exclusion of five cases with missing values, the standard multiple regression equation of the independent variables in the individual and injury-related set on the outcome of post-injury occupation for 162 cases was highly significant, F(5,156) = 6.0, $P<.001$. The regression equation explained 16% ($r^2=0.16$) of the variance in post-injury occupation, with all of the independent variables having unique contribution of 15% ($sr^2=0.15$) and a shared contribution of 1%.

On this outcome, the regression equation for circumstantial issues set of independent variables for 166 cases was highly significant, F(5,160 = 7.9, $P<.001$. The regression equation explained 20% of the variance in this outcome. Two of the independent variables, lack of independent transport and perceived workplace discrimination, together made a unique contribution of 17% towards this outcome, with the remaining 3% being shared.

Tables 6 and 7 show the correlations between variables, the unstandardised regression coefficients (B), the semipartial correlations (sr^2) and r, r^2 and adjusted r^2 for both of these analyses.

Discussion

The primary purpose of this study was to determine the extent to which a number of individual, injury-related and circumstantial factors influenced whether people returned to work or study following SCI, whether they were currently employed and the type of occupation performed post-injury. The results indicate that for these outcomes between 14% and

Table 5 Forward stepwise logistic regression analyses of 'currently working' as a function of the retained predictors in the final two equations

Predictors	*B*	*Wald statistic*	*Df*	P	r
Individual/injury related subset:					
Age at injury	0.06	10.93	1	0.001	0.20
Pre-injury occupation	0.67	11.89	1	0.001	0.21
Circumstantial subset:					
Lack of independent transport	1.34	11.28	1	0.001	0.20
Perceived discrimination	1.57	5.20	1	0.02	0.12
Perceived lack of skills	−1.57	7.02	1	0.01	−0.15
Financial disincentives	−1.29	4.87	1	0.03	−0.11
Perceived environmental barriers	1.89	5.48	1	0.02	0.12

Table 6 Standard multiple regression of the individual and injury-related subset on post-injury occupation

Variables	*Post-injury occupation transformed (DV)*	*Complete cervical lesion*	*Age at injury transformed*	*Time since injury*	*Highest pre-injury qualification*	*B*	*β*	sr^2 *unique*	F
Complete cervical lesion	−0.15					−0.36	−0.18	0.03	6.00*
Age at injury	0.10	0.13				0.13	0.19	0.03	6.00*
Time since injury	−0.19	0.11	−0.10			−0.00	−0.18	0.03	5.76*
Highest pre-injury qualification	−0.19	−0.11	0.13	−0.18		−0.11	0.17	0.03	4.27*
Pre-injury occupation	0.22	0.06	−0.30	0.01	−0.42	0.16	0.22	0.04	6.87**
								$r^2=0.16$	
								Adjusted $r^2=0.13$	
								$r=0.40$	

*$P<0.05$; **$P<0.01$

Table 7 Standard multiple regression of the circumstantial subset on post-injury occupation

Variables	*Post-injury occupation transformed (DV)*	*Perceived discrimination*	*Independent transport*	*Skills level*	*Financial disincentives*	*B*	*β*	sr^2	F *unique*
Perceived discrimination	0.25					0.61	0.27	0.06	12.47**
Independent transport	0.32	−0.09				0.47	0.33	0.11	21.54**
Skills level	−0.10	0.07	−0.10			−0.18	−0.10	0.01	1.71
Financial disincentives	−0.07	0.14	−0.09	0.11		−0.14	−0.07	0.00	0.99
Environmental issues	0.12	0.36	−0.02	0.27	0.12	0.11	0.07	0.00	0.72
								$r^2 = 0.20$	
							Adjusted	$r^2 = 0.17$	
								$r = 0.44$	

**$P < 0.01$

22% of the variance was correlated with the independent variables.

Ever worked or studied

In reviewing the factors which effect the rate of return to work or study, several variables identified in the literature were supported by the findings in this study. Individuals who were younger at the onset of injury, had experienced a longer duration of disability and who had higher levels of formal education, were more likely to return to work or study following their injury. In support of Castle's[17] findings, having a complete, cervical lesion was found to reduce the likelihood of employment post-injury; 56% of participants with a complete cervical injury returned to work or study, compared to 70% of those whose lesions were not of a complete, cervical type.

