Running head: REDUCING THE RISK OF PTSD

*****Accepted for publication in the British Journal of Health Psychology******

The role of psychological symptoms and social group memberships in reducing the risk of post-traumatic stress after traumatic injury

Janelle M. Jones[1*], W. Huw Williams[2], Jolanda Jetten[3], S. Alexander Haslam[2], Adrian Harris[4] & Ilka H. Gleibs[5]

[1*]Department of Psychology, Simon Fraser University, Canada

[2]School of Psychology, University of Exeter, United Kingdom

[3]School of Psychology, The University of Queensland, Australia

[4]Accidents & Emergency Department, Royal Devon & Exeter NHS Foundation Trust, UK

[5]School of Psychology, University of Surrey, United Kingdom

*Corresponding author: Janelle M. Jones, Department of Psychology, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6, Canada; janellej@sfu.ca

Acknowledgements: We thank Kathryn Bristow and Tamar Lawrence for their help with data management. This research was funded by the Economic and Social Research Council (RES-062-23-0135).

Abstract

Objectives: The costs associated with traumatic injury are often exacerbated by the development of post-traumatic stress symptoms. However it is unclear what decreases the risk of developing post-traumatic symptoms over time. The aim of the present research was to examine the role of psychological symptoms and social group memberships in reducing the risk of developing post-traumatic stress symptoms after orthopaedic injuries (OI) and acquired brain injuries (ABI).

Design/Methods: A longitudinal prospective study assessed self-reported general health symptoms, social group memberships, and post-traumatic stress symptoms among participants with mild or moderate ABI (*n*=62) or upper limb OI (*n*=31) at two weeks (T1) and three months (T2) after injury.

Results: Hierarchical regressions revealed that having fewer T1 general health symptoms predicted lower levels of T2 post-traumatic stress symptoms after OI but forming more new group memberships at T1 predicted lower levels of T2 post-traumatic stress symptoms after ABI.

Conclusions: A focus on group memberships may be particularly important in reducing the risk of developing post-traumatic stress symptoms after injuries, such as ABI, which result in long-term life changes.

Word count: 176

Keywords: post-traumatic stress, general health symptoms, social group memberships, traumatic injury

Manuscript word count: 4864 + title page: 132 (max is 5000)

Traumatic injuries have considerable economic and physical costs. These injuries account for one tenth of lost lives and one sixth of the disease burden worldwide (World Health Organisation, 2008) and an estimated $80 billion in medical treatment and $326 billion in lost productivity in the US alone (Corso, Finkelstein, Miller, Fiebelkorn, & Zaloshnja, 2006). Over half of the injuries sustained in developed countries such as the US are attributable to unintentional accidents (e.g., falls, motor vehicle accidents; Johnson, Thomas, Thomas, & Sarimento, 2009; Polinder, Meerding, Toet, van Baar, Mulder, & van Beeck, 2004). When fatality does not occur, these accidents often result in injuries that lead to temporary or life-long disability. Two major types of injury are orthopedic injury (OI), such as a strain, sprain, dislocation or fracture of the musculoskeletal system (e.g., arm, leg, tendon), and acquired brain injury (ABI), where normal brain function is impaired by a blow to, or puncturing of, the head.

Given that OI and ABI are often caused by traumatic incidents, it is not surprising that post-traumatic stress symptoms and post-traumatic stress disorder (PTSD) are common outcomes. PTSD occurs for 10-14% of individuals who have experienced any traumatic event and occurs in approximately 7.5% of individuals who have experienced an accident (e.g., Breslau, Davis, Andreski & Peterson, 1991; Kessler, Sonnega, Bromet, Hughes & Nelson, 1995). There is also an increased incidence of these outcomes among people with traumatic accidental injuries. For instance, Mellman, David, Bustamente, Fins and Esposito (2001) found that 16% of patients with accidental OI exhibited post-traumatic stress symptoms roughly two weeks after injury. This number increased to 24% six weeks after injury, with an additional 22% of patients exhibiting sub-clinical PTSD (i.e., 2 of 3 symptoms). Findings reported by Starr and colleagues (2004) were even more striking. They found that 43% to 57% of patients with OI (due to falls and motor vehicle accidents) met the criteria for PTSD one year after injury. Reports indicate that a similar proportion of individuals with accidental

ABI also meet the criteria for PTSD 3 to 12 months after injury (see McMillan, Williams, & Bryant, 2003).

In light of these findings, the importance of trying to reduce the likelihood of post-traumatic stress symptoms after accidental injury becomes obvious. A first step in this process is to identify and address the risk factors associated with post-traumatic stress symptom development. The present research examined the roles of two factors in reducing the development of post-traumatic stress symptoms after accidental injury: (a) general health symptoms and (b) social group memberships.

General health symptoms as predictors of post-traumatic stress symptoms

Symptoms can tell us a lot about injury. Indeed, the persistence or dissipation of symptoms is an important indicator of people's overall health and well-being. One of the more robust findings in the PTSD literature is that stress symptoms immediately after a traumatic event are strongly related to the development of PTSD (Yehuda, 2002). For this reason, many post-trauma interventions have focused on reducing initial post-traumatic stress symptoms. However this strategy is not always effective — suggesting that other factors might also play a role in the experience and development of initial post-traumatic stress symptoms and PTSD over time. We propose that general health symptoms can provide additional insight into these outcomes.

