Readiness for Change Predicts Outcomes of Functional Rehabilitation Following Motor Vehicle Accident

Gregg A. Tkachuk · John K. Marshall ·
Annalyn C. Mercado · Bruce McMurtry ·
Fern Stockdale-Winder

Abstract *Introduction* Previous research has found pre-treatment motivational readiness to engage in pain self-management to be associated with completion of a rehabilitation program. This preliminary study examined this relationship, as well as the ability of pre-treatment readiness to change to predict clinical decisions of post-treatment functional work capacity. *Methods* The sample consisted of 106 individuals involved in a tertiary functional rehabilitation program for motor vehicle accident (MVA) survivors. The Multidimensional Pain Inventory (MPI) and Pain Stages of Change Questionnaire (PSOCQ) were completed prior to treatment. *Results* Hierarchical logistic regression analyses revealed that PSOCQ profile scores ($P = 0.008$), including higher individual PSOCQ contemplation ($OR = 5.30$; $P = 0.017$) and action ($OR = 5.16$; $P = 0.049$) scores, significantly increased the likelihood of completing the functional rehabilitation program. Clinical decisions about functional work capacity were predicted by MPI profile scores ($P = 0.001$), and this model was significantly improved by the addition of PSOCQ scores ($P = 0.037$). Lower MPI interference ($OR = 5.41$; $P = 0.002$), and higher MPI affective distress ($OR = 2.81$; $P = 0.010$), MPI support ($OR = 1.72$; $P = 0.027$), and PSOCQ action ($OR = 5.35$; $P = 0.038$) scores were significant predictors of clinicians' decisions regarding functional work capacity in the final model that identified 88% of those judged capable of returning to work and 63% of those who were judged not capable of returning to work. *Conclusions* This preliminary study suggests that readiness to self-manage pain is an important predictor of both completion of functional rehabilitation program and clinicians' decisions regarding functional work capacity after an MVA. The latter outcome appears to be more complex, influenced both by motivational readiness to engage in pain self-management and cognitive-behavioral adaptation to pain.

Keywords Motivational readiness · Cognitive behavioral adaptation · Multidisciplinary functional rehabilitation · Return to work capacity

G. A. Tkachuk (✉)
Department of Clinical Health Psychology, University of Manitoba, Winnipeg, Canada
e-mail: gtkachuk@panamclinic.com

J. K. Marshall · A. C. Mercado
FIT for Active Living Program, Saskatoon City Hospital, Saskatoon, Canada

B. McMurtry
Chronic Pain Centre, Saskatoon Health Region, Saskatoon, Canada

F. Stockdale-Winder
Rehabilitation and Geriatric Services, Saskatoon Health Region, Saskatoon, Canada

The overarching goal of multidisciplinary functional restoration treatment programs is to reinstate individuals to their highest possible level of functional activity after suffering a musculoskeletal injury. In general, multidisciplinary programs have proven more effective than monodisciplinary treatments in reducing health care utilization, decreasing reliance on medication, and returning individuals to previous functioning and work [1, 2]. Multidisciplinary functional restoration programs for whiplash-associated disorders (WAD) have resulted in return-to-work rates of 65–75% [3, 4]. However, an outstanding concern involves treatment program attrition and level of patient motivation to engage adequately in functional restoration and other rehabilitation programs [5, 6]. A prospective 1-year follow-up study revealed that patients who did not complete a

functional restoration program for chronic musculoskeletal disorders were 10 times less likely to have returned to work and 7 times less likely to have remained at work at the end of the year [7].

Although progress has been made, research has not reliably identified consistent psychosocial predictors of multidisciplinary treatment completion and related outcomes, including capacity for returning to work in insurance-funded patients with primary WAD and other musculoskeletal disorders. Previous reviews have concluded that demographic variables [8] and patient perceptions regarding pain and disability are predictive of work disability [9]. In fact, there is a growing body of evidence suggesting that higher pre-treatment levels of patient-perceived pain, disability, and psychological distress are associated with early discharge [10] and poorer post-treatment outcomes in patients with WAD [11–14] and other musculoskeletal disorders [15]. Similarly, lower levels of perceived social support have been related to premature termination from treatment [16, 17] and not returning to work [11].

