Journal of Affective Disorders 214 (2017) 8–14

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

# Recovery trajectories for long-term health-related quality of life following a road traffic crash injury: Results from the UQ SuPPORT study

Justin Kenardy[a,b,*], Michelle Heron-Delaney[c], Joan Hendrikz[a], Jacelle Warren[a], Shannon L. Edmed[a], Erin Brown[a]

[a] Recover Injury Research Centre, University of Queensland, Brisbane, Queensland, Australia
[b] School of Psychology, University of Queensland, Brisbane, Queensland, Australia
[c] School of Psychology, Australian Catholic University, Brisbane, Queensland, Australia

ARTICLE INFO

*Keywords:*
Quality of life
Road traffic crash
Posttraumatic stress disorder

ABSTRACT

*Background:* Diminished physical and mental health-related quality of life (HRQoL) is a common consequence of road traffic crash (RTC) injury. This study aimed to (a) determine the probable recovery trajectories in physical and mental HRQoL; (b) examine the impact of posttraumatic stress disorder (PTSD) on HRQoL scores within these trajectory groups; and (c) examine the influence of predictor covariates on trajectory group membership.

*Methods:* 336 (63% female, $M_{age}$ =44.72; *SD* =14.77) injured RTC survivors completed the SF-36v2 at approximately 6, 12, and 24 months after sustaining a RTC injury. Participants also completed telephone interviews to assess prior history of psychological disorder and current PTSD at each wave.

*Results:* Three trajectories were identified for SF-36v2 Physical Component Score (PCS): ”gradual recovery” (27.3%);”low but improving” (54.7%); and”severe and chronic” (17.9%). Four trajectories were defined for SF36v2 Mental Component Score (MCS): “unaffected” (19.1%);”severe but improving” (24.1%);”severe and declining” (17.3%); and”low but improving” (39.5%). A PTSD diagnosis significantly reduced SF36v2 component scores only in trajectories associated with poorer outcome. Age was predictive of trajectory group membership for PCS, whereas injury severity was predictive of trajectory group membership for MCS.

*Limitations:* Use of a compensation seeking sample affects generalizability to the general RTC population.

*Conclusions:* This study identified a concerning subgroup of individuals who have chronic and/or declining physical and mental HRQoL that can be impacted by a diagnosis of PTSD. The development of interventions with a special focus on associated psychological injury is needed to improve the HRQoL of at-risk individuals following RTC injury.

## 1. Introduction

Each year, over 50 million people worldwide sustain a non-fatal injury in a road traffic crash (RTC) (World Health Organization, 2013). Even in first world countries, non-fatal RTC injuries are high: The United States records more than 2.3 million peopleaffected annually (Economic Commission for Europe, 1995). These non-fatal RTCs represent substantial personal, social, and economic public health burdens (Connelly and Supangan, 2006; Gopinath et al., 2015). The majority of research on the consequences of RTC-related injuries has focussed on participants with severe injuries. However, it is increasingly being recognised that even minor injuries, which comprise the majority of injuries sustained in RTCs, can have ongoing consequences for those involved in an RTC (Mayou and Bryant, 2001). These chronic consequences can include functional difficulties, delayed return to work, and reduced health-related quality of life (HRqoL), which may vary depending on a range of premorbid, injury-related, and post-injury factors (Cassidy et al., 2000; Fitzharris et al., 2010; Fort et al., 2011; Kenardy et al., 2015a, 2015b; Mayou and Bryant, 2001; McLean et al., 2014; Read et al., 2004).

A commonly cited consequence of RTC-related injury is diminished HRQoL (Alghnam et al., 2014). The measurement of HRQoL following injury is important to assess the full burden of RTC-related disability, rather than the measurement of physical health status alone (Moergeli et al., 2012). Previously, we have found persistently below average HRQoL, as measured by the SF-36, over a 24-month period in a sample of individuals with predominantly minor physical injuries (Kenardy et al., 2015b). Our study suggested that HRQoL can be affected long

* Correspondence to: Level 7, UQ Oral Health Centre, 288 Herston Road, Herston QLD 4006, Australia.
*E-mail address:* j.kenardy@uq.edu.au (J. Kenardy).

http://dx.doi.org/10.1016/j.jad.2017.02.031
Received 4 November 2016; Received in revised form 17 February 2017; Accepted 28 February 2017
Available online 28 February 2017
0165-0327/ 

after injury onset, even when those injuries are considered minor. Understanding the patterns of response following RTC-related minor injury would be of even more benefit, as they may identify distinct groups that would benefit from early targeted interventions following RTC-related injury.

Psychological distress follows physical injury for a significant minority of people, regardless of injury severity (Mayou and Bryant, 2002). A systematic review of predictors of posttraumatic stress disorder (PTSD) found that injury severity had no utility in predicting PTSD in adult RTC survivors (Heron-Delaney et al., 2013), which suggests that the risk of developing PTSD post-RTC is not reduced for those with minor injuries (Heron-Delaney et al., 2013). A range of psychological disorders can develop following an RTC-related injury, including depression, anxiety, and PTSD. PTSD is characterized by a constellation of re-experiencing, avoidance, and hyperarousal symptoms that follow a potentially traumatic event (note, this study followed the DSM-IV-TR diagnostic criteria of PTSD, which are slightly modified in the DSM-5) (American Psychiatric Association, 1994, 2013). Given the requirement of a potentially traumatic event in its diagnosis, relative to other disorders, PTSD can be most easily be attributed to the RTC, and not to historical sequelae. Unfortunately, the research on the prevalence of PTSD after RTC-related injury is inconsistent due to differences in studies' sample size, assessment timing, and study site, but it is estimated to be in the range of 6–45% (Heron-Delaney et al., 2013). However, the upper limit in the range of this estimate exceeds the prevalence typical for PTSD developing after trauma exposure. Following an RTC, research shows that individuals diagnosed with PTSD have poorer recovery (in terms of physical and mental HRQoL) than individuals without PTSD (Kenardy et al., 2015b). Further, PTSD appears to predict poorer QoL following an RTC (Hours et al., 2014). As such, an examination of the influence of PTSD on HRQoL trajectories following RTC-related injury is warranted.