Being an independent driver impacted favorably on return to work or study post-injury, with reduced dependence on the inflexible, inaccessible or unreliable options of taxi services and public transport likely to be the reason for this finding. Increased flexibility associated with being an independent driver may also enhance the individuals' internal locus of control, previously identified as important to successful rehabilitation outcome.

Contrary to previous findings,[17,41] and indeed contrary to what would be intuitively expected, the experience of environmental barriers in the workplace, such as inaccessible toilet facilities and work resources and inadequate car park allocation, was positively associated with working or studying since injury. Thus the environmental problems experienced by those who had actually studied or worked since their injury were greater than the barriers received by those who had not. This suggests that while environmental barriers may be factors making it more difficult to work, they do not necessarily prevent employment or study opportunities.

Current employment

As with the outcome of having ever worked or studied since injury, both being of a younger age at time of injury and being an independent driver were also associated with being currently employed. Thirty-five per cent of participants who were aged 30 years or over at onset of injury were currently employed as opposed to 51% of currently employed individuals who were aged younger than 30 years at the time of injury. Additionally, being in a higher scale pre-injury occupation was associated with current employment. Because lower scale occupations generally provide less financial remuneration, people previously employed in these types of jobs may experience less incentive to return to work. Linked to this is the finding that financial disincentives were associated with not being currently employed. The perceived disadvantages of losing social security benefits, which would lead to exclusion from accessing government funded equipment supplies, transport schemes and medical subsidies, may deter people from seeking employment.[42]

Both environmental barriers and perceived discrimination were associated with current employment. Again these associations may reflect the actual experience of those actively participating in the workforce as opposed to the assumed experiences of those who are not. A perceived lack of skill was linked to being currently unemployed: 24% felt they lacked the skills to consider employment in the first place. Further, of the 40 people who had returned to work or study after their injury but were not currently employed at the time of being surveyed, 39 gave as their reason for terminating employment or study, the perception that the job demands were too difficult or personal skill level inadequate for satisfactory job completion.

Post-injury occupations

The results of this study linked being of younger age at onset of injury and having a longer duration of injury with employment in higher scale occupations post-

injury. These findings support those of other studies which suggest, firstly, that vocational plans are less rigid at a younger age, allowing flexibility in vocational adjustment and appropriate future career planning; and secondly, that a change in career direction requires more time for vocational exploration, education and training in new fields.[9,31]

A lower level of pre-injury education was correlated with employment in a lower scale occupation post-injury. For example, of the participants in this study with a school level education, only 17% were employed in higher scale occupations post-injury. By contrast, a higher proportion of those with a university degree or degrees, 47%, were employed in higher scale occupations. Additionally, working in a lower scale occupation pre-injury was related to employment in lower scale occupations post-injury, highlighting that those who did not attain a higher level of education pre-injury were not likely to do so following their injury. Sustaining a complete, cervical injury was also associated with employment in lower scale occupations such as clerical positions or voluntary work and student activity post-injury.

Of the independent variables in the circumstantial issues set, transport difficulties were found to be associated with employment in lower scale post-injury occupations. Apart from the difficulties associated with a lack of independent means of transport noted previously, that lower scale occupations tend to pay less may limit the individual's ability to purchase his/her own vehicle, necessitating the use of public transport or dependence on others for transportation needs. The issue of independent transport may also be linked to the relationship found between having experienced a complete, cervical injury and employment in lower scale occupations post-injury. In our experience, individuals who have sustained a complete spinal cord injury at or above the sixth cervical level, tend to experience significant difficulties returning to driving. In such instances, public transport and the difficulties associated with its use, may impact upon employment options.