General health symptoms refer to the presence of psychological and somatic symptoms such as fatigue (e.g., feeling run down), anxiety, insomnia, social dysfunction (e.g., been able to enjoy normal day-to-day activities), and severe depression (e.g., feeling life is hopeless) after traumatic incidents, and have been associated with several negative outcomes. For example, Michaels and colleagues (1999a) found that a decline in general health six months after injury due to a motor vehicle accident was associated with significantly higher levels of PTSD. This finding, like much of the research on general health,

is based on retrospective self-reports of general health symptoms some time after injury. Accordingly, it is not clear whether general health symptoms are predictive of the development of initial post-traumatic stress symptoms, or PTSD, over time.

Given that these somatic and psychological concerns may prove to be an unwelcome change to an individual's daily functioning, we contend that the extent to which general health symptoms are perceived to be severe or debilitating might be associated with higher levels of post-traumatic stress symptoms.

Social group memberships as a predictor of post-traumatic stress symptoms

The social identity approach to health and well-being suggests that social group memberships, such as friendships, families, clubs, and other community or organisational affiliations, and the identities that are gained from them, make a significant contribution to people's outcomes (Haslam, Jetten, Postmes & Haslam, 2009; Jetten, Haslam, & Haslam, 2011; Tajfel & Turner, 1979). The beneficial health effects of group memberships is often most apparent when people experience important life changes as a result of illness and injury. For example, it has been found that maintaining or gaining group memberships is associated with higher levels of life satisfaction and self-esteem, improved cognitive functioning, enhanced physical health and lower mortality when faced with stroke, dementia, and acquired brain injury (Boden-Albala, Litwak, Elkind, Rundek & Sacco, 2005; Ertel, Glymour & Berkman, 2008; Haslam, et al., 2008; Jetten, Haslam, Pugliese, Tonks, & Haslam, 2010; Jones et al., 2011).

Why would maintaining or gaining group memberships be such an important determinant of health and well-being? Equally important, why might group memberships play a role in whether people develop post-traumatic stress symptoms? First, group memberships provide a basis for the receipt of social support (Haslam, O'Brien, Jetten, Penna, & Vormedal, 2005). From theories that address issues of social identity (Tajfel &

Turner, 1979) and conservation of resource (Hobfoll, 1989; 2002) we know that belonging to many groups is one way that people can gain the support needed to understand and cope with illness, injury, and important life transitions (e.g., Haslam et al., 2009; Iyer, Jetten, Tsivrikos, Haslam, & Postmes, 2009; Jones et al., 2011; Putnam, 2000). Furthermore, past research has shown that lack of social support is a strong predictor of traumatic stress and PTSD (see Brewin, Andrews & Valentine, 2000; Ozer, Best, Lipsey & Weiss, 2003). For instance, lower levels of social support are associated with higher levels of PTSD 14 years after spinal cord injury (Nielsen, 2003) and after motor vehicle accidents (Clapp & Beck, 2009). However, what is not known is whether group memberships predict the initial development of post-traumatic stress symptoms and the persistence of these symptoms over time. If group memberships provide a basis for social support, then it follows that having access to more group memberships (and thus more coping resources) should be associated with reduced traumatic stress (Hobfoll, 1991).

Second, because group life is central to our sense of who we are, the maintenance of group memberships provide individuals with an important sense of self-continuity (Haslam et al., 2008; Sani, Bowe, & Herrera, 2008). When people are able to maintain memberships in groups that they belonged to before injury, this provides psychological ties to the past that can help them make sense of the present (Iyer et al., 2009; Iyer & Jetten, 2011). Moreover, such self-continuity also provides a platform for the acquisition of new group memberships in the future (Bluck & Alea, 2008).

Third, because group life is also a crucible for the formation of identity (Postmes, Haslam & Swaab, 2005), gaining new group memberships can help individuals to re-build their sense of self after illness or injury. In particular, new group memberships provide opportunities for interaction, influence and sense-making which allow individuals to re-negotiate, re-define, and re-invent who they are when faced with important life changes such

as traumatic injury (e.g., Jones et al., 2011). This in turn is linked to post-traumatic growth (Muenchberger, Kendall & Neal, 2008). For all of these reasons we contend that changes to social group memberships might play an important role in determining the development of post-traumatic symptoms and the persistence of such symptoms over time.

Research overview and hypotheses

The aim of the present research was to examine the contributions of general health symptoms and social group memberships in reducing the development of post-traumatic stress symptoms over time. We examined this question within two injury groups — individuals with orthopaedic injuries (OI) and individuals with acquired brain injuries (ABI) — at two weeks (T1) and three months (T2) after discharge from the emergency department of a large hospital in the United Kingdom. At both measurement points, we obtained self-reports of post-traumatic stress symptoms, general health symptoms, and group memberships. We hypothesized (a) that fewer initial symptoms post-injury (T1) would be associated with lower levels of post-traumatic stress symptoms at T2 over and above initial levels of post-traumatic stress symptoms (H1), and (b) that the more social group memberships individuals maintained and acquired immediately following injury, the lower their levels of post-traumatic stress symptoms would be at T2 (over and above initial levels of post-traumatic stress symptoms) (H2).