One construct developed as a result of consideration for the transtheoretical model of behavior change [18] that has received considerable research attention in the wider chronic pain literature is motivational readiness for pain self-management [19, 20]. Motivational readiness has most often been studied using the Pain Stages of Change Questionnaire (PSOCQ) [21], which is comprised of four scales (i.e., precontemplation, contemplation, action, and maintenance). Using the PSOCQ, one study [22] found that chronic pain patients who completed cognitive behavioral treatment had significantly lower precontemplation and higher contemplation scale scores prior to treatment than those who failed to complete treatment. Another study using logistic regression analysis [23] reported that chronic pain patients with lower precontemplation and higher action scale scores had significantly greater odds of completing a program of cognitive behavioral treatment than those who tended to have reverse scores on these scales. A more recent study [24] found that a combined sample of patients who completed a course of either cognitive behavioral or functional restoration treatment had significantly lower precontemplation and higher contemplation, action, and maintenance scores when compared to patients who failed to complete one of these treatments. To the best of our knowledge, no study has examined motivational readiness as a predictor of post-treatment functional work capacity in motor vehicle accident survivors, using the PSOCQ.

The aims of this naturalistic study were to (a) replicate previous research [23] by demonstrating that pre-treatment motivational readiness variables predicted completion of a multidisciplinary treatment program; and (b) extend previous research by examining whether pre-treatment motivational readiness to self-manage pain also predicted clinicians' decisions regarding functional work capacity following participation in a multidisciplinary rehabilitation program for MVA-related injuries. It was hypothesized that motivational readiness for pain self-management (i.e., lower precontemplation, higher contemplation, higher action scale scores) would significantly predict these outcomes, while controlling for the influence of previously researched demographic and pain-related variables.

Method

Participants

Participants were referred by their insurer to a tertiary level multidisciplinary functional restoration program after having received primary level treatment ranging anywhere from several weeks to several months consisting of physiotherapy, chiropractic therapy, massage therapy, or acupuncture therapy. Some participants also received secondary level multidisciplinary treatment somewhat similar to tertiary functional restoration but over a shorter, less intensive schedule. Each participant had sustained musculoskeletal injuries secondary to an MVA that had occurred at least 3 months prior. None of the participants had attained their pre-MVA level of functioning at the time of program entry. Participation in the multidisciplinary treatment program was voluntary. However, participants may have been influenced to participate in treatment to greater or lesser degrees based on the limitations of their contracted agreement with the insurer.

One hundred fifty-six individuals were approached to participate in the study. One hundred twenty-three (79%) agreed to participate; however due to incomplete data, the final sample consisted of 106 individuals (68%). Demographic information for study participants is presented in Table 1. Eighty-three (78%) of the 106 study participants were employed at the time of their MVA. Of these 83 employer-attached individuals, 51 (61%) were not able to work at the time of entry into the treatment program. The other 32 individuals (39%) were working at significantly reduced functional capacities that necessitated referral for multidisciplinary treatment. Program participants who were medically unstable (including serious physical or mental health issues) or unable to read or write English were excluded from the study. None of the participants were involved in litigation related to their MVA. The study was approved by the University of Saskatchewan Behavioral Research Ethics Board and all participants provided written informed consent to participate.

Table 1 Descriptive information for study sample at baseline

Variable	%
Age	41.2 (13.2)[a]
Gender	
Male	38.7
Female	61.3
Education Level	
Did not complete high school	31.0
High school graduate	51.0
Post-graduate education	18.0
Employment status	
Employer-attached	78.3
Not employer-attached	21.7
Time Post-Injury (weeks)	50.5[b]
Primary Pain Site	
Neck	57.5
Low back pain	13.2
Upper extremity	6.6
Lower extremity	7.5
Upper torso	2.8
Multiple sites	12.3

[a] Mean (standard deviation)

[b] Median

Multidisciplinary Functional Restoration Program

Participants were treated in an interdisciplinary, 5 day per week out-patient program provided by physical therapists, occupational therapists, exercise therapists, psychologists, and other healthcare professionals, as required. Functional restoration consisted of individual and group treatment sessions with healthcare practitioners. Participants met with a physiotherapist twice weekly for manual treatment and a psychologist for twice weekly cognitive-behavioral therapy and group relaxation training. They also received daily work conditioning and activities of daily living, therapeutic exercise, weekly group education classes related to exercise, proper ergonomics and biomechanics, pain management, stress management, and other interventions, as required. The treatment program was tailored to the specific needs of each participant.

