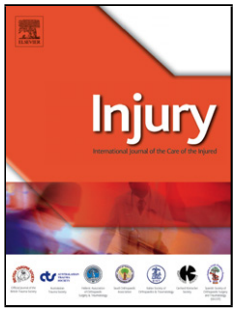


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Running head: Non-return to work following road traffic crash

# Predictors of non-return to work 2 years post-injury in road traffic crash survivors: results from the UQ SuPPORT study

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**Abstract**

**Purpose:** Individuals who have sustained an injury from a road traffic crash (RTC) are at increased risk for long lasting health problems and non-return to work (NRTW). Determining the predictors of NRTW is necessary to develop screening tools to identify at-risk individuals and to provide early targeted intervention for successful return to work (RTW). The aim of this study was to identify factors that can predict which individuals will not RTW following minor or moderate injuries sustained from a RTC.

**Method:** Participants were 194 claimants (63.4% female) within a common-law "fault-based" system from the UQ SuPPORT cohort who were working prior to their RTC. Participants were assessed at 6 months on a variety of physical and mental health measures and RTW status was determined at 2 years post-RTC. RTW rate was 78.4%.

**Results:** Univariate predictors of NRTW included being the driver or passenger, having a prior psychiatric diagnosis, high disability level, low mental or physical quality of life, predicted non-recovery, high pain, low function, high expectations of pain persistency, low expectations about RTW, having a psychiatric diagnosis, elevated depression or anxiety. The final multivariable logistic regression model included only two variables: disability level and expectations about RTW. Seventy-five percent of individuals who will not RTW by 2 years can be identified accurately at an early stage, using only these two predictors.

**Conclusion:** The results are promising, because they suggest that having information about two factors, which are easily obtainable, can predict with accuracy those who will require additional support to facilitate RTW.

*Keywords*: **Motor Vehicles; Traffic Accidents; Return to Work; Mental Health; Health**

**Predictors of non-return to work 2 years post-injury in road traffic crash survivors: results from the UQ SuPPORT study**

The annual cost of road traffic crashes (RTCs) in Australia is estimated at $27 billion [1] and Australia reports spending 3.6% of its gross domestic product on RTCs [2]. The World Health Organization [3] anticipates that RTC injuries will be the third leading cause of disability-adjusted life years lost (DALYs) by 2020. One of the major factors contributing to these costs is non-return to work (NRTW) following injury. NRTW is also problematic because working is associated with better health, self-esteem and social connectedness [4, 5], as well as improved quality of life and overall longevity [6].

Previous research on return to work (RTW) rates and predictors in RTC cohorts have produced varied results, most likely due to the differences in the nature of injuries in the samples assessed, the variance in severity of injury (mild through to catastrophic), the timeframe for follow-up, the compensation scheme and other sociocultural factors that vary across countries, such as the health care system. Rates of RTW range from 42%-69% at 9 to 12 months post-RTC for more serious injuries [7-10] and from 83% to 100% at 8 to 12 months post-RTC for less serious injuries [10-13]. The majority of individuals with minor injuries will RTW within 12 months, however there is a substantial minority who will experience delayed or NRTW. Although the RTW rate may seem acceptable for those who experience less serious injuries, of the four studies examining this population [10-13], only one study found a 100% RTW rate, while the others report a 10-17% NRTW rate. Given that those suffering minor or moderate (as opposed to serious/severe) injuries are the largest group of RTC survivors, this group warrants further research. For example, in Queensland, 87% of RTC survivors (i.e., 42,721 individuals) finalised a claim relating to minor or moderate injuries during 2005-2014 [14]. This represents a substantial proportion of individuals who will potentially not RTW, if the NRTW rate is estimated to be around 10%.

Predictors of NRTW 9 to 12 months after serious RTC injury include longer hospital stay [7], injury type [9], greater injury severity [10, 15], being discharged to rehabilitation versus home [7], intending to or pressing charges [15], having an occupation with less independence [7], having PTSD [16] and greater pain and physical sequelae at 6 months post-RTC [15]. Predictors of NRTW 8 to 24 months after minor/moderate RTC injury include manual labour occupation [13], greater injury severity [13], injury type [13] and greater pain severity [17]. The only reasonably consistent predictor of NRTW to date in RTC cohorts is greater injury severity [10, 13, 15].

Due to the small number of studies and predictors assessed, it is premature to form any strong conclusions regarding predictors of RTW in the RTC population. Most research regarding RTW following RTC has focused on cohorts with serious injuries, several studies only report rates of RTW and do not investigate predictors of RTW, and those that examine predictors of RTW tend to include a limited range of predictors, with little consistency in the predictors assessed across studies. It is possible that predictors of RTW in RTC cohorts differ according to the severity and nature of the injuries sustained. However, there is not enough evidence to allow comparison of RTW rates and predictors in minor/moderate versus serious/critical RTC injuries. More research is needed to inform our understanding of the factors that predict NRTW in minor and moderate injury groups following RTC.

To inform the present study, we examined published findings on a broader range of injury survivors to investigate the factors which predict failure to RTW. Studies were selected based on having clearly specified variables which were assessed at baseline and used to predict NRTW outcomes at a subsequent time point in a general injury population (as opposed to a specialised service such as a pain clinic). The participant cohort includes general trauma, work-related injuries, brain injury, and musculoskeletal disorders. Both hospitalised and non-hospitalised injuries are included, with follow-ups ranging from 3- to 24-months post-injury. RTW rates following the various forms of injury ranged from 43-97%. The most consistent predictor of RTW in broader injury samples was positive expectations at baseline regarding

RTW in the future [18-26]. Other predictors of NRTW in broader injury samples included older age [18, 19, 27-31] (but see [32, 33] for conflicting results), lower levels of education [29, 34-37], increased injury severity [27, 30, 34, 38, 39] (but see [40, 41] for conflicting results), type of injury [28, 30, 35, 37], returning to physical work tasks [28, 34, 40, 42], perceiving accident severity as severe [38, 40, 42], higher baseline pain levels [18, 27, 30, 37, 39, 43], baseline mental health symptoms [27, 39], baseline posttraumatic stress [37, 39, 44], baseline anxiety [35, 44] and baseline depression [44, 45] (but see [41] where baseline anxiety and depression do not predict RTW).

Determining the predictors of NRTW for RTC survivors is necessary to develop screening tools to identify at-risk individuals and to provide early targeted intervention for successful RTW. Previous research has focused predominantly on hospitalised patients. However, recent evidence suggests that even when the injuries sustained from RTC are minor, these injuries can lead to long lasting health problems e.g., [12, 46-48].

This study aims to identify factors that can predict which individuals will not RTW in RTC survivors with minor and moderate injuries. There is a paucity of research on individuals who have sustained minor or moderate injuries, only a limited range of risk factors have been assessed and follow-up periods have typically been 12 months or less. The current prospective study assesses RTW at 2 years post-RTC, including a large variety of predictors: demographics, road user type, physical and functional health, disability, pain, posttraumatic stress, depression, anxiety, social support and expectations about recovery and RTW, using a wide variety of measures.