We also explored whether there might be differences in the contributions of symptoms and group memberships to post-traumatic stress symptoms over time as a function of the type of injury sustained (H3). On the one hand, there are important similarities between ABI and OI: both result from traumatic incidents, are treated at hospital emergency departments, and vary in their severity. On the other hand, there are marked differences. The effects of OI on individuals are often temporary: symptoms heal and relationships with others tend to be unaffected. However, the effects of ABI on individuals can be permanent:

Symptoms can persist or get worse and relationships with others can become strained or dissolve often because ABI is associated with psychological and physical changes that do not occur with OI (Wood, Liossi & Wood, 2005; see also C. Haslam et al., 2008). Exploring the impact of these variables within injuries could highlight important differential indicators of post-traumatic stress symptoms over time.

Method

Participants

Two weeks after being admitted to a large hospital in England 141 patients completed the first measurement (T1; Overall age: *M*=45.16, *SD*=14.31; Male: *n*= 57, Female: *n*=84; All White British). Patients had sustained mild head injury (i.e., no loss of consciousness reported: *n*=58), moderate head injury (i.e., loss of consciousness reported: *n*=40), or upper limb orthopaedic injury (no loss of consciousness reported: *n* = 43). Data had been screened to eliminate individuals who had sustained injury from assault, sexual assault, and individuals who had sustained orthopaedic injuries that also involved blows to the head. All T1 participants were also contacted three months after discharge (T2). T2 participants were 93 patients (Overall age: *M*=47.24, *SD*=14.01; Male: *n*=36, Female: *n*=57) who had sustained mild head injury (MHI: *n*=35), moderate head injury (MoHI: *n*=27), or upper limb orthopaedic injuries (OI: *n*=31). All analyses reported below were conducted with the 93 participants who had participated at both T1 and T2 and who had completed all relevant measures. For these participants, injuries had been sustained through falls (*n*=57), accidents (*n*=12), sports injury (*n*=11), hitting their head (*n*=4; MHI only), road traffic accidents (*n*=4), migraine/virus (*n*=2; HI conditions only), or alcohol related fall/blackouts (*n*=3; MoHI only). Participants responded to a single item to assess injury severity (i.e., How serious was the event?) on a scale from 1 (*Minor*) to 4 (*Severe*). On average, injuries were seen as minor, although participants who had sustained MoHI rated their injuries more serious (*M*=1.77,

SD=.71) than did participants who had sustained MHI (*M*=1.27, *SD*=.67; *p* = .004). Neither HI condition differed significantly from the OI condition in perceived injury severity (*M*=1.52, *SD*=.51, *p*s > .12; *F* (87)=4.48, *p*=.014, η_p^2 =.09; 3 participants did not rate their injury's severity). Analyses indicated that there were no significant differences in the number of participants who remained versus dropped out in terms of their membership in different injury groups: χ^2 (2) = 1.58, *p* = .46 or by gender: χ^2 (1) = .33, *p* = .56. The only observed difference was in terms of age. Participants who remained in the study were significantly older (*M* = 47.24, *SD* = 14.01) than those who dropped out (*M* = 40.87, *SD* = 14.11; *t* (136) = 2.50, *p* = .014.

Measures and Procedure

Participants who had given their consent to be contacted at discharge were contacted by mail to take part in a longitudinal study on well-being after injury. During the first mail-out they were sent a package that included an information sheet, informed consent, and the questionnaire. The questionnaire assessed general health symptoms, group memberships, and post-traumatic stress and asked for demographic information (e.g., injury severity, age, gender). Participants were told that they would be approached again at three months post-injury to complete the same questionnaire and told that they could opt out at any point. A total of 890 questionnaires were mailed out as part of our initial data collection. In total we had a response rate of 16% at T1, and retained 66% of these respondents at T2. Respondents were entered into monthly draws for £50 worth of department store vouchers.

Participants completed the short form of the General Health Questionnaire (GHQ-12; Goldberg, 1992) to assess their symptoms after injury. Here they made subjective judgements about changes in the presence of somatic symptoms (e.g., feeling run down), anxiety, insomnia, social dysfunction, and depression over the past week on a 3-point scale (worse=-1, same=0, better=1). Participants' scores were summed across the 12 questions to compute a

total GHQ score, where negative scores indicated worsening symptoms and positive scores indicated improving symptoms (T1: α=.88, *M*=-1.96, *SD*=3.86; Range: -12 to 6).

Participants also completed three measures assessing the sense of belonging, connection, and support associated with their group memberships before and after injury (EXeter Identity Transitions Scales — EXITS; Haslam et al., 2008). Four items measured their maintained group memberships since injury (e.g., I still belong to the same group(s) that I was in before; I still receive support from the same groups I was in before; T1: α=.87, *M*=3.80, *SD*=.81), and four items measured their new group memberships since injury (e.g., I am active in one or more new groups; I get practical help from people in one or more new groups; T1: α=.95, *M*=2.24, *SD*=.96). To control for pre-existing differences in number of group memberships participants belonged to before the injury, four items measured their pre-injury group memberships (e.g., I was a member of lots of different groups, I had friends in many different groups; T1: α=.91, *M*=3.27, *SD*=.99).