The program conducts performance-based functional assessments using the Physical Work Performance Evaluation (PWPE) [25], a standardized functional capacity evaluation used to determine the physical work abilities of individuals who have sustained a musculoskeletal injury. The PWPE assessment protocol is administered by trained clinicians who evaluate multiple standardized tasks that assess aspects of work related to dynamic strength, position tolerance, and mobility. Previous studies have reported that therapist determinations of safe work levels have

demonstrated acceptable inter-rater reliability on the vast majority of tasks in the protocol [25–27].

Procedure

Participants completed the MPI and the PSOCQ prior to the initiation of multidisciplinary treatment. At the completion of multidisciplinary treatment the outcome variables, completion of rehabilitation program and clinicians' decisions regarding functional work capacity, were assessed from clinic records.

Measures

Multidimensional Pain Inventory (MPI)

The MPI [28] is a 61-item self-report measure of cognitive-behavioral adaptation to pain consisting of multiple subscales with acceptable psychometric properties [28, 29]. Items are formatted on a 7-point Likert scale ranging from 0 to 6. For the current study, the predictive utility of the pain severity, interference, life control, affective distress, and support subscales were considered, because they survey a wide range of patient beliefs regarding the impact of the pain experience.

Pain Stages of Change Questionnaire (PSOCQ)

The PSOCQ [21] is a 30-item measure of motivational readiness for pain self-management consisting of four subscales demonstrated to have acceptable psychometric properties [21–23, 30]. Items are scaled from 1 (strongly disagree) to 5 (strongly agree). The precontemplation scale items reflect little perceived personal responsibility for pain control and no interest in making behavioral changes. The contemplation scale items represent consideration of behavioral change, along with an increasing awareness of personal responsibility for controlling pain. The action scale items assess the degree to which someone is actively involved in learning self-management strategies to control pain. The maintenance scale items characterize ongoing self-management of pain and a high degree of personal responsibility for pain control.

Completion of Rehabilitation Program

To assess program completion, information obtained from attendance records was dichotomized into categories based on whether or not the participant completed the recommended course of treatment or experienced sufficient improvement that no further treatment was necessary. The recommended course of treatment varied for each client and ranged anywhere from 4 to 16 weeks.

Clinicians' Decisions Regarding Functional Work Capacity

The clinicians' decisions regarding functional work capacity were similarly obtained from clinical records and dichotomized based on whether the participant was judged as having an improved capacity for returning to work or not, for the employer-attached participants (i.e., those who were working at the time of their MVA). This determination is made by the clinical rehabilitation team at the conclusion of recommended treatment based on a job demand analysis, standardized functional testing, and clinical observation. Thus, the decision regarding whether a participant had an improved work capacity was based on observed changes using the above criteria that occurred from pre-treatment to the conclusion of recommended treatment. Due to the program's emphasis on individual tailoring, and the naturalistic nature of this study, these assessments were not standardized across participants as might be expected in a controlled investigation. Thus, a dichotomous variable was determined from clinic records to represent treatment outcome.

Design and Analysis

A longitudinal naturalistic study design was used to examine factors predicting changes in the treatment outcome variables. Hierarchical logistic regression models were tested for the prediction of each discrete outcome variable. The MPI scales were entered as a first block followed by a second block of PSOCQ scales (i.e., after controlling for MPI variables). For all statistical tests, $P \leq 0.05$ was considered statistically significant. For the analysis of the clinicians' decisions of functional work capacity, those clients who had not completed the treatment program were excluded from the analysis. This yielded the following sample sizes: (n = 106) for program completion and (n = 75) for clinician decisions of functional work capacity.

Results

Data Screening

All variables were screened for outliers and evidence of multicollinerarity. Two of the variables (i.e., pain severity and contemplation) had extreme scores that were truncated to the next most outlying score falling within three standard deviations from the mean score. Two sets of variables showed evidence of moderate multicollinerarity. The MPI variables pain severity and interference and the PSOCQ variables action and maintenance were each moderately correlated to each other. Due to the size of the available sample in relation to the number of potential predictors, and with a goal of maintaining a minimum of 10 cases per predictor variable, a decision was made to drop the pain severity variable from the analyses because it had a lower (and statistically nonsignificant) correlation with the outcome variables than did interference. Similarly, the maintenance variable was not included because it has not been found to be a significant predictor in previous studies.