## Method

**Participants**. This analysis forms part of The University of Queensland Study of Physical and Psychological Outcomes for claimants with predominantly minor injuries following a Road Traffic crash (UQ SuPPORT) [49]. Participants were RTC survivors recruited from the Motor Accident Insurance Commission (MAIC) database between April 2009 and September 2010. All participants were claimants within a common-law "fault-based"

compulsory third party (CTP) motor vehicle insurance scheme in the State of Queensland. There are over four million insured vehicles in Queensland [14] and MAIC regulates and monitors the CTP scheme for all insured vehicles in the State. This scheme provides injured persons (whether they are drivers, passengers, pedestrians or cyclists) with an insurance policy that covers their unlimited liability for personal injury caused by the insured motor vehicle. Being a fault-based scheme, the injured party must establish negligence against the owner/driver of the insured motor vehicle, and can seek monetary compensation in a court of law from the person established as being at fault for their injury/losses. If the injured person was completely at fault in the accident, then the individual cannot obtain compensation. Eligible participants received a letter of invitation to participate in the study from MAIC. The consent process was opt-in, such that participants needed to return their completed consent form via post to MAIC, to be included in the study. Once the participant had consented, all study data was collected by the research team and MAIC had no further involvement in the study.

A total of 3146 eligible individuals were invited to participate in the study: 382 consented to participate, however 10 dropped out before the first wave. Thus, 372 participants were included in the study sample at Wave 1 (see Figure 1), and 242 (65.1%) provided complete information regarding current work status and work status prior to the RTC at Wave 3 (2 years post-RTC). Current and/or pre-RTC work status was therefore missing for 130 participants. Additional data was collected at Wave 2 (approximately 12 months post-RTC), however no data from this wave is reported in the current paper since the focus is early predictors of RTW post-RTC.

**Eligibility criteria**. The inclusion criteria were as follows: (1) RTC-related physical injuries which were predominately minor with an Abbreviated Injury Scale (AIS) score of 1-3; individuals could be the driver/passenger of a car/motor bike, cyclist, or pedestrian involved in a RTC; (2) aged 18 years and older; (3) good English-speaking ability; (4) RTC date within 3 months of claim notification date; and (5) Australian resident. The exclusion criteria were

as follows: (1) cognitive impairment (subjectively assessed by trained interviewers based on the participants' capacity to answer questions during the initial interview) and (2) a severe physical condition preventing the patient from completing the interview or survey.

**Procedure**. The UQ SuPPORT study is a longitudinal cohort study with survey and telephone interview data collected at approximately 6 (Wave 1), 12 (Wave 2), and 24 (Wave 3) months post-RTC. The full protocol for UQ SuPPORT has been described elsewhere [49]. The UQ SuPPORT study was approved by the Medical Research Ethics Committee at The University of Queensland, Brisbane, Australia (Approval No.: 2009000035).[1]

**Measures**. All measures described below were administered at Wave 1 (6 months) except for RTW, which was measured at Wave 3 (2 years). The following measures were administered via survey booklet or Computer Assisted Telephone Interview (CATI). See Kenardy et al. [49] for a complete description of all measures utilised in this study, including discussion of psychometric properties, subscales and example items for each measure.

*Survey booklet*. The Orebro Musculoskeletal Pain Questionnaire (OMPQ) [50] contains 25 items which measure physical and functional level and adjustment to injury and pain, by examining factors that may impede recovery, including emotional state, fear-avoidance beliefs and coping strategies. A higher rating indicates higher levels of risk. This represents the OMPQ total score. A cut-off score of $\geq 105$ was selected as the cut-off for 'predicted not to recover overall', in line with previous research [50]. Consistent with previous research [50], the OMPQ was divided into subscales of function and pain and the previous scoring method and cut-offs were utilised in the current study. To create the function scale score, items 17 to 21 (items relating to ability to participate in normal activities, e.g. weekly shopping) were summed, to provide a score ranging between 0 and 50. A score of $\leq 44$ was selected as the cut-off for the 'predicted

[1] All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

not to recover' group because this represents abnormal, restricted function [50]. The pain scale score was derived by multiplying the intensity of pain rating by the frequency of pain rating, proving a score in the range of 0 to 100. The cut-off score for those who were not predicted to recovered was ≥17 [50].

Two specific questions were selected from the OMPQ to assess participants' expectations about RTW and pain persistency. Question 12 asked participants to estimate the chances that they will be able to work in six months on a scale where 0 indicated "No chance" and 10 indicated "Very large chance". The cut-off score for low expectations to RTW was <8. Question 11 asked participants to estimate how large the risk is that their current pain may become persistent, where 0 indicated "No risk" and 10 indicated "Very large risk". The cut-off score for high expectation of pain persistency was ≥8. Cut-off scores on both scales were derived following inspection of the histograms of responses.

The Short Form 36v2 (SF-36v2) [51] contains 36 items which measure physical and mental health constructs as well as perceived health status and daily functioning by asking respondents to describe their health in the past 4 weeks. SF-36v2 items and scales are standardised to a 0-100 point scale where a higher score indicates a better health state. Physical health component and a mental health component summary scores were calculated as per the authors' scoring instructions [51]. The cut-off score of 30.18 for physical health related quality of life (HRQoL) was derived from calculating the mean (39.68) and *SD* (9.50) based on the entire Wave 1 sample ($N$ = 372) and including those who scored < 1 *SD* below the mean in the low physical HRQoL group. Using the same method to dichotomise mental HRQoL, those scoring < 26.31 were included in the low mental HRQoL ($M$ = 38.84, $SD$ = 12.53). This method of dichotomising the low versus moderate/high functioning group is consistent with the approach used for other health-related measures which provide continuous data [52] and utilised the the 68-95-99.7 rule for a normal distribution, ensuring that only those with a clinically

meaningful reduced HRQoL (approximately 16% of participants) would be included in the low HRQoL group [53].

The Multidimensional Scale of Perceived Social Support (MSPSS) [54] contains 12 items which assess perceptions of interpersonal functioning and social support in three domains: friends, family and significant others. A global support score is also calculated, with higher scores indicating greater levels of perceived support, and this score was used in all analyses.

The Impact of Event Scale Revised (IES-R) [55] contains 22 items and three subscales (avoidance, intrusion, and hyperarousal) which assess current subjective posttraumatic stress with reference to the past 7 days. Scores range from 0 to 75, with higher scores indicating greater levels of posttraumatic stress. A cut-off score of $\geq 35$ was used to define significant posttraumatic stress based on the findings of validation studies (see Brewin [56] for a review).

The Hospital Anxiety and Depression Scale (HADS) [57] contains 14 items across two subscales which assess depression (7 items) and anxiety (7 items) symptoms in the past week. Scores range from 0 to 21 for each subscale, with high scores denoting greater psychological distress. A cut-off score of $\geq 8$ indicated elevated depression or anxiety levels, in line with previous studies [58, 59].

Return to work was assessed at Wave 3 using the following two questions: 1) "Were you working before the traffic crash?" (Yes – full time, Yes – part time, No) and 2) "What is your current work status?" (Working full time, Working part time, Not working). Participants who answered "Yes – full time" or "Yes – part time" to question 1, and answered "Not working" to question 2, were designated as having not returned to work (NRTW).

*Computer assisted telephone interview.* The World Health Organization Disability Assessment Schedule II (WHO-DAS-II) [60] contains 12 items which assess participants' perceived limitations in the past 30 days regarding communication, self-care, mobility, relationships, work, and community roles. The summary score ranges from 0 to 48, with higher scores indicating higher disability. The cut-off for high disability was 20.43. The high

disability group included those participants scoring greater than 1 *SD* (8.89) above the mean (11.54) (based on the entire Wave 1 sample of 372 participants), consistent with O'Donnell et al. [52].