Post-traumatic stress symptoms were measured using the Trauma Screening Questionnaire (Brewin et al., 2002). Participants agreed or disagreed to 10 yes/no statements concerning emotional and physical disturbances related to their injury (e.g., Bodily reactions when reminded of the event; Upsetting thoughts or memories about the event come into your mind against your will). The number of statements with which they agreed was summed and divided by the total number of items to produce an index of the proportion of post-traumatic stress symptoms experienced (T1: M_{yes}=.24, *SD*=.24, T2: M_{yes}=.16, *SD*=.18). Using Brewin et al.'s criteria of experiencing 6 or more disturbances, we found that 17% of participants with acquired brain injury and 11% of participants with orthopaedic injury experienced post-traumatic stress symptoms at T1. These figures dropped to 9% and 3% respectively at T2. It should be noted that hat there were no significant differences between participants who remained in the study and those who left in terms of their GHQ scores, the number of

maintained groups or new groups that they had formed, or their reported PTSD at T1, all *t*s < -.93, all *p*s > .34.

Results

Pearson's correlations were computed to examine the bivariate relationships between general health symptoms, groups memberships, and post-traumatic stress symptoms after injury (see Table 1). Findings revealed that higher levels of post-traumatic stress symptoms at T2 were associated with higher levels of T1 post-traumatic stress symptoms, general health symptoms at T1, and fewer new group memberships at T1. There were no relationships between age, injury severity, the number of old group memberships, or the number of maintained group memberships, on T2 post-traumatic stress symptoms. However, old and new group memberships were positively related to new group memberships at T1. General health symptoms were also marginally correlated with new group memberships at T1.

Next, hierarchical multiple regressions were used to examine the contributions of symptoms and group memberships, over and above initial levels of post-traumatic stress symptoms, on post-traumatic stress symptoms over time. On the basis of the correlations and our hypotheses, we targeted our analyses on the two T1 predictor variables that were significantly related to post-traumatic stress symptoms at T2. Post-traumatic stress symptoms at T1 were entered into the first step as a control variable. General health symptoms at T1 were entered into the second step and new group memberships at T1 were entered into the third step. Post-traumatic stress symptoms at T2 served as the dependent variable. The control variable and predictors were all mean centred.

Post-traumatic stress symptoms at three months

Over and above the contribution of post-traumatic stress symptoms at T1, we found that general health symptoms at T1 accounted for an additional 3% of the variance in post-traumatic stress symptoms at T2 (see Table 2). Not surprisingly, fewer general health

symptoms at T1 were associated with lower levels of post-traumatic stress symptoms at T2, β=-.20, t=-2.02, p = .047. This provided support for H1: the fewer general health symptoms individuals had at T1, the less likely it was that they would develop post-traumatic stress symptoms over time. In support of H2 we found that new group memberships at T1 accounted for an additional 7% of the variance in post-traumatic stress symptoms at T2 when controlling for post-traumatic stress symptoms and general health symptoms at T1. Participants who indicated they had joined new groups after injury at T1 reported lower levels of PTSD symptoms at T2 (β=-.19, t=-2.19, p=.031). Having fewer general health symptoms and joining new groups two weeks after injury, explained some of the variance in post-traumatic stress symptoms over time, with new group memberships having an impact on post-traumatic stress symptoms over and above that of general health symptoms. Yet while these patterns are broadly consistent with H1 and H2, we argue that it is also important to examine support for these hypotheses as a function of the nature of the injury sustained (i.e., H3).

Orthopaedic Injury. Separate analyses of individuals with OI (see Table 3) indicated that over and above the effects of initial levels of post-traumatic stress symptoms, general health symptoms at T1 accounted for an additional 10% of the variance in post-traumatic stress symptoms at T2. In particular, there was a significant effect such that fewer general health symptoms at T1 were associated with lower levels of post-traumatic stress symptoms at T2, β = -.36, t(26)=-2.23, p=.035. Acquisition of new group memberships at T1 did not add any additional explanatory power to understanding subsequent levels of post-traumatic stress symptoms.

Head injury. Analyses of individuals with acquired brain injuries (see Table 4) indicated that general health symptoms at T1 did not contribute any additional explanatory power to our understanding of post-traumatic stress symptoms at T2. However, group

memberships at T1 explained an additional 4% of the variance in post-traumatic stress symptoms at T2. Participants who were able to form new group memberships at T1 reported experiencing lower levels of post-traumatic stress symptoms at T2, β=-.21, t=-2.09, p=.042. In support of H3, then, there appear to be clear differences in the additional factors that predict post-traumatic stress symptoms as a function of the type of injury that individuals have sustained.

Discussion

The present study sought to identify the factors that might reduce the risk of developing post-traumatic stress symptoms after unintentional accidents resulting in orthopaedic and acquired brain injury. Extending previous research, we found that when controlling for initial levels of post-traumatic stress symptoms, having more new group memberships predicted lower levels of post-traumatic stress symptoms after injury over and above the contribution of general health symptoms.