Preliminary Analyses

Potential demographic predictors (i.e., age, gender, education, primary pain location, and time post-injury) were not significantly correlated with either of the outcome variables. Other potentially influential variables could not be examined due to the limited sample size.

Program Completion

Ninety-four of 106 participants (89%) completed the multidisciplinary rehabilitation program. A hierarchical logistic regression model revealed that MPI scores did not significantly increase the likelihood of rehabilitation program completion. The addition of PSOCQ variables significantly improved the prediction of program completion (See Table 2). Within that model, higher PSOCQ contemplation and action scores significantly increased the likelihood of completing the rehabilitation program. This model correctly identified program completers 98% of the time. However, it was only able to identify 8% of the noncompleters, likely due to the low prior probability of noncompleters (11%).

Clinicians' Decisions of Functional Work Capacity

Of the 75 employer-attached participants who completed treatment, 49 (65%) were judged as having improved work capacity at the end of the multidisciplinary rehabilitation program. A hierarchical logistic regression model revealed that MPI scores significantly predicted functional work capacity, and correctly identified 88% of those who were judged to have improved work capacity and 48% of those who were not. The addition of PSOCQ scores significantly improved the predictive model, controlling for MPI variables, correctly identifying 88% of individuals who were judged to have improved work capacity and 63% of those who were not. In that model, participants with lower MPI interference, higher MPI affective distress, higher MPI support, and higher PSOCQ action scores were more likely to be classified as having improved work capacity (See Table 3).

Table 2 Logistic regression predicting program completion

Model	Chi square	−2 Log likelihood	Sig. of change	df	Predictors	Beta	SE	Wald	df	Odds ratio	95% C.I.
MPI scores	3.94	70.93	0.414	4	Interference	−0.76	0.46	2.73	1	0.467	0.189, 1.153
					Life control	−0.03	0.32	0.01	1	0.973	0.517, 1.831
					Affective distress	0.33	0.35	0.84	1	1.38	0.691, 2.770
					Support	0.38	0.23	2.70	1	1.46	0.930, 2.281
PSOCQ scores	15.67	59.21	0.008**	7	Interference	−0.95	0.54	3.15	1	0.385	0.134, 1.106
					Life control	−0.29	0.43	0.47	1	0.75	0.324, 1.717
					Affective distress	0.20	0.39	0.27	1	1.23	0.570, 2.632
					Support	0.32	0.26	1.55	1	1.38	0.833, 2.271
					Precontemplation	0.14	0.57	0.06	1	1.15	0.373, 3.524
					Contemplation	1.67	0.70	5.73	1	5.30*	1.352, 20.766
					Action	1.64	0.83	3.89	1	5.16*	1.010, 26.332

* $P < 0.05$, ** $P < 0.01$

Discussion

This preliminary study examined the impact of motivational readiness to self-manage pain and cognitive-behavioral adaptation to pain on the prediction of program completion and clinicians' decisions regarding functional work capacity for MVA survivors. Consistent with previous research [23] using logistic regression, the results of this study found that pre-treatment motivational readiness to self-manage pain predicted completion of multidisciplinary treatment. This study went beyond previous research [23] to demonstrate that pre-treatment motivational readiness to self-manage pain also predicted clinicians' decisions regarding work capacity following completion of a multidisciplinary treatment program, over

and above the influence of well-validated cognitive-behavioral variables. This appears to be the first such demonstration within a population of motor vehicle accident survivors.

Consistent with findings from previous studies examining the impact of motivational factors on the completion of cognitive-behavioral pain self-management programs [22–24] the current work indicated that survivors of MVA's who had increased perceived responsibility for pain control and were more strongly considering self-management (contemplation) were more likely to complete the functional restoration program. The results of this study were also consistent with previous research [23, 24] in finding that higher action scale scores predicted completion of the multidisciplinary functional rehabilitation program.