The Composite International Diagnostic Interview module for Posttraumatic Stress Disorder (CIDI-PTSD) [61] and the Composite International Diagnostic Interview-Short Form (CIDI-SF) [62] for major depressive episode (MDE) and generalized anxiety disorder (GAD), were used to assess participants' mental health status based on the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition (DSM-IV) criteria [63].

In addition to the measures listed above, participants' perception of threat to life was assessed by asking ''How much did you believe you were going to die during the accident?'' Psychiatric history was also acquired by asking participants if they had ever seen a mental health professional and subsequently been given a diagnosis; Participants who had received a diagnosis were coded as 1 (psychiatric history), all others were coded as 0 (no psychiatric history). Demographic variables (gender, age, education level) and road user type (vulnerable road user [pedestrian or cyclist] and non-vulnerable road user [driver or passenger]) were also collected from participants, at Wave 1 only.

*Data provided by MAIC*. The data provided by MAIC, which was sourced from the participant's insurance company, was correct as at 10th April 2013 (i.e. 2.4 to 4 years post-RTC). All AIS 2005 [64] injury codes were provided for each participant and an injury severity score (ISS) was calculated. The ISS measures overall injury severity for patients with multiple injuries [65], and can be classified into three groups [66]: ISS = 1-3 (e.g. superficial injuries such as a cervical spine strain, i.e., 'whiplash'), ISS = 4-8 (e.g. simple upper extremity long bone fractures), and ISS = 9+ (e.g. a combination of superficial/minor injuries, or lower extremity long bone fractures).

**Statistical analyses**. Of the 242 participants with complete work status data (see Table 1), 194 were working prior to the RTC (either in a full- or part-time capacity) and were included

in the current analysis, and 48 were not working prior to the RTC and were excluded from the current analysis. At 2 years post-RTC, 152 participants (78.35%) who were working prior to the RTC had returned to work (i.e. RTW status = Yes), while the remaining 42 (21.65%) had not returned to work (i.e., RTW status = No). RTW status was the dependent variable used in analysis (i.e. 1 = NRTW and 0 = RTW).

A total of 23 predictors collected at Wave 1 (6 months post-RTC) were initially tested for their univariate association with RTW status using logistic regression. Dichotomised versions of the predictors were used in order to easily identify those 'at-risk', with the majority of predictors having either a natural dichotomy (e.g. gender [M/F], psychiatric history [Y/N]) or published cut-off scores (e.g. OMPQ [50], IESR [56], HADS [58]). The 23 predictors were: age, gender, education level, road user vulnerability (driver/ passenger versus pedestrian/cyclist), ISS category, psychiatric history, disability level (WHO-DAS-II total score), physical and mental health-related quality of life (HRQoL) (SF-36v2 physical and mental component scores), OMPQ function and pain sub-scores, OMPQ total score, OMPQ expectations about pain persistency question, OMPQ expectations about RTW question, perception of threat to life, PTSD diagnosis, MDE diagnosis, GAD diagnosis, any DSM-IV diagnosis, posttraumatic stress symptoms (from IES-R), depression symptoms (from HADS), anxiety symptoms (from HADS) and social support. Those predictors that were significant at $p < .10$ were then simultaneously entered into the multivariable logistic regression model, and backwards elimination was used to identify significant predictors of NRTW. Likelihood ratio (LR) tests were used to compare models with and without a predictor included. A predictor was retained in the final model when the LR test and parameter *t* statistic had a result with $p < .05$. The Hosmer and Lemeshow goodness of fit test was used to assess the fit of the final regression model, where a large *p* value indicates good model fit.

The predictive value of the model was then assessed by receiver operating characteristic (ROC) curves. ROC curves were used to compare the performance of different classification

measures in discriminating between those who returned to work versus those who did not. Two models were evaluated by ROC curves: The model including all 13 significant univariate predictors, and the model including the two significant predictors from the final multivariable model. The number of predictors in each model was used to produce a risk score for predicting RTW status (RTW vs. NRTW). The risk score represents the number of risk factors for NRTW present for each participant, with higher scores indicating more risk of NRTW. Sensitivity (the proportion of individuals correctly identified as not going to RTW), specificity (the proportion of individuals correctly identified as going to RTW), PPV (the proportion of individuals who were predicted not to RTW and actually do not RTW), NPV (the proportion of individuals who were predicted to RTW, who actually do RTW) and overall efficiency (the proportion of cases correctly identified by the predictors) were calculated. Cut-off scores were selected to strike the best possible balance between high sensitivity and reasonable specificity, in order to identify as many at-risk individuals as possible. IBM SPSS version 22.0 for Windows was used to perform all statistical analyses.

**Results**

Firstly, demographics (age, gender, education level), injury factors (road user type, ISS) and psychiatric history were compared between those with and without work status data at Wave 3 (see Figure 1); those with complete work status data ($N$=242) were found to be significantly older ($M$ = 49.83, $SD$ = 14.67) than those without work status data ($N$=130, $M$=45.15, $SD$=15.07, $t_{(370)} = 2.90$, $p < .01$). There were no other significant differences between the groups. Secondly, of the 194 participants included in the current analysis, the majority of the participants (60.82%) had an ISS of 1 to 3 ($N$=118), with 25.25% ($N$=49) having an ISS of 4 to 8 and 13.40% ($N$=26) having an ISS of 9+. Age ranged from 19 to 83 years ($M$=46.61,

*SD*=13.02 years). There were 123 (63.40%) females. Most of the claimants were drivers or passengers in the RTC (79.40%), with only 20.60% being cyclists or pedestrians[2].

Of the 23 variables examined in univariate analyses, 13 were found to be significant univariate predictors of NRTW (Tables 2 and 3). Only two predictors remained significant in the final multivariable model: Disability level and expectations about return to work (from the OMPQ; see Table 4). The Hosmer and Lemeshow goodness of fit test, with $p = .999$, indicates the observed data are not significantly different from the predicted values produced by the final multivariable model. This indicates that the model is a good fit for the data.

Table 5 presents the cut-off score from the ROC analysis, sensitivity, specificity, PPV, NPV and percent correctly classified for the 13-item measure and the two-item measure. For the 13-item measure, the 13 significant univariate predictors (see Table 3) were coded and summed to produce a risk score to predict RTW status (RTW vs. NRTW). The risk score represented the number of risk factors for NRTW present for each participant, which were defined as driver/passenger, history of mental illness, WHO-DAS-II high disability, SF-36v2 low mental or physical HRQoL, OMPQ overall predicted not to recover, OMPQ pain scale predicted not to recover, OMPQ function scale predicted not to recover, OMPQ high expectations about pain, OMPQ low expectations about RTW, DSM-IV diagnosis, elevated HADS depression levels and elevated HADS anxiety levels. Thus, higher scores indicated more risk of NRTW, with a maximum possible score of 13. For the 13-item measure, a cut-