Importantly, we provide novel evidence that the contribution of general health symptoms and group memberships to post-traumatic stress symptoms after injury differs as a function of the type of injury sustained. For individuals with orthopedic injuries fewer general health symptoms were associated with lower levels of post-traumatic stress symptoms three months later. For individuals with acquired brain injuries, gaining new group memberships post-injury predicted lower levels of post-traumatic stress symptoms at three months. Although post-traumatic stress symptoms are a common experience for individuals with both types of injuries, these findings suggest that addressing general health symptoms may be critical in reducing the development of post-traumatic stress symptoms after orthopedic injury whereas facilitating group memberships may provide an important additional buffer against the development of post-traumatic stress symptoms after acquired brain injury.

Evidence that general health symptoms and group memberships appear to have different implications for the development of post-traumatic stress symptoms as a function of the type of injury sustained might reflect fundamental differences in the consequences of orthopedic and acquired brain injuries. As noted earlier, despite the fact that these injuries are similar in some ways, they differ in the extent to which they involve long-term life changes. Orthopaedic injuries often result in temporary impairment of physical functioning. Broken bones, fractures, strains and sprains eventually heal, enabling individuals to regain most, if not all, of their physical functioning. Individuals with orthopaedic injuries and fewer initial symptoms may therefore experience lower levels of post-traumatic stress symptoms over time because their injury is minimally disruptive of their way of life — it does not result in major changes or challenges to which they must adjust.

In contrast, acquired brain injuries often result in more lasting impairment of physical *and* psychological functioning. The physical, cognitive, emotional, and behavioural changes that accompany acquired brain injuries do not always heal, and are often absent from orthopaedic injuries. In fact people who sustain brain injuries can be left with permanent changes to both their abilities and their sense of self. These changes often strain social relationships (e.g., Wood et al. 2005), which may jeopardise a person's ability to deal effectively with the consequences of the permanent changes associated with injury. In these terms, individuals with acquired brain injuries who are able to join new groups may experience lower levels of post-traumatic stress symptoms because these relationships provide the psychological resources (e.g., opportunities for self-continuity and identity formation) and social resources (e.g., social support) needed to manage the changes associated with brain injury that can help them makes sense of, and reframe, their post-injury experiences (Hobfoll, 1991; Iyer & Jetten, 2011; Jones et al., 2011). In these ways, group

memberships might help to smooth the disruption to one's life caused by more permanent injuries.

Implications and Recommendations

In light of these findings we can make two simple recommendations for dealing with individuals who have sustained accidental injury. First, upon discharge, patients' group memberships should be assessed at various points in time (see Haslam, Jetten, & Haslam, 2011). Monitoring the quantity and quality of lost, maintained, or gained group memberships may be an important line of defence against post-traumatic stress symptoms after injury. Indeed, research suggests that the more groups individuals belong to, the more resources they can draw upon and the better they cope when faced with the changes and challenges of life transitions and physical stressors (Iyer et al., 2009; Jones & Jetten, 2011). Furthermore, having good, supportive groups that provide useful and needed resources plays a substantial role in the reduction of negative outcomes when contending with the changes and challenges associated with different health conditions (Cohen, 2004; Haslam et al., 2011; Stinson et al., 2008). In addition to more traditional assessments of symptoms, monitoring changes in the quantity and the quality of pre-injury and post-injury group memberships might be a useful indicator of who is at risk of developing negative outcomes such as post-traumatic stress symptoms, or PTSD over time.

The present findings are notable because they reflect one of the first prospective and longitudinal assessments of the contribution of both psychological symptoms and group memberships in the development of post-traumatic stress symptoms. They suggest that group-building activities might be a fruitful avenue for the design and implementation of interventions to reduce post-traumatic stress symptoms. Recent work by Gleibs and her colleagues has demonstrated that group-based based interventions, such as water clubs to promote behaviour change among older adults, and gender-based clubs to promote social

connection and community within residential care, are associated with positive outcomes including increases in water consumption and lower levels of psychological distress (e.g., depression, anxiety; Gleibs, Haslam, Haslam & Jones, 2011; Gleibs, Haslam, Jones et al., 2011). On the basis of such findings a second recommendation would be to have health care professionals and clinicians refer individuals who have sustained traumatic injuries to relevant support groups. The mutual support gained from these groups may be especially useful for conditions that carry a large social burden (i.e., conditions that are embarrassing, disfiguring, or stigmatizing; Davison, Pennebaker & Dickerson, 2000). Support groups can be a therapeutic, and cost-effective, addition to primary care services, or a much-needed supplement for patients who have lost other social resources (e.g., Hobfoll, 2002). Informing patients that support groups exist can increase the uptake of these types of services, and has the potential to increase the breadth of the care received by patients, which may improve their outcomes.

Limitations and future directions

Despite the important contribution to our understanding of the development of post-traumatic stress symptoms over time, there are some limitations associated with the present research. First, the sample size was relatively small. Our initially low response rate and subsequent dropout may reflect the fact that participants were entered into a random prize draw rather than receiving compensation individually. Questionnaire length and the multiple time points for data collection might have also contributed to participant drop-out (see Edwards et al., 2002, for relevant discussion). While this does not invalidate our findings, it does make it necessary to determine whether similar patterns are observed among larger samples of injured individuals.