Table 3 Logistic regression predicting decisions regarding improved work capacity

Model	Chi square	−2 Log likelihood	Sig. of change	df	Predictors	Beta	SE	Wald	df	Odds ratio	95% C.I.
MPI scores	18.12	79.89	0.001**	4	Interference[a]	−1.47	0.44	11.18	1	4.37**	1.84, 10.31
					Life control	0.46	0.30	2.34	1	1.58	0.88, 2.85
					Affective distress	1.07	0.36	8.62	1	2.90**	1.43, 5.92
					Support	0.43	0.22	3.75	1	1.54	1.00, 2.37
PSOCQ scores	26.64	71.38	0.037*	7	Interference[a]	−1.69	0.54	9.62	1	5.41**	1.86, 15.63
					Life control	0.35	0.34	1.02	1	1.41	0.72, 2.77
					Affective distress	1.03	0.40	6.58	1	2.81**	1.28, 6.19
					Support	0.54	0.24	4.90	1	1.72*	1.06, 2.76
					Precontemplation	0.80	0.55	2.15	1	2.23	0.76, 6.52
					Contemplation	0.30	0.66	0.21	1	1.35	0.37, 4.97
					Action	1.68	0.81	4.31	1	5.35*	1.10, 26.06

* $P < 0.05$, ** $P < 0.01$

[a] Odds ratios for the Interference variable were flipped to reflect meaningful likelihoods

The importance of contemplation and action orientation suggests that prior to starting a functional restoration program, both level of openness to adopting pain self-management strategies and the degree of perceived engagement in the process of self-management are important. However, the outcomes differed from the findings of the previous research with regard to the importance of another aspect of motivation for change. Unlike the three prior studies, data from this study indicated that perceived personal responsibility for, and interest in, pain self-management (precontemplation) was unrelated to program completion. This suggests that items on this scale may not be as sensitive a barometer for detecting motivation to self-manage pain and complete treatment for MVA survivors with predominant whiplash-related injuries and neck pain. Other factors that could explain this finding were that precontemplation scores in this sample were generally lower than in the previous studies. Since most participants referred to this treatment program had not improved in previous attempts at less comprehensive treatments mandated by their insurer, they might have been more motivated to complete treatment at the interdisciplinary day program level. The possibility of losing their compensation likely played a role in their motivation to attend treatment. Some evidence of this is found in the relatively higher completion rate of the participants in this study (89%) over the previous studies.

Contrary to previous findings, the current results indicated that patient perceptions of pain and disability, measured in the current study using the MPI, did not predict program completion. On the surface, this suggests that knowledge of motivational readiness for self-management (i.e., contemplation and action scale scores) was sufficient to predict the completion of a functional restoration treatment program for MVA survivors. However, this finding is interpreted with caution, since there was such a high rate of program completion that could have biased this outcome. Notwithstanding this, as there was a significant tendency for individuals with higher contemplation and action scores to complete treatment, such information could certainly be beneficial for individual treatment planning. Although patient perceptions and current adaptation to pain is often the focus of psychosocial assessment for participation in functional rehabilitation, the current findings indicate that readiness for change may be a more relevant characteristic to assess during initial evaluations in order to determine the likelihood of program completion as an isolated outcome. Further, psychological interventions directed at increasing motivational readiness for pain self-management in the earliest stages of functional restoration programs may be a necessary first step helpful in achieving higher rates of program completion and other functional outcomes [31]. Motivational Interviewing (MI) [32] is one such intervention, and Jensen [31] provided a cogent introduction of the philosophy and strategies of MI for pain clinicians. MI shows a good deal of promise in the treatment of patients with chronic pain; however, controlled studies are needed to evaluate the effectiveness of this approach.

Completion of a rehabilitation program is usually a necessary first outcome for successful functional restoration. However, this study also sought to examine whether motivational factors further predicted decisions regarding functional work capacity in this unique population. Consistent with our hypothesis, the results indicated that, after inclusion of the cognitive behavioral adaptation variables, the set of motivational variables as a whole, and a higher level of perceived active self-management in particular, significantly improved the predictive model in enhancing the likelihood of being judged as having an improved capacity for returning to work. This finding suggests that motivational readiness to self-manage pain is an important construct, and may in fact be a fundamental process to consider in the planning and implementation of functional restoration treatment programs. Interestingly, whereas cognitive-behavioral adaptation variables had no influence on the prediction of who would complete treatment, they were quite influential in predicting this outcome. Previous studies, reviewed earlier, suggested that several of these variables could be predictive of pain-related outcomes in those with MVA-related injuries. The current study found that a lower level of perceived pain-related interference with functioning was predictive of being classified as having an improved return to work capacity. This finding is largely consistent with research demonstrating that lower perceived interference predicted less pain at a 1-year post-treatment follow-up [12]. This finding also corresponds with findings from another study investigating return to work following rehabilitation for MVA-related whiplash injuries that concluded that refractory beliefs about level of pain-related disability throughout the course of treatment were a major impediment to successful return to work in that population [13].