[2] To compare the characteristics of the current study sample with the broader minor/moderate-injury RTC population, the 2009 RTC data from the Department of Transport and Main Roads (DTMR) was consulted [67]. This data is sourced from the Queensland Police Service's Records and thus includes not-at-fault and at-fault (compensable and non-compensable) individuals (*N* = 12,014). Minor and moderate injuries in the DTMR sample include those that require either no medical treatment beyond first-aid (e.g., a sprain or bruise) or medical treatment that does not require hospitalisation, which captures the same severity of injuries as the current study sample. Individuals in the current study sample are of similar age to those in the broader RTC minor/moderate-injury population (41% vs. 38% aged between 30-49 years, respectively), however, the percentage of females in the current study (64%) is higher compared with the DTMR population (50%). There was a smaller percentage of drivers/passengers in the current study (79%), compared with the DTMR population (86%), meaning there was a higher percentage of cyclists/pedestrians in the current study (21%) than in the DTMR population (14%).

off score of seven out of 13 risk factors resulted in the greatest discrimination. The second measure included only the two variables which were significant in the multivariable logistic regression: WHO-DAS-II disability level and expectations about RTW (OMPQ). A cut-off score of one resulted in the greatest discrimination. Participants with missing data on the relevant predictor variables were omitted from the ROC analyses, resulting in a sample size of 148 participants for the 13-item measure and 151 participants for the two-item measure. Even though the predictive performance of the 13-item and two-item measure were both significantly better than chance, the two-item measure had greater predictive power (AUC = .790 (95% CI .70-.88), $p < .001$) compared with the 13-item measure (AUC = .748 (95% CI .65-.85), $p < .001$). For the two-item measure, a cut-off score of one maximised sensitivity and specificity, such that three-quarters (95% CI .61-.90) of those who are not going to RTW, and 79% (95% CI .72-.87) of those who will RTW, were detected by the measure. NPV was high (.91) and PPV was acceptable (.53) for the two-item measure.

**Discussion**

The aim of this study was to identify predictors of NRTW in a predominantly[3] minor-injury cohort of RTC survivors. Of those who were working full- or part-time prior to the RTC, 21.6% did not RTW in a full- or part-time capacity at 2-year follow-up. When assessed individually, significant predictors of NRTW included being the driver or passenger, having a prior psychiatric diagnosis, high disability level, low mental or physical HRQoL, predicted non-recovery (OMPQ), high pain, low function, high expectations of pain persistency, low expectations about RTW, having a DSM-IV diagnosis, elevated depression or anxiety. These 13 predictors make up the 13-item measure, however only disability level and expectations

[3] This cohort is deemed to have sustained predominantly minor injuries as 86% of the sample had an ISS ≤8 (with 61% having an ISS of ≤ 3), thus most participants suffered superficial injuries or injuries such as upper extremity fractures.

about RTW were significant multivariate predictors and thus made up the final (two-item) measure.

The main purpose of our measures was to correctly identify as many individuals as possible who are at risk of not returning to work two years after their RTC (sensitivity) and to screen out individuals who are likely to RTW (NPV), and thus do not require additional assistance. Specifically, by using the two-item measure, 75% of individuals who will not RTW at 2 years can be identified accurately at an early stage, and 91% of individuals likely to RTW can be screened out from further intervention. One might question, however, whether a PPV of 53% is effective. Only 53% of those receiving help would actually need it. However, it should be noted that the PPV cannot be close to 1 when the prevalence of the outcome is relatively low [68] (i.e. prevalence of NRTW in the current sample was 21.6%), thus it is difficult to get a high PPV. Specificity is high: 79% of those who will RTW at 2 years can be identified early. This means that additional support is not provided to those who do not need it, conserving limited resources for those most in need. The effectiveness of interventions to increase RTW rates has been shown in a preliminary evaluation of a RTW intervention designed specifically for RTC survivors, where the RTW rate was higher in the intervention group, relative to the usual care group [69]. This suggests that developing a screening tool to detect individuals at risk of NRTW would be beneficial, since appropriate and effective interventions to increase the RTW rate could be offered. The two-item measure is short (5-10 minutes to complete) and simple to administer and answer, meaning that non-specialists can easily score the items and determine whether someone is at-risk of NRTW.

The finding that expectations regarding RTW at baseline predict NRTW at 2 years is consistent with previous research in general injury cohorts [18-26]. This study is the first to demonstrate that this factor predicts RTW in a RTC cohort. Lower expectancies regarding RTW may reduce the chance that individuals will engage in behaviours which promote RTW, and discourage persistence when challenges, such as experiencing pain and discomfort, arise

[70]. Expectations regarding RTW are potentially amenable to change [71] and thus could be targeted via early intervention. High disability levels predicting NRTW is also consistent with previous findings from another RTC cohort [15]. Disability refers to an individual's functioning, and is considered a dynamic interaction between the individual's health and environmental and/or personal factors. Therefore, early rehabilitation that addresses physical, psychological and social functioning in an integrative way may be the best approach for early intervention when targeting disability [72].

When examining the univariate predictors of NRTW, the finding that greater pain levels predict NRTW is consistent with two previous studies using RTC cohorts [15, 17] and in general injury samples [18, 27, 30, 37, 39, 43]. The finding that greater baseline symptom levels of anxiety [35, 44] and depression [44, 45] predict NRTW is consistent with previous general injury studies, however it is inconsistent with findings from van Velzen et al. [41]. The presence of a baseline DSM-IV diagnosis predicted RTW, consistent with previous research in general injury [27, 39]. However, the current study did not find baseline PTSD significantly predicts NRTW, which is inconsistent with previous research reporting a relationship between PTSD and NRTW in a RTC sample [16] and broader injury cohorts [37, 39, 44]. It may be that the relationship between PTSD and RTW varies as a function of the type of injury and method of sustaining the injury. More research is needed investigating the relationship between initial mental health post-injury and RTW in RTC samples.

The finding of no significant relationship between injury severity and NRTW is in contrast with previous research with RTC cohorts [9, 13, 15] and the majority of research from broader injury cohorts [27, 30, 34, 38, 39]. There were, however, two studies from the wider injury literature where no relationship between injury severity and RTW was found [40, 41]. It may be that injury severity is not relevant to RTW status when the initial injuries were predominantly minor and RTW status is assessed at 2 years post-RTC. The remaining significant univariate

predictors in the current study have not specifically been assessed with respect to NRTW, thus it is not possible to compare these findings with previous research.

The RTW rate of 78.4% at 2 years in the current study is lower than the 83-100% RTW rate for minor and moderate injuries reported at 8-12 months post-RTC in previous studies [10-13]. The lower rate in the current study, despite a longer follow-up period, is most likely due to the method of recruitment. Participants in the current study had to respond to a letter inviting them to participate. In the aforementioned studies, participants were recruited during a hospital visit [10-13]. Our method of recruitment may have resulted in a larger number of individuals who were experiencing greater difficulties initially, as these individuals may have been more motivated to participate. Nonetheless, given the substantial number of individuals who experience minor or moderate injuries from RTC [14], even a small proportion not returning to work represents a significant problem in terms of costs for the individual, employers and society.

It is also possible that the higher proportion of females in the current study, compared with previous studies that had a greater proportion of males, could have contributed to the lower RTW rate than in previous studies [10-13]. The proportion of female employees in Australia is 46%, thus women are generally less likely than males to be employed [73]. However, the higher proportion of females in this study is unlikely to have substantially influenced the RTW rate, as both genders were equally likely to RTW.