Perceived discrimination in the workplace was found to be associated with employment in lower scale occupations post injury. A lack of understanding of the nature of SCI may impact on employer selection of candidates for more skilled professional or management occupations. As a result, individuals who have sustained a SCI may seek employment in lower scale, clerical type positions.[43,44]

Implications

Several implications for therapeutic intervention arise from these findings. Firstly, individuals who were older at the onset of their SCI (above 30 years), those who sustained a complete cervical injury, and those with lower levels of pre-injury education (no more than school level of education), were found to be less likely to return to work/study following their injury. Targeting individuals who fit one or more of these categories with tailored vocational rehabilitation programs may prove beneficial in facilitating return to work. Specifically, specialized vocational rehabilitation programs designed to address both generic vocational issues such as skill acquisition and development, as well as transportation options and access issues, may help in reducing the influence of these factors as barriers to post-injury employment.

Secondly, vocational rehabilitation programs may need to review the duration of follow-up provided once employment has been gained. In particular, older individuals and those who were in lower scale pre-injury occupations may need to be monitored for longer periods, as these are the groups which appear to be most at risk of not sustaining employment. Programs would need to adjust their focus once employment was gained to additionally address issues such as workplace discrimination, time management and negotiation skills, which were found to contribute to difficulties in sustaining work.

Thirdly, vocational rehabilitation programs need to be developed with input from individuals who have sustained a SCI. In this study, participants strongly indicated the need for specific vocational counselling, talking with peers who are in the workforce and the creation of special interest groups as means to facilitate the gaining and sustaining of employment post-injury.

Finally, some of the issues raised in this study may lie outside the scope of traditional rehabilitation programs. Challenging employer perceptions and attitudes, and lobbying for improved transport systems and genuine equal access to all public facilities may be required from the broader community. Reducing financial disincentives to working, increasing funding for personal care attendants, and providing modification of workplace equipment to facilitate competent vocational performance may require new policies to be developed on a political front.

Limitations

Several limitations to this study indicate the need for caution in interpreting the results outlined. The use of a fixed alternative survey design may have compromised the collection of qualitative data, limiting the scope of the issues brought to light. Similarly, the presence of sample bias may have influenced the range of findings, as only the details and opinions of those motivated to participate in the study were obtained. The use of more qualitative means of data collection, for instance a semi-structured questionnaire administered by telephone, may have gained more in-depth information from a greater number of participants.

Another factor which may have impacted upon the representativeness of the study was the fact that current addresses were not available for all randomly selected ex-patients, despite consulting electoral rolls.

The replacement of these patients with others randomly selected from the identified population was not completed due to time constraints.

The scope of the study prevented analysis of all the factors which may contribute to vocational outcome post traumatic SCI. The influence of compensation on vocational outcomes has been noted as requiring further clarification.[33,45] It was considered inappropriate for inclusion as an independent variable in this study for the following reason: On September 1 1994 a new Motor Accident Insurance Act[46] relating to compulsory third-party insurance was introduced, aiming to increase the speed of claim settlements to ensure the timely address of issues pertinent to rehabilitation, including equipment purchase and the establishment of appropriate accommodation. Since only four participants in this study sustained compensible injuries after 1 September 1994, the impact of the new Act would not be influential in this study. Prior to this Act the average length of settlement for claims of this nature was 10 years.[47] Because of this lengthy delay, it seems unlikely that the prospect of a successful claim would have affected decisions about employment for participants in this study. The study of people with compensible injuries occurring after the introduction of this new Act may provide information about the influence that compensation has on vocational outcomes and reasons for working.

Another aspect not addressed in this study was the effect of rehabilitation programs on facilitating return to work and study post-injury. Because information on the type, intensity and duration of the programs in which participants were involved was not ascertained in the survey, detailed analysis of the effect of this factor was not possible.

Further research is required to develop a greater understanding of the complexities associated with vocation following SCI. This study has focused on individuals who sustained their injury between 2 and 12 years ago. Combined cross-sectional and longitudinal studies to capture the influence of time and adjustment on vocational development post-injury would be beneficial.

Analysis of the scope of general rehabilitation programs and vocation-specific rehabilitation services with respect to their objectives, remediation strategies, outcomes and follow-up procedures would shed light on the nature of the programs currently on offer. Following this up with an investigation of both the success of these programs and the extent to which they address the issues raised in this and other studies would provide an essential evaluation of these services.

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