

Research

Adaptation, self-motivation and support services are key to physical activity participation three to five years after major trauma: a qualitative study

Christina L Ekegren^{a,b,c,d}, Sandra Braaf^a, Shanthi Ameratunga^e, Jennie Ponsford^{f,g}, Andrew Nunn^h, Peter Cameron^{a,c}, Ronan A Lyons^{a,i}, Belinda J Gabbe^{a,i}

^aSchool of Public Health and Preventive Medicine, Monash University, Melbourne, Australia; ^bRehabilitation, Ageing and Independent Living (RAIL) Research Centre, Monash University, Melbourne, Australia; ^cEmergency and Trauma Centre, Alfred Health, Melbourne, Australia; ^dBaker Heart and Diabetes Institute, Melbourne, Australia; ^eSchool of Population Health, University of Auckland, Auckland, New Zealand; ^fSchool of Psychological Sciences, Monash University, Melbourne, Australia; ^gMonash Epworth Rehabilitation Research Centre, Epworth Healthcare, Melbourne, Australia; ^hVictorian Spinal Cord Service, Austin Health, Melbourne, Australia; ⁱHealth Data Research UK, Swansea University, Swansea, UK

KEY WORDS

Exercise
Sedentary lifestyle
Trauma
Wounds and injuries
Recovery



ABSTRACT

Questions: What are the perceived long-term impacts of major trauma on physical activity participation over time? What factors influence physical activity participation in people recovering from major trauma?

Design: Longitudinal qualitative study. **Participants:** Sixty-six people aged ≥ 16 years with non-neurological major trauma. **Methods:** Participants were interviewed 3 years ($n = 66$), 4 years ($n = 63$) and 5 years ($n = 57$) after their injury. A thematic analysis was performed. **Results:** Despite wanting to be physically active, many participants experienced significant, long-term physical activity restriction after their injury, which persisted over time. Restrictions were often related to a fear of re-injury or of exacerbating pain and fatigue levels. These restrictions were a source of distress and frustration for many participants, given the perceived impacts on their social life, family roles and enjoyment of life. Participants were also concerned about weight gain, health decline and reduced physical fitness. Participants valued the support of insurers and specialised services in facilitating access to modified activities, such as clinical Pilates and hydrotherapy. Many participants also recognised the importance of adaptation, goal-setting, self-motivation and determination to be physically active despite limitations. **Conclusion:** People recovering from major trauma experienced significant and persistent physical activity restriction after their injury. Given the high prevalence of activity restrictions, distress and health concerns that were reported, there is an urgent need to develop and evaluate support strategies to improve physical activity participation in this group. [Ekegren CL, Braaf S, Ameratunga S, Ponsford J, Nunn A, Cameron P, Lyons RA, Gabbe BJ (2020) Adaptation, self-motivation and support services are key to physical activity participation three to five years after major trauma: a qualitative study. *Journal of Physiotherapy* 66:188–195]

© 2020 Australian Physiotherapy Association. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Injury is one of the top five contributors to the global burden of disease and a leading cause of significant long-term disability.¹ Combined with increasing rates of injury hospitalisations,² improved trauma systems and acute care are giving rise to ever higher numbers of trauma survivors.³ As a result, more individuals are living longer with injury-related disability.⁴ Since 1990 there has been a 53% increase in global years lived with disability resulting from injury.⁵ Disability is associated with higher rates of physical inactivity, obesity and chronic disease, which are all factors that are capable of amplifying the burden of injury.^{6,7}

Recent research, using objective measurement, has demonstrated that people with serious injury exhibit prolonged physical inactivity and high levels of sedentary behaviour.^{8,9} Long-term physical inactivity (ie, failure to meet physical activity guidelines¹⁰) and excessive sedentary behaviour (ie, waking behaviour characterised by low energy

expenditure while sitting, reclining or lying¹¹) are related to all-cause mortality, cancer, heart disease and type 2 diabetes.^{12,13} Knowing this, it is vital to understand, from the perspective of trauma survivors, the barriers to resuming physical activity after injury and the impact of physical activity restrictions on their lives. This information may be used to help people resume and manage physical activity after trauma and potentially reduce avoidable health decline in the years thereafter.