The current finding that a higher perceived level of affective distress increased the likelihood of being classified with an improved return to work capacity is an interesting one. One prior study [33] found that higher affective distress predicted a greater reduction in post-treatment pain in those with low back pain in their study. It should be noted that the affective distress scale on the MPI reflects degree of anxiety and general tension, as well as mood, and thus could be measuring something distinct from depression, which would be hypothesized to have a negative affect on return to work capacity. In fact, it can be speculated that high affective distress could potentially motivate some individuals to participate more urgently in the treatment program.

The current study also found that a lower pre-treatment level of perceived social support from a significant other decreased the likelihood of being classified with an improved capacity for returning to work. This finding is consistent with the results of previous studies indicating that a lack of family support [16, 17] is related to poorer multidisciplinary rehabilitation outcomes.

The importance of perceived interference, affective distress, and social support in predicting decisions regarding functional work capacity suggests that these variables, in addition to motivational readiness to adopt pain self-management strategies, represent potentially important targets for intervention in functional restoration programs for MVA survivors. Cognitive-behavioral and other interventions aimed at reducing perceptions of disability [4, 13] and fear avoidance [34], increasing acceptance of chronic pain [35], and improving communication skills appear to be well justified, based on the current findings. Further assessment of an individual's social support network and any subsequent need for adjunct treatments (e.g., couples therapy, family therapy) may also improve the likelihood of a positive outcome [36]. Another recently developed construct related to accident-related injury is perceived injustice [37], which warrants further study in this population.

Several limitations of the current study are acknowledged. To begin, this study was naturalistic in the sense that the treatments were individualized for each participant and the outcome data were obtained from clinical records. Program completion was selected as a primary outcome variable because it had been examined as such in previous studies evaluating motivation for change in multidisciplinary treatment for chronic pain and was readily available through clinic records. The relatively high rate of program completion may reflect some tendency for participants to acquiesce to insurer demands. However, the results of this study should generalize to other such insurance-funded populations where this might also be expected to occur. The sample size limited the number of variables that could be tested in this preliminary study. In particular, other factors that could have influenced the findings included physical and mental health comorbidities, type of employment, level of income and income replacement, and other work-related factors. The impact of these variables should be studied in future full-scale evaluations.

The current study relied upon decisions regarding improvements in functional work capacity made by rehabilitation clinicians as the second outcome variable. This was a necessary limitation due to the nature of the rehabilitation program that features individually tailored assessments and programs. Thus, there was no entirely objective common metric across which participants could be assessed. Though it is acknowledged that these decisions have a subjective component, the clinical team takes steps to minimize bias by incorporating both objective testing and consensus arrived at through extensive team discussion in making these decisions. This outcome also reflects the actual day-to-day functioning of the rehabilitation program and therefore the results may be generalized to other clinics that function on a similar basis.

It is recommended that future studies examine the impact of motivational readiness to self-manage pain and cognitive-behavioral adaptation to pain on other treatment endpoints such as changes in pain level, emotional distress, perceived disability, and actual functional outcomes, as well as the relationship among changes in these variables and functional outcomes. It will also be important for future work to examine the impact of other cognitive-behavioral variables (e.g., pain-related catastrophizing, fear, self-efficacy, and acceptance) to provide a better understanding of how motivation for self-management and cognitive-behavioral adaptation fit into broader biopsychosocial models of rehabilitation.

The current study employed the PSOCQ because it is the most widely accepted instrument for assessing motivation for change. However, there is some controversy regarding use of the instrument because the original scoring method does not readily allow for patients to be assigned to a particular stage of change [23, 30]. On the other hand, the use of profile scoring, as in this study, suggests that the overall construct is not without merit and worthy of continued development, both theoretically and methodologically.