Previous research in RTC and general injury populations suggest a multiplicity of preinjury, injury-related, and post-injury factors contribute to an individual's HRQoL outcomes following injury. For example, preinjury history of psychological disorders has been found to influence post-injury outcomes, including HRQoL (Hours et al., 2014; Khati et al., 2013). It has also been found that females report poorer QoL outcomes than males following major trauma (Holbrook and Hoyt, 2004), traumatic brain injury (Scholten et al., 2015), and RTC-related injury (Hours et al., 2014; Khati et al., 2013; Littleton et al., 2011). However, findings on other demographic outcomes and injury severity are mixed. Even though age is routinely included as a covariate in population-based research in QoL (e.g., Alghnam et al., 2014), the research does not always find a significant association between age and HRQoL. For instance, Moergeli et al. (2012) found no such relation in adults following accidental injury, whereas other studies have found that older age was associated with lower HRQoL following road traffic injury (Hours et al., 2014; Littleton et al., 2011; Nhac-Vu et al., 2014). The strength of the relationship between injury severity and HRQoL is also mixed. Some studies have found a significant association between more severe injuries and poorer QoL (Khati et al., 2013), while another study only found a significant association between higher injury severity and decreased QoL via an indirect effect of posttraumatic stress (Moergeli et al., 2012). In contrast, Kenardy et al. (2015a, 2015b) have previously found that lower injury severity was associated with poorer mental HRQoL in those with predominately minor injury following an RTC (Kenardy et al., 2015b), although given that the relationship was more pronounced when PTSD was diagnosed, this finding may reflect the relationship between minor injuries such as whiplash and mental health problems that has been previously established in the literature (Sterling et al., 2003). Collectively, this body of literature indicates that there are a number of factors that are important to consider when examining how people report HRQoL following injury. Understanding how HRQoL relates to factors such as preinjury history of psychological disorders, demographics, and injury severity, would be important to help target interventions for at-risk individuals in order to improve outcome following RTC-related injury.

In the current study, we used a latent group-based trajectory framework. Trajectory modeling provides a novel approach to understanding patterns of HRQoL responses over time. A semiparametric analytic technique developed by Nagin (1999), known as latent group-based trajectory analysis, can be used to identify underlying latent trajectories that depict different longitudinal patterns of responding. Maximum likelihood methods are used to model underlying latent trajectories and their shape. These models can be used to determine whether particular factors, such as age or injury severity, are more likely to relate to one particular trajectory. In this way, potential factors that influence recovery trajectories could be used in the early identification of people at risk of poor recovery. This approach has been used previously to describe the longitudinal course of physical and mental HRQoL following mild traumatic brain injury (Chiang et al., 2016).

The examination of HRQoL trajectories following RTC-related injury will help characterize the scope and course of perceived QoL, potentially identifying opportunities for interventions to maximize RTC survivors' long term outcomes. Overall, the aim of this study was to identify the longitudinal trajectories of physical and mental HRQoL following predominantly minor injuries sustained in an RTC. It was hypothesized that multiple distinct trajectories would be identified within the data. The second aim was to examine the influence of PTSD on HRQoL scores within each trajectory. It was hypothesized that the presence of PTSD would worsen both PCS and MCS HRQoL scores for each trajectory. The third aim was to investigate a range of covariates as predictors of trajectory group membership. Specifically, it was hypothesized that non-time-varying covariates of age, sex, injury severity, history of psychological disorder and road user type would influence trajectory group membership.

## 2. Method

### 2.1. Participants and procedure

This analysis forms part of The University of Queensland Study of Physical and Psychological Outcomes for claimants with predominantly minor injuries following an RTC (UQ SuPPORT). The UQ SuPPORT study protocol is available elsewhere (Kenardy et al., 2014). In brief, participants were recruited from records held by the Motor Accident Insurance Commission (MAIC) across 18 months (April 2009 – September 2010), with survey and telephone interview data collected at approximately 6, 12, and 24 months post-RTC from these participants. Participants were claimants within the Queensland common law"fault-based" Compulsory Third Party (CTP) motor vehicle insurance scheme. Eligibility criteria were: (1) Driver/passenger of a car/motorbike, cyclist, or pedestrian involved in an RTC; (2) sustained predominantly minor physical injury defined as a maximum Abbreviated Injury Scale (AIS) score of ≤3; (3) aged 18 years or older; (4) sufficient English speaking ability; (5) RTC occurred within three months prior to claim notification; and (6) Australian resident. Exclusion criteria were: (a) cognitive impairment (subjectively assessed by trained interviewers based on the participants' capacity to answer initial telephone interview questions), and (b) a severe physical condition preventing the telephone interview or survey from being completed by the participant (e.g., stroke, paralysis). By using these inclusion and exclusion criteria, only people with non-catastrophic injuries (i.e., only minor, moderate, or serious injuries (not severe or critical), as defined by an AIS score ≤3), participated in the study.

The recruitment process was governed by legislation, and involved MAIC inviting all eligible participants to take part in the study via a letter of invitation. Claimants could then opt-in by returning their signed consent in a reply-paid envelope. A total of 3146 eligible claimants were sent the letter of invitation, and 382 (12%) of these