Strengths of the current study include the inclusion of milder, non-hospitalised injuries, a wide variety of measures assessing several domains (including both physical and mental health factors), a reasonably long duration of follow-up (2 years) and the use of diagnostic interview to establish DSM-IV diagnoses. A potential limitation of the study is the relatively low participation rate (12%), likely to be a consequence of obtaining consent via post rather than in person, however previous studies that have recruited using this method report similar participation rates [46]. Because participants with complete work status data were older than those

with no work status data, this may affect the generalisability of the current findings. In addition, the sample group does not represent the entire possible RTC cohort. At-fault drivers (who are not compensable) were not eligible for inclusion in this study and these groups may differ in the factors affecting their RTW [74]. Future research should endeavour to assess a larger sample, including at-fault non-compensable drivers, to improve the generalisability of the results. Nonetheless, understanding risk factors for NRTW in compensable individuals with predominantly minor injuries is under-researched and important.

It is possible that those who declined to participate in the study did so because they were busier due to having returned to work. This may have inflated the percentage of participants who had not returned to work at Wave 3 in the current study. Another factor which may have inflated the NRTW rate is the natural progression to retirement for older participants. Given that participants ranged in age from 19 to 83 years, it is likely that some of the older participants may have retired for reasons unrelated to the RTC. Future research assessing NRTW should attempt to include an age-matched uninjured sample, to determine the proportion of individuals who are initially employed, and then subsequently unemployed two years later due to health reasons, involuntary unemployment or retirement. This issue is not specific to the current study and applies to all NRTW studies without an uninjured control group. Nevertheless, the NRTW percentage should be interpreted with some caution.

It was beyond the scope of this study to do additional follow-ups to ascertain whether all RTW attempts were sustained and whether occupational factors (e.g., type of occupation, workplace modifications) influence RTW outcomes. However, current research indicates the importance of considering occupational factors when assessing RTW (e.g., [75]), thus this should be assessed in future research. Future research should also investigate whether work status is transient (i.e., temporary or permanent) at both time points, to increase our understanding of the permanency of work prior to and following RTC. It would also be beneficial to assess whether participants had modified their work duties/position or reduced their working hours

two years post-RTC, to further explore the impact of minor and moderate injuries sustained from RTC on RTW. Finally, it would be beneficial to assess life events not associated with the RTC that may affect work status, e.g., further injury, diagnosis with significant illness and age-related retirement from work, to provide a richer understanding of the factors which impact on RTW.

This study shows promising results in terms of screening for risk of NRTW in a cohort of RTC survivors who sustained predominantly minor injuries. RTW is important, in terms of reducing financial burden for the individual, their family and society as well as the associated benefits of better health, social connectedness and quality of life [4-6]. The results may ultimately have significant implications for policy and practice. Individuals with minor and moderate injuries represent the majority (87%) of compensation claims in Queensland [14]. A substantial minority of those with predominantly minor injuries experience difficulties with RTW. A short screening measure asking people about their expectations regarding RTW and assessing their disability level could be used when compensation claims are lodged, to identify who warrants more intense and costly assessment. At-risk individuals could then be monitored and, if needed, given additional support or referred to appropriate early intervention. The two-item measure can also correctly screen out a large proportion of individuals who would RTW. This allows for more efficient allocation of scarce resources to individuals who need help.

**Conflict of interest and funding**

There is no conflict of interest in the present study for any of the authors.

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**References**

1. Bureau of Infrastructure Transport and Regional Economics (BITRE). Road crash costs in Australia 2006, Report 118. Canberra, November 2009.

2. Bureau of Transport Economics. Road Crash Costs in Australia. Canberra, Australia: Commonwealth of Australia; 2000.

3. World Health Organization. Global Status Report on Road Safety. Geneva; 2009.

4. Harrison K, Allen S. Features of occupational rehabilitation systems in Australia: a map through the maze. *Work* 2003; **21**: 141-52.

5. Hayden JA, Cote P, Bombardier C. Evaluation of the quality of prognosis studies in systematic reviews. *Ann Intern Med* 2006; **144**: 427-37.

6. Ottomanelli L, Lind L. Review of critical factors related to employment after spinal cord injury: implications for research and vocational services. *J Spinal Cord Med* 2009; **32**: 503-31.

7. Friedland JF, Dawson DR. Function after motor vehicle accidents: a prospective study of mild head injury and posttraumatic stress. *J Nerv Ment Dis* 2001; **189**: 426-34.

8. Gabbe BJ, Cameron PA, Williamson OD, Edwards ER, Graves SE, Richardson MD. The relationship between compensable status and long-term patient outcomes following orthopaedic trauma. *Med J Aust* 2007; **187**: 14-7.

9. Read KM, Kufera JA, Dischinger PC, et al. Life-altering outcomes after lower extremity injury sustained in motor vehicle crashes. *J Trauma* 2004; **57**: 815-23.

10. Hours M, Chossegros L, Charnay P, et al. Outcomes one year after a road accident: results from the ESPARR cohort. *Accid Anal Prev* 2013; **50**: 92-102.

11. Barnes J, Thomas P. Quality of life outcomes in a hospitalized sample of road users involved in crashes. *Annual Proceedings: Association for the Advancement of Automotive Medicine* 2006; **50**: 253-68.

12. Mayou R, Bryant B. Outcome in consecutive emergency department attenders following a road traffic accident. *Br J Psychiatry* 2001; **179**: 528-34.

13. Fitzharris M, Bowman D, Ludlow K. Factors associated with return-to-work and health outcomes among survivors of road crashes in Victoria. *Aust N Z J Public Health* 2010; **34**: 153-9.

14. Motor Accident Insurance Commission. Statistical information 1 July to 31 December 2014. Brisbane, Queensland: Motor Accident Insurance Commission, 2015.

15. Fort E, Bouffard E, Charnay P, et al. Return to work following road accidents: factors associated with late work resumption. *J Rehabil Med* 2011; **43**: 283-91.

16. Matthews LR. Work potential of road accident survivors with post-traumatic stress disorder. *Behav Res Ther* 2005; **43**: 475-83.

17. Gopinath B, Jagnoor J, Nicholas M, et al. Presence and predictors of persistent pain among persons who sustained an injury in a road traffic crash. *Eur J Pain* 2015; **19**: 1111-8.

18. Heijbel B, Josephson M, Jensen I, Stark S, Vingard E. Return to work expectation predicts work in chronic musculoskeletal and behavioral health disorders: prospective study with clinical implications. *J Occup Rehabil* 2006; **16**: 173-84.

19. Huijs JJ, Koppes LL, Taris TW, Blonk RW. Differences in predictors of return to work among long-term sick-listed employees with different self-reported reasons for sick leave. *J Occup Rehabil* 2012; **22**: 301-11.

20. Iles RA, Davidson M, Taylor NF, O'Halloran P. Systematic review of the ability of recovery expectations to predict outcomes in non-chronic non-specific low back pain. *J Occup Rehabil* 2009; **19**: 25-40.

21. Kuijer W, Groothoff JW, Brouwer S, Geertzen JH, Dijkstra PU. Prediction of sickness absence in patients with chronic low back pain: a systematic review. *J Occup Rehabil* 2006; **16**: 439-67.

22. Cole DC, Mondloch MV, Hogg-Johnson S, and The Early Claimant Cohort Prognostic Modelling Group. Listening to injured workers: how recovery expectations predict outcomes - a prospective study. *CMAJ* 2002; **166**: 749-54.