Second, the incidence of post-traumatic stress in the present sample was low over time in comparison to some of the numbers reported in the literature (e.g., Starr et al., 2004;

McMillan et al., 2003). This may reflect national differences in the perception of traumatic events and/or the support available to manage injuries. Indeed, differences in the British versus American medical systems might have an impact on the personal economic burden of treatment and/or the type of care and support obtained. Furthermore, national differences also exist in the outcomes associated with accidental injuries. Developing countries (e.g., Eastern Europe) report higher levels of mortality from accidental injuries relative to developed countries (e.g., Western Europe, North America; Peden, McGee, & Sharma, 2002). More detailed cross-national comparisons (e.g., taking into account injuries sustained, available support, the presence of differential risk factors) could provide useful information about the generalizability of the present findings across different cultural contexts.

Third, while three months after injury is a considerable length of time, it could take longer to recognize and diagnose PTSD after accidental injury. Extended follow-ups of individuals at 6 and 12 months after injury might yield additional insight into the roles that symptoms and groups memberships play in the development of PTSD.

Finally, although the measures used in the present research are adequate, future research could use measures that conceptualize general health, social group memberships, and post-traumatic stress symptoms in slightly different ways. For instance, with respect to social group memberships, we do not know the specific groups that individuals were thinking about when responding to the EXITS items. Future research should ask individuals to list these groups and examine whether there are specific types of groups that are more (or less) beneficial to individuals who are recovering from different injuries. Alternative measures of general health symptoms (e.g., the Short-form 36 Health Survey; Ware, Kosinski, & Keller, 1996; Ware & Sherbourne, 1992) and post-traumatic stress symptoms (e.g., the PTSD Symptom Scale Self-Report; Foa, Riggs, Dancu, & Rothbaum, 1993) might also improve the specificity of the variables of interest in the present research and, if patterns are similar, can

provide converging evidence of the roles of symptoms and groups memberships in the development of initial post-traumatic stress symptoms and PTSD over time.

Conclusion

Accidental injury has substantial costs that are often compounded by the development of post-traumatic stress symptoms after injury. The present research suggests that whether symptoms or group memberships contribute to the development of post-traumatic stress symptoms after injury depends on the nature of the injury and its implications for long-term physical and psychological functioning. Strategies for reducing the development of post-traumatic stress symptoms may therefore need to be more sensitive to the nature of the injury itself. In particular, while a traditional strategy of symptom alleviation seems to be the best way of managing those recovering from orthopaedic injury, the maintenance and development of group memberships seems to the best way of improving outcomes for those who are recovering from acquired brain injury. This conclusion is consistent with growing recognition that the road to cure is not only physical but also social (Jetten, Haslam & Haslam, 2011), and that effective patient management requires sensitivity to both of these pathways.

References

Bisson, J. I. (2007). Post-traumatic stress disorder. *British Medical Journal, 334,* 789-793.

Bluck, S. & Alea, N. (2008). Remembering being me: The self continuity function of autobiographical memory in younger and older adults. In F. Sani (Ed.) *Self continuity: Individual and collective perspectives* (pp. 55-70). New York, NY, US: Psychology Press.

Boden-Albala, B. Litwak, E., Elkind, M.S.V., Rundek, T. & Sacco, R. L. (2005). Social isolation and outcomes post stroke. *Neurology, 64,* 1888-1892.

Breslau, N., Davis, G. C., Andreski, P., Peterson, E. (1991). Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Archives of General Psychiatry, 48,* 216 - 222.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology, 68,* 748 –766.

Brewin, C. R., Rose, S., Andrews, B., Green, J., Tata, P., McEvedy, C., Turner, S. & Foa, E. B. (2002). Brief screening instrument for post-traumatic stress disorder. *British Journal of Psychiatry, 181,* 158-162.

Cohen, S. (2004). Social relationships and health. *American Psychologist, 59,* 676-684.

Clapp, J. D. & Beck, J. G. (2009). Understanding the relationship between PTSD and social support: The role of negative network orientation. *Behaviour Research and Therapy, 47,* 237-244.

Davison, K. P., Pennebaker, J. W. & Dickerson, S. S. (2000). Who talks? The social psychology of illness support groups. *American Psychologist, 55,* 205-217.

Edwards, P., Roberts, I., Clarke, M., DiGiuseppi, C., Pratap, S., Wentz, R. & Kwan, I. (2002). Increasing response rates to postal questionnaires: Systematic review. *BMJ,*

324, 1183.

Ertel, K. A., Glymour, M. M., & Berkman, L. F. (2008). Effects of social integration on preserving memory function in a nationally representative US elderly population. *American Journal of Public Health, 98,* 1215-1220.

Foa, E. B., Riggs, D. S., Dancu, C. V., & Rothbaum, B. O. (1993). Reliability and validity of a brief instrument for assessing posttraumatic stress disorder. *Journal of Traumatic Stress, 6*, 459-473.