Finally, it will also be important for future research to include a follow-up assessment to evaluate long-term outcomes and examine change in motivational readiness and cognitive-behavioral adaptation over the course of rehabilitation. Change in these variables over the course of treatment may be important mediators of treatment completion and additional functional outcomes [38].

Notwithstanding the above limitations, taken together, the findings of this study begin to highlight important variables that may influence functional restoration outcomes for MVA survivors. Motivational readiness for pain self-management contributed significantly to these outcomes over and above the influence of cognitive-behavioral adaptation variables. Furthermore, the results of this study suggest that both sets of variables be considered for treatment planning and adequately preparing patients to participate as fully as possible in cognitive behavioral and multidisciplinary rehabilitation treatment programs. Finally, the results suggest that motivational readiness for pain self-management and cognitive-behavioral adaptation to the pain experience not be studied in isolation, but together in more comprehensive models, to improve our understanding of pain, functional restoration treatment, and related functional outcome.

References

1. Gatchel RJ, Okifuji A. Evidence-based scientific data documenting the treatment and cost effectiveness of comprehensive pain programs for chronic nonmalignant pain. J Pain. 2006;7: 779–93.
2. Turk DC. Clinical effectiveness and cost-effectiveness of treatment for patients with chronic pain. Clin J Pain. 2002;18:355–65.
3. Vendrig AA, van Akkerveeken PF, McWhorter KR. Results of a multimodal treatment program for patients with chronic symptoms after a whiplash injury of the neck. Spine. 2000;25:238–44.
4. Sullivan MJL, Adams H, Rhodenizer T, Stanish WD. A psychosocial risk factor–targeted intervention for the prevention of chronic pain and disability following whiplash injury. Phys Ther. 2006;86:8–18.
5. Turk DC, Rudy TE. Neglected factors in chronic pain treatment outcome studies—referral patterns, failure to enter treatment, and attrition. Pain. 1990;43:7–25.
6. Turk DC, Rudy TE. Neglected factors in chronic pain treatment outcome studies—relapse, noncompliance, and adherence enhancement. Pain. 1991;44:5–28.
7. Proctor TJ, Mayer TG, Theodore B, Gatchel RJ. Failure to complete a functional restoration program for chronic musculoskeletal disorders: a prospective 1-year outcome study. Arch Phys Med Rehabil. 2005;86:1509–15.
8. Fishbain DA, Rosomoff HL, Goldberg M, Cutler R, Abdel-Moty E, Khalil TM, Rosomoff RS. The prediction of return to the workplace after multidisciplinary pain center treatment. Clin J Pain. 1993;9:3–15.
9. Sullivan MJL, Feuerstein M, Gatchel R, Linton SJ, Pransky G. Integrating psychosocial and behavioral interventions to achieve optimal rehabilitation outcomes. J Occup Rehabil. 2005;15: 475–89.
10. Carosella AM, Jeffrey M, Lackner JM, Feuerstein M. Factors associated with early discharge from a multidisciplinary rehabilitation program for chronic low back pain. Pain. 1994;57: 69–76.
11. Baltov P, Cote J, Truchon M, Erhmann Feldman D. Psychosocial and socio-demographic factors associated with outcomes for patients undergoing rehabilitation for chronic whiplash associated disorders: a pilot study. Dis Rehabil. 2008;30:1947–55.
12. Olsson I, Bunketorp O, Carlsson SG, Styf J. Prediction of outcome in whiplash-associated disorders using West Haven-Yale Multidimensional Pain Inventory. Clin J Pain. 2002;18:238–44.
13. Adams H, Ellis T, Stanish WD, Sullivan MJL. Psychosocial factors related to return to work following rehabilitation of whiplash injuries. J Occup Rehabil. 2007;17:305–15.
14. Gun RT, Osti OL, O'Riordan A, Mpelasoka F, Eckerwall CGM, Smyth JF. Risk factors for prolonged disability after whiplash injury: a prospective study. Spine. 2005;30:386–91.
15. Sullivan MJL, Ward LC, Tripp D, French DJ, Adams H, Stanish WD. Secondary prevention of work disability: community-based psychosocial intervention for musculoskeletal disorders. J Occup Rehabil. 2005;15:377–92.