23. Carriere JS, Thibault P, Sullivan MJ. The mediating role of recovery expectancies on the relation between depression and return-to-work. *J Occup Rehabil* 2015; **25**: 348-56.

24. Turner JA, Franklin G, Fulton-Kehoe D, et al. Worker recovery expectations and fear-avoidance predict work disability in a population-based workers' compensation back pain sample. *Spine* 2006; **31**: 682-9.

25. Du Bois M, Donceel P. A screening questionnaire to predict no return to work within 3 months for low back pain claimants. *Eur Spine J* 2008; **17**: 380–5.

26. Ebrahim S, Malachowski C, Kamal El Din M, et al. Measures of patients' expectations about recovery: a systematic review. *J Occup Rehabil* 2015; **25**: 240-55.

27. Clay FJ, Fitzharris M, Kerr E, McClure RJ, Watson WL. The association of social functioning, social relationships and the receipt of compensation with time to return to work following unintentional injuries to Victorian workers. *J Occup Rehabil* 2012; **22**: 363-75.

28. Berecki-Gisolf J, Clay FJ, Collie A, McClure RJ. Predictors of sustained return to work after work-related injury or disease: insights from workers' compensation claims records. *J Occup Rehabil* 2012; **22**: 283-91.

29. Blackwell TL, Leierer SJ, Haupt S, Kampitsis A. Predictors of vocational rehabilitation return-to-work outcomes in workers' compensation. *Rehabil Couns Bull* 2003; **46**: 108-14.

30. He Y, Hu J, Yu IT, Gu W, Liang Y. Determinants of return to work after occupational injury. *J Occup Rehabil* 2010; **20**: 378-86.

31. Waljas M, Iverson GL, Lange RT, et al. Return to work following mild traumatic brain injury. *J Head Trauma Rehabil* 2014; **29**: 443-50.

32. Kvam L, Vik K, Eide AH. Importance of participation in major life areas matters for return to work. *J Occup Rehabil* 2015; **25**: 368-77.

33. Nightingale EJ, Soo CA, Tate RL. A Systematic review of early prognostic factors for return to work after traumatic brain injury. *Brain Impair* 2007; **8**: 101-42.

34. Clay FJ, Newstead SV, McClure RJ. A systematic review of early prognostic factors for return to work following acute orthopaedic trauma. *Injury* 2010; **41**: 787-803.

35. Lin KH, Guo NW, Shiao SC, et al. The impact of psychological symptoms on return to work in workers after occupational injury. *J Occup Rehabil* 2013; **23**: 55-62.

36. Soberg HL, Bautz-Holter E, Roise O, Finset A. Long-term multidimensional functional consequences of severe multiple injuries two years after trauma: a prospective longitudinal cohort study. *J Trauma* 2007; **62**: 461-70.

37. Stulemeijer M, van der Werf S, Borm GF, Vos PE. Early prediction of favourable recovery 6 months after mild traumatic brain injury. *J Neurol Neurosurg Psychiatry* 2008; **79**: 936-42.

38. Schnyder U, Moergeli H, Klaghofer R, Sensky T, Buchi S. Does patient cognition predict time off from work after life-threatening accidents? *Am J Psychiatry* 2003; **160**: 2025-31.

39. Iakova M, Ballabeni P, Erhart P, Seichert N, Luthi F, Deriaz O. Self perceptions as predictors for return to work 2 years after rehabilitation in orthopedic trauma inpatients. *J Occup Rehabil* 2012; **22**: 532-40.

40. Lange C, Burgmer M, Braunheim M, Heuft G. Prospective analysis of factors associated with work reentry in patients with accident-related injuries. *J Occup Rehabil* 2007; **17**: 1-10.

41. van Velzen JM, van Bennekom CA, Edelaar MJ, Sluiter JK, Frings-Dresen MH. Prognostic factors of return to work after acquired brain injury: a systematic review. *Brain Inj* 2009; **23**: 385-95.

42. Lilley R, Davie G, Ameratunga S, Derrett S. Factors predicting work status 3 months after injury: results from the Prospective Outcomes of Injury Study. *BMJ* 2012; **2**.

43. Zampolini M, Bernardinello M, Tesio L. RTW in back conditions. *Disabil Rehabil* 2007; **29**: 1377-85.

44. Garrelfs SF, Donker-Cools BH, Wind H, Frings-Dresen MH. Return-to-work in patients with acquired brain injury and psychiatric disorders as a comorbidity: a systematic review. *Brain Inj* 2015; **29**: 550-7.

45. Lloyd C, Waghorn G, McHugh C. Musculoskeletal disorders and comorbid depression: implications for practice. *Aust Occup Therap J* 2008; **55**: 23-9.

46. Smith B, Mackenzie-Ross S, Scragg P. Prevalence of poor psychological morbidity following a minor road traffic accident (RTA): the clinical implications of a prospective longitudinal study. *Couns Psychol Q* 2007; **20**: 149-55.

47. Kenardy J, Heron-Delaney M, Warren J, Brown E. The effect of mental health on long-term health-related quality of life following a road traffic crash: results from the UQ SuPPORT study. *Injury* 2015; **46**: 883-90.

48. Kenardy J, Heron-Delaney M, Warren J, Brown E. Effect of mental health on long-term disability after a road traffic crash: results from the UQ SuPPORT study. *Arch Phys Med Rehabil* 2015; **96**: 410-7.

49. Kenardy J, Heron-Delaney M, Bellamy N, Sterling M, Connelly L. The University of Queensland study of physical and psychological outcomes for claimants with minor and moderate injuries following a road traffic crash (UQ SuPPORT): design and methods. *Eur J Psychotraumatol* 2014; **5**.

50. Linton SJ, Boersma K. Early identification of patients at risk of developing a persistent back problem: the predictive validity of the Orebro Musculoskeletal Pain Questionnaire. *Clin J Pain* 2003; **19**: 80-6.

51. Ware JE, Kosinski M, Dewey JE. How to score version 2 of the SF-36 Health Survey (standard and acute forms). Lincoln: Quality Metric Inc; 2000.

52. O'Donnell ML, Holmes AC, Creamer MC, et al. The role of post-traumatic stress disorder and depression in predicting disability after injury. *Med J Aust* 2009; **190**: S71-4.

53. Grafarend EW. Linear and nonlinear models: fixed effects, random effects, and mixed models: Walter de Gruyter; 2006.

54. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. *J Pers Asses* 1988; **52**: 30-41.

55. Weiss DS, Marmar CR. The Impact of Event Scale - Revised. In Wilson JP, Keane TM, eds. *Assessing psychological trauma and PTSD: a handbook for practitioners*. New York: Guilford Press; 1997: 399-411.

56. Brewin CR. Systematic review of screening instruments for adults at risk of PTSD. *J Trauma Stress* 2005; **18**: 53-62.

57. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychia Scand* 1983; **67**: 361-70.

58. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale: An updated literature review. *J Psychosom Res* 2002; **52**: 69-77.

59. Kuijpers PM, Denollet J, Lousberg R, et al. Validity of the Hospital Anxiety and Depression Scale for Use With Patients With Noncardiac Chest Pain *Psychosomatics* 2003; **44**: 329-35.