Gleibs, I. H., Haslam, C., Haslam, S. A., & Jones, J. M. (2011). Water clubs in residential care: Is it the water or the club that enhances health and well-being? *Psychology & Health, 26,* 1361-1377.

Gleibs, I. H., Haslam, C., Jones, J. M., Haslam, S. A., McNeill, J. & Connolly, H. (2011). No country for old men? The role of a 'Gentlemens' Club' in promoting social engagement and psychological well-being in residential care. *Aging and Mental Health, 15,* 456-467.

Goldberg, D. (1992). *General Health Questionnaire (GHQ-12).* Windsor, UK: NFER-Nelson.

Haslam, C. Jetten, J., & Haslam, S. A. (2011). Advancing the social cure: Implications for theory, practice, and policy. In J. Jetten, C. Haslam & S. A. Haslam (Eds.) *The Social Cure: Identity, health, and well-being*. London: Psychology Press.

Haslam, C., Holme, A., Haslam, S.A., Iyer, A., Jetten, J., & Williams, W.H. (2008). Maintaining group membership: Identity continuity and well-being after stroke. *Neuropsychological Rehabilitation, 18,* 671-691.

Haslam, S. A., O'Brien, A., Jetten, J., Vormedal, K., & Penna, S. (2005). Taking the strain: Social identity, social support and the experience of stress. *British Journal of Social Psychology, 44*, 355–370.

Haslam, S. A., Jetten, J., Postmes, T. & Haslam, C. (2009). Social identity, health and well-being: An emerging agenda for applied psychology. *Applied Psychology: An International Review, 58,* 1-23.

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44,* 513-524.

Hobfoll, S. E. (1991). Traumatic stress: A theory based on rapid loss of resources. *Anxiety Research, 4,* 187-197.

Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology, 6,* 307-324.

Hu, Y., Stewart-Brown, S., Twigg, L. & Weich, S. (2007). Can the 12-item General Health Questionnaire be used to measure positive mental health? *Psychological Medicine, 37,* 1005–1013.

Iyer, A., & Jetten, J. (2011). What's left behind: Identity continuity moderates the effect of nostalgia on well-being and life choices. *Journal of Personality and Social Psychology, 101,* 94-108.

Iyer, A., Jetten, J., Tsivrikos, D., Haslam, S. A., & Postmes, T. (2009). The more (and the more compatible) the merrier: Multiple group memberships and identity compatibility as predictors of adjustment after life transitions. *British Journal of Social Psychology, 48,* 707-733.

Jetten, J., Haslam, C., Pugliese, C., Tonks, J., & Haslam, S.A. (2010). Declining autobiographical memory and the loss of identity: Effects on well-being. *Journal of Clinical and Experimental Neuropsychology, 32,* 408-416.

Jetten, J., Haslam, C. & Haslam, S. A. (Eds) (2011). *The Social Cure: Identity, health, and well-being*. New York: Psychology Press.

Jetten, J., Haslam, C., Haslam, S.A., & Branscombe, N. (2009, September/October). The

social cure: How and why groups make us healthier. *Scientific American Mind*, 26-33.

Johnson, R. L., Thomas, R.G., Thomas, K.E. & Sarmiento, K. (2009). *State Injury Indicators Report: Fourth Edition— 2005 Data*. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.

Jones, J. M., Haslam, S. A., Jetten, J., Williams, W. H., Morris, R., & Saroyan, S. (2011). That which doesn't kill us can make us stronger (and more satisfied with life): The contribution of personal and social changes to well-being after acquired brain injury. *Psychology & Health, 26,* 353-369.

Jones, J. M. & Jetten, J. (2011). Recovering from strain and enduring pain: Multiple group memberships promote resilience in the face of novel physical challenges. *Social Psychological and Personality Science, 3,* 239-243.

Jones, J. M., Jetten, J., Haslam, S. A. & Williams, W. H. (2011). Deciding to disclose: The importance of social relationships for well-being after acquired brain injury. In J. Jetten, C. Haslam & S. A. Haslam (Eds). *The Social Cure: Identity, health, and well-being* (pp. 255-271). London: Psychology Press.

Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52*, 1048 - 1060.

King, N. S. (1996). Emotional, neuropsychological, and organic factors: their use in the prediction of persisting postconcussion symptoms after moderate and mild head injuries. *Journal of Neurology, Neurosurgery & Psychiatry*, 61, 75-81.

King, N. S., Crawford, S., Wenden, F.J., Moss, N.E.G. & Wade, D.T. (1995). The Rivermead Post Concussion Symptoms Questionnaire: A measure of symptoms commonly experienced after head injury and its reliability. *Journal of Neurology, 242*, 587-592.

McCauley, S. R., Boake, C., Levin, H. S., Contant, C. F., & Song, J. X. (2001).

Postconcussional disorder following mild to moderate traumatic brain injury: Anxiety, depression, and social support as risk factors and comorbidities. *Journal of Clinical and Experimental Neuropsychology, 23*, 792 - 808.

McMillan, T. M., Williams, W. H., & Bryant, R. (2003). Post-traumatic stress disorder and traumatic brain injury: A review of causal mechanisms, assessment, and treatment. *Neuropsychological Rehabilitation, 13*, 149–164.