16. King SA, Snow BR. Factors for predicting premature termination from a multidisciplinary inpatient chronic pain program. Pain. 1989;39:281–7.
17. Richmond RL, Carmody TP. Dropout from treatment for chronic low back pain. Prof Psychol Res Pract. 1999;30:51–5.
18. Prochaska JO, DiClemente CC. The transtheoretical approach: towards a systematic eclectic framework. Homewood, IL: Dow Jones Irwin; 1984.
19. Jensen MP, Nielson WR, Kerns RD. Toward the development of a motivational model of pain self-management. J Pain. 2003;4:477–92.
20. Kerns RD, Habib S. A critical review of the pain readiness to change model. J Pain. 2004;5:357–67.
21. Kerns RD, Rosenberg R, Jamison RN, Caudill MA, Haythornthwaite J. Readiness to adopt a self-management approach to chronic pain: the Pain Stages of Change Questionnaire (PSOCQ). Pain. 1997;72:227–34.
22. Kerns RD, Rosenberg R. Predicting responses to self-management treatments for chronic pain: application of the pain stages of change model. Pain. 2000;84:49–55.
23. Biller N, Arnstein P, Caudill MA, Federman CW, Guberman C. Predicting completion of a cognitive-behavioral pain management program by initial measures of a chronic pain patient's readiness for change. Clin J Pain. 2000;16:352–9.
24. Gersh E, Arnold C, Gibson SJ. The relationship between the readiness for change and clinical outcomes in response to multidisciplinary pain management. Pain Med. 2011;12:165–172.
25. Lechner DE, Jackson JR, Roth DL, Straaton KV. Reliability and validity of a newly developed test of physical work performance. J Occup Med. 1994;36(9):997–1004.
26. Tuckwell NL, Straker L, Barrett TE. Test retest reliability on nine tasks of the physical work performance evaluation. Work. 2002;19:243–53.
27. Durand MJ, Loisel P, Poitras S, Mercier R, Stock SR, Lemaire J. The interrater reliability of a functional capacity evaluation: the physical work performance evaluation. J Occup Rehabil. 2004;14:119–29.
28. Kerns RD, Turk DC, Rudy TE. The West Haven-Yale multidimensional pain inventory (WHYMPI). Pain. 1985;23:345–56.
29. Bernstein I, Jaremko M, Hinkley B. On the West Haven-Yale multidimensional pain inventory. Spine. 1995;20:956–63.
30. Jensen MP, Nielson WR, Romano JM, Hill ML, Turner JA. Further evaluation of the pain stages of change questionnaire: is the transtheoretical model of change useful for patients with chronic pain? Pain. 2000;86:255–64.
31. Jensen M. Enhancing motivation to change in pain treatment. In: Turk DC, Gatchel RJ, editors. Psychological approaches to pain management: a practitioner's handbook. New York, NY: Guilford Press; 2002. p. 71–93.
32. Miller WR, Rollnick S. Motivational interviewing: preparing people for change. New York, NY: Guilford Press; 2002.
33. Michaelson P, Sjolander P, Johansson H. Factors predicting pain reduction in chronic back and neck pain after multimodal treatment. Clin J Pain. 2004;20(6):447–54.
34. Vlayen JWS, de Jong J, Leeuw M, Crombez G. Fear reduction in chronic pain: graded exposure in vivo with behavioral experiments. In: Asmundson GJG, Vlaeyen WS, Crombez G, editors. Understanding and treating fear of pain. New York: Oxford University Press; 2004. p. 313–43.
35. McCracken LM. Learning to live with the pain: acceptance of pain predicts adjustment in persons with chronic pain. Pain. 1998;74:21–7.
36. Kerns RD, Otis JD, Wise EA. Treating families of chronic pain patients: application of a cognitive-behavioral transactional model. In: Turk DC, Gatchel RJ, editors. Psychological approaches to pain management: a practitioner's handbook. New York, NY: Guilford Press; 2002. p. 256–75.
37. Sullivan MJL, Adams H, Horan S, Maher D, Boland D, Gross R. The role of perceived injustice in the experience of chronic pain: scale development and validation. J Occup Rehabil. 2008;18: 249–61.
38. Jensen MP, Nielson WR, Turner JA, Romano JM, Hill ML. Changes in readiness to self-manage pain are associated with improvement in multidisciplinary pain treatment and pain coping. Pain. 2004;111:84–95.