60. Ustün TB, Kostanjsek N, Chatterji S, Rehm J, editors. Measuring Health and Disability: Manual for WHO Disability Assessment Schedule (WHODAS 2.0). Genever: World Health Organization; 2010.

61. Peters L, Andrews G, Cottier LB, Chatterji S, Janca A, Smeets R. The composite international diagnostic interview posttraumatic stress disorder module: preliminary data. *Int J Methods Psychiatr Res* 1996; **6**: 167-74.

62. Kessler RC, Andrews G, Mroczek D, Ustun B, Wittchen H-U. The World Health Organization Composite International Diagnostic Interview short-form (CIDI-SF). *Int J Methods Psychiatr Res* 1998; **7**: 171-85.

63. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, D.C.: Author; 1994.

64. Association of the Advancement of Automotive Medicine. Abbreviated Injury Scale (AIS) 2005. Des Plaines: AAAM; 2005.

65. Baker SP, O'Neill B, Haddon WJ, Long WB. The Injury Severity Score: A method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974; **14**: 187-96.

66. Copes WS, Champion HR, Sacco WJ, Lawnick MM, Keast SL, Bain LW. The Injury Severity Score revisited. *J Trauma* 1988; **28**: 69-77.

67. Transport and Main Roads. 2009 road traffic crashes in Queensland. 2012. http://www.tmr.qld.gov.au/-/media/Safety/Transport-and-road-statistics/Road-safety/Road_traffic_crashes_in_qld_2009.pdf?la=en (accessed 24 February, 2017).

68. Altman DG, Bland JM. Diagnostic tests 2: predictive values. *BMJ* 1994; **309**: 102.

69. Brooke KJ, Faux SG, Wilson SF, Liauw W, Bowman M, Klein L. Outcomes of motor vehicle crashes with fracture: a pilot study of early rehabilitation interventions. *J Rehabil Med* 2014; **46**: 335-40.

70. Lacker JM, Carosella AM, Feuerstein M. Pain expectancies, pain, and functional self-efficacy expectancies as determinants of disability in patients with chronic low back disorders. *J Consult Clin Psychol* 1996; **64**: 212-20.

71. Fadyl J, McPherson K. Return to work after injury: a review of evidence regarding expectations and injury perceptions, and their influence on outcome. *J Occup Rehabil* 2008; **18**: 362-74.

72. Stiers W, Perry KN. Education and training in rehabilitation psychology. In Kennedy P, ed. *The Oxford handbook of rehabilitation psychology*: Oxford University Press; 2012: 417-31.

73. ABS. Labour Force, Australia, June 2016, cat. no. 6202.0. 2016. http://www.abs.gov.au/ausstats/abs@.nsf/mf/6202.0/ (accessed 24 February, 2017).

74. Littleton SM, Hughes DC, Poustie SJ, et al. The influence of fault on health in the immediate post-crash period following road traffic crashes. *Injury* 2012; **43**: 1586-92.

75. Street TD, Lacey SJ. A systematic review of studies identifying predictors of poor return to work outcomes following workplace injury. *Work* 2015; **51**: 373-81.

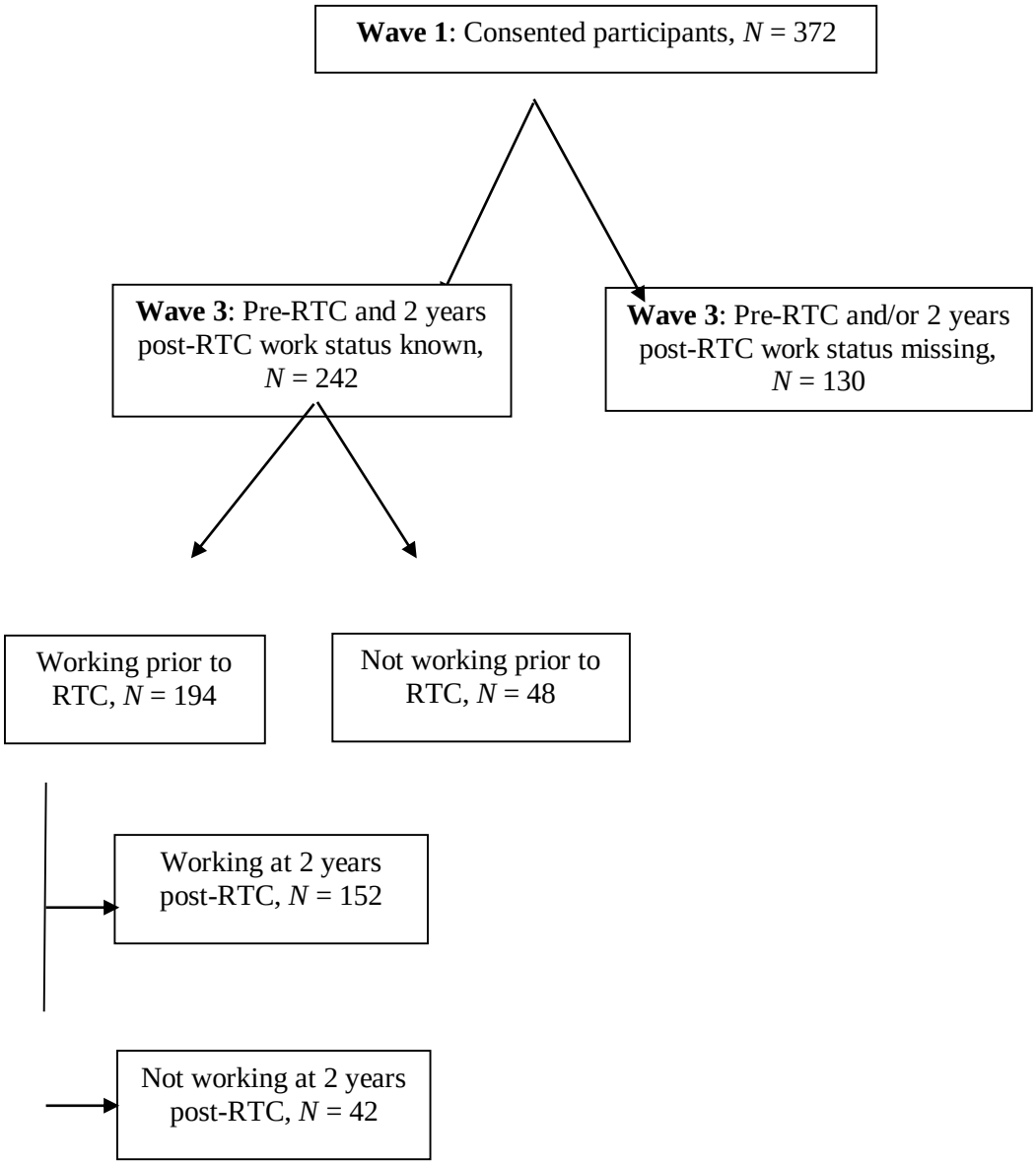


*Figure 1*. Flow chart of study participants

*Table 1*. Participants' work status pre- and post-RTC (*N*=242).

| | **Work status 2 years post-RTC** | | |
|---|---|---|---|
| **Pre-RTC Work Status** | Working full-time | Working part-time | Not working |
| Working full-time (*N*=129) | 89 (69%) | 14 (11%) | 26 (20%) |
| Working part-time (*N*=65) | 7 (11%) | 42 (65%) | 16 (24%) |
| Not working (*N*=48) | 1 (2%) | 2 (4%) | 45 (94%) |