Mellman, T.A., David, D., Bustamante, V., Fins, A. I. & Esposito, K. (2001). Predictors of post-traumatic stress disorder following severe injury. *Depression and Anxiety, 14*, 226-231.

Michaels, A, J., Michaels, C. E., Moon, C. H., Smith, J, S., Zimmerman, M. A., Taheri, P. A., & Peterson, C. (1999). Posttraumatic stress disorder after injury: Impact on general health outcome and early risk assessment. *The Journal of Trauma: Injury, Infection, and Critical Care, 47*, 460-467.

Muenchberger, H., Kendall, E., & Neal, R. (2008). Identity transition following traumatic brain injury: A dynamic process of contraction, expansion and tentative balance. *Brain Injury, 22*, 979-992.

Nielsen, M. S. (2003). Prevalence of posttraumatic stress disorder in persons with spinal cord injuries: The mediating effect of social support. *Rehabilitation Psychology, 48*, 289-295.

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin, 129*, 52–73.

Peden, M., McGee, K., & Sharma, G. (2002). The Injury Chart Book: A graphical overview of the global burden of injuries. Geneva: World Health Organization. Retrieved online: January 25, 2012; URL:http://*whqlibdoc.who.int/publications/924156220x.pdf*

Perkonigg, A., Pfister, H., Stein, M. B., Hofler, M., Lieb, R., Maercker, A., & Wittchen, H-U., (2005). Longitudinal course of posttraumatic stress disorder and posttraumatic stress disorder symptoms in a community sample of adolescents and young adults. *American Journal of Psychiatry, 162,* 1320-1327.

Perry, S., Difede, J., Musngi, G., Frances, A. J., & Jacobsberg, L. (1992). Predictors of posttraumatic stress disorder after burn injury. *American Journal of Psychiatry, 149,* 931–935.

Polinder, S., Meerding, W.J., Toet, H., van Baar, M.E., Mulder, S. & van Beeck, E. (2004). A surveillance based assessment of medical costs of injury in Europe: phase 2. Erasmus Medical Centre: Rotterdam and Consumer Safety Institute: Amsterdam. Retrieved online from: http:/www.euroipn.org/grd/attachments/80/final%20report.pdf

Postmes, T. & Haslam, S. A, & Swaab, R. (2005). Social influence in small groups: An interactive model of identity formation. *European Review of Social Psychology, 16,* 1-42.

Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community.* New York: Simon & Schuster.

Ryan, L. M. & Warden, D. L. (2003). Post concussion syndrome. *International Review of Psychiatry, 15*, 310-316.

Sani, F., Bowe, M., & Herrera, M. (2008). Perceived collective continuity and social well-being: Exploring the connections. *European Journal of Social Psychology, 38*, 365–374.

Sareen, J., Cox, B. J., Stein, M. B., Afifi, T. O., Fleet, C., Asmundson, G. J. G. (2007). Physical and mental comorbidity, disability, and suicidal behavior associated with posttraumatic stress disorder in a large community sample. *Psychosomatic Medicine, 69*, 242-248.

Shalev, A.Y., Peri, T., Canetti, L., & Schreiber, S. (1996). Predictors of PTSD in injured trauma survivors: A prospective study. *American Journal of Psychiatry,* 153, 219-225.

Smith-Seemiller, L., Fow, N. R., Kant, R., & Franzen, M. D., (2003). Presence of post concussion syndrome in patients with chronic pain versus mild traumatic brain injury. *Brain Injury, 17,* 199–206.

Starr, A. J., Smith, W. R. , Frawley, W. H., Borer, D. S., Morgan, S. J., Reinert, C. M. & Mendoza-Welch, M. (2004) Symptoms of posttraumatic stress disorder after orthopaedic trauma. *Journal of Bone & Joint Surgery, 86*, 1115 - 1121.

Stinson, D. A., Logel, C., Zanna, M. P., Holmes, J. G.' Cameron, J. J., Wood, J. V., & Spencer, S. J. (2008). The cost of lower self-esteem: Testing a self- and social-bonds model of health. *Journal of Personality and Social Psychology, 94,* 412-428.

Tate, R.L., & Broe, G.A. (1999). Psychosocial adjustment after traumatic brain injury: What are the important variables? *Psychological Medicine, 29,* 713–725.

Ware, J., Jr., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*, 220-233.

Ware, J. E., & Sherbourne, C. D. (1992). The MOS 36 Item Short Form Health Survey (SF-36). *Medical Care, 30*, 473-481.

Wilcox, S. (2010). Social relationships and PTSD symptomatology in combat veterans. *Psychological Trauma: Theory, Research, Practice and Policy,* 2, 175-182.

Williams, W. H., Potter, S. & Ryland, H. (2010). Mild traumatic brain injury and postconcussion syndrome: A neuropsychological perspective. *Journal of Neurology, Neurosurgery & Psychiatry. DOI:* 10.1136/jnnp.2008.171298

World Health Organisation (2008). The global burden of disease: 2004 update. Retrieved

online: September 20, 2010; URL: http://www.who.int/entity/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf.

Yehuda, R. (2002). Post-traumatic stress disorder. T*he New England Journal of Medicine, 346*, 108-114.