*Table 2*. Mean, standard deviation (*SD*) and sample size (*N*) for the low, high and total groups for the significant univariate predictors of non-return to work at 2 years.

| **Measure** | **Group** | ***N*** | **Mean** | **SD** |
|---|---|---|---|---|
| Disability level (WHO-DAS-II) | High disability | 24 | 24.46 | 4.11 |
| | Low/moderate disability | 153 | 7.81 | 5.66 |
| | Total | 177 | 10.07 | 7.91 |
| Mental HRQoL (SF-36v2) | Low mental HRQoL | 29 | 19.02 | 5.54 |
| | High mental HRQoL | 133 | 44.33 | 9.78 |
| | Total | 162 | 39.80 | 13.36 |
| Physical HRQoL (SF-36v2) | Low physical HRQoL | 26 | 25.31 | 4.68 |
| | High physical HRQoL | 136 | 43.73 | 7.05 |
| | Total | 162 | 40.78 | 9.54 |
| OMPQ total score | Predicted not to recover overall | 65 | 123.03 | 12.15 |
| | Predicted to recover overall | 93 | 75.32 | 21.16 |
| | Total | 158 | 94.94 | 30.17 |
| OMPQ pain subscale | Predicted not to recover for pain | 25 | 48.75 | 19.87 |
| | Predicted to recover for pain | 134 | 8.68 | 5.12 |
| | Total | 159 | 42.45 | 23.46 |
| OMPQ function subscale | Predicted not to recover for function | 130 | 32.42 | 9.43 |

| | | | | |
|---|---|---|---|---|
| | Predicted to recover for function | 29 | 47.79 | 2.08 |
| | Total | 159 | 35.23 | 10.43 |
| Expectation about pain persistency | High expectation of pain persistency | 65 | 8.86 | 0.90 |
| | Low expectation of pain persistency | 94 | 4.52 | 1.98 |
| | Total | 159 | 6.30 | 2.69 |
| Expectation about RTW | High expectation to RTW | 116 | 9.66 | 0.69 |
| | Low expectation to RTW | 43 | 3.77 | 2.64 |
| | Total | 159 | 8.06 | 3.01 |
| Depressive symptoms (HADS) | Elevated depression level | 51 | 10.45 | 2.00 |
| | Normal levels of depression | 111 | 3.22 | 2.29 |
| | Total | 162 | 5.49 | 4.03 |
| Anxiety symptoms (HADS) | Elevated anxiety level | 84 | 11.56 | 2.73 |
| | Normal levels of anxiety | 78 | 3.92 | 2.73 |
| | Total | 162 | 7.88 | 4.60 |

*Table 3*. Significant univariate predictors of non-return to work at 2 years (1=NRTW [*N*=42]), 0=RTW [*N*=152]), odds ratios (OR), confidence intervals (CIs) and *p* values.

| **Variable** | **Categorical cut-off** | **OR** | **95% CIs** | ***p*** |
|---|---|---|---|---|
| Road user type (NRTW *N*=42) | 1 = Driver/ passenger<br>0 = Pedestrian/cyclist | 2.95 | 0.99 – 8.82 | .053 |
| Psychiatric history (NRTW *N*=40) | 1 = Prior psych diagnosis<br>0 = No prior psych diagnosis | 2.41 | 1.09 – 5.30 | .029 |
| Disability level (NRTW *N*=39) | 1 = >20.43 = high disability<br>0 = ≤20.43 = low/moderate disability | 5.77 | 2.33-14.30 | <.001 |
| Mental HRQoL (NRTW *N*=38) | 1 = <26.31 = low mental HRQoL<br>0 = ≥26.31 = moderate/high mental HRQoL | 2.28 | 0.91-5.72 | .080 |
| Physical HRQoL (NRTW *N*=38) | 1 = <30.18 = low physical HRQoL<br>0 = ≥ 30.18 = moderate/high physical HRQoL | 2.28 | 0.91-5.72 | .080 |
| OMPQ total score (NRTW *N*=36) | 1 = ≥ 105 = predicted not to recover overall<br>0 = <105 = predicted to recover overall | 8.04 | 3.35-19.30 | <.001 |
| OMPQ pain subscale (NRTW *N*=37) | 1 = ≥17 = predicted not to recover in terms of pain<br>0 = < 17 = predicted to recover in terms of pain | 4.07 | 0.91-18.14 | .066 |
| OMPQ function subscale | 1 = ≤44 = predicted not to recover in terms of function | 10.72 | 1.41-81.76 | .022 |

| | | | | |
|---|---|---|---|---|
| (NRTW *N*=37) | 0 = >44 = predicted to recover in terms of function | | | |
| Expectation about pain persistency (NRTW *N*=37) | 1 = ≥8 = high expectation of pain persistency<br>0 = <8 = low expectation of pain persistency | 2.33 | 1.10-4.92 | .027 |
| Expectation about RTW (NRTW *N*=37) | 1 = <8 = low expectation to RTW<br>0 = ≥8 = high expectation to RTW | 12.04 | 5.14-28.19 | <.001 |
| DSM-IV diagnosis (NRTW *N*=40) | 1 = met DSM-IV criteria<br>0 = did not meet DSM-IV criteria | 2.47 | 1.16-5.25 | .019 |
| Depressive symptoms (HADS) (NRTW *N*=38) | 1 = ≥ 8 = elevated depression level<br>0 = <8 = normal levels of depression | 3.33 | 1.57-7.10 | .002 |
| Anxiety symptoms (HADS) (NRTW *N*=38) | 1 = ≥ 8 = elevated anxiety level<br>0 = <8 = normal levels of anxiety | 2.12 | 0.99-4.52 | .052 |

NOTE. Variables which did not significantly predict NRTW included age, gender, education level, ISS, perception of threat to life, PTSD diagnosis, MDE diagnosis, GAD diagnosis, Posttraumatic stress symptoms (from IESR) and social support.

*Table 4*. Multivariable logistic regression model predicting NRTW and associated Odds Ratios (OR), 95% Confidence Intervals (95% CI) and *p* values; reference group in parentheses.

| **Variable** | **OR** | **95% CI** | ***p*** |
|---|---|---|---|
| Expectations about return to work (High Expectation) | | | |
| Low expectations | 9.39 | 3.87 – 22.81 | <.001 |
| Disability level (low to moderate disability) | | | |
| High disability (> 1SD above sample mean) | 4.94 | 1.57 – 15.50 | .049 |

Hosmer and Lemeshow *p* value = .999

*Table 5.* Sensitivity, specificity, PPV, NPV and percent correctly classified as NRTW for the different measures (95% Confidence Intervals denoted in parentheses).

| Measure | Cut-off score | Sensitivity | Specificity | PPV | NPV | % correctly classified |
|---|---|---|---|---|---|---|
| 13-item[a] | 7 | .80 (.67-.93) | .48 (.39-.57) | .32 (.22-.42) | .89 (.81-.97) | .55 (.47-.63) |
| Two-item[b] | 1 | .75 (.61-.90) | .79 (.72-.87) | .53 (.40-.67) | .91 (.85-.97) | .74 (.67-.81) |

[a]13-item measure was the sum of individual univariate predictors

[b] two-item measure was derived from multivariate analyses of 13 predictors