There is substantial qualitative research investigating barriers to and enablers of physical activity participation in people with traumatic brain and spinal cord injury.^{14–18} However, people with traumatic brain injury and spinal cord injury are a minority within the wider trauma population^{19,20} and, to date, there has been no qualitative research on physical activity participation in people with non-neurological major trauma. These patients have vastly different recovery trajectories to those with traumatic brain injury or spinal cord injury, yet have also been shown to experience long-term adverse effects on their health, work, social participation and quality of life.

Therefore, there is a need for further research to understand the post-traumatic experiences of physical activity participation in people with non-neurological major trauma.

Therefore, the research questions for this qualitative study were:

1. What are the perceived long-term impacts of major trauma on physical activity participation over time?
2. What factors influence physical activity participation in people recovering from major trauma?

Method

Design

This qualitative study followed the Standards for Reporting Qualitative Research checklist.²¹ The study was nested within a larger population-based longitudinal cohort study, REcovery after Serious Trauma—Outcomes, Resource use and patient Experiences (RESTORE), which reported the outcomes of 2,955 seriously injured people from Victoria, Australia, in the first 5 years after injury.²²

Participants

Participants were recruited for RESTORE from the Victorian State Trauma Registry (VSTR), which is a population-based registry capturing all major trauma cases within the state of Victoria.²³ Patients are included on the VSTR if they meet any of the following criteria: death after injury; an Injury Severity Score > 12; admission to an intensive care unit for > 24 hours and requiring mechanical ventilation for at least part of their stay; or requiring urgent surgery.²⁴ The VSTR uses an opt-out consent process and the opt-out rate has remained below 1% each year of the past decade.²⁴ Patients are followed up by trained telephone interviewers at 6, 12 and 24 months after injury to capture patient-reported recovery outcomes, with 85% of them retained at 24 months.²⁴ Patients from the VSTR were recruited for RESTORE if they: had a date of injury between 1 July 2011 and 30 June 2012; were English-speaking; and had completed their routine 2-year follow-up interview for the VSTR (Figure 1). During the final 2-year follow-up interview, participants meeting these criteria were invited to participate in semi-structured interviews based on purposive sampling criteria, ensuring coverage of a spectrum of the major trauma population, in terms of age, gender, residential location (metropolitan or regional), whether care was delivered at a major trauma service and whether they received

compensation from a work or transport-injury insurer. Those agreeing to be contacted were sent a patient information form in the mail and then followed up by telephone to schedule an appointment for the first qualitative interview. The target sample size was 40 to 60 participants, to allow for potential attrition over the study period. This qualitative study included only those RESTORE participants aged ≥ 16 years and excluded those with spinal cord injury or severe traumatic brain injury (Figure 1). A severe traumatic brain injury was defined as an Abbreviated Injury Scale²⁵ score for the head region of ≥ 3 and a Glasgow Coma Scale score of 3 to 8.

Procedures

Five experienced interviewers conducted semi-structured interviews by telephone at 3, 4 and 5 years after the injury. Where possible the same interviewer contacted participants at each time point, thereby improving rapport and aiding retention. The same questions were asked at each time point with topics relating to participants' experiences with and perceptions of their long-term recovery from injury, including issues relating to home, social, work, transport and activity participation (see Appendix 1 on the eAddenda for interview guide). At the 3-year interview, participants were asked about their experiences up until that point of recovery, while at 4 and 5 years they were asked to focus on their experiences in the previous year only. Consent was provided for all interviews to be audio recorded and transcribed. As the study progressed, the project manager (SB) held fortnightly meetings with the five interviewers to discuss preliminary data and review initial themes. With consent, participants' demographic and injury data were extracted from the VSTR. These data included age; sex; highest level of education; postcode of residence, mapped to the Index of Relative Socio-Economic Advantage and Disadvantage and the Accessibility/Remoteness Index of Australia; pre-injury level of disability (self-reported as none, mild, moderate, marked or severe disability); Charlson Comorbidity Index (mapped from International Classification of Disease, 10th revision, Australian Modification (ICD-10-AM) codes);^{26,27} injury diagnosis and cause (ICD-10-AM codes); Injury Severity Score using the 2008 Update of the 2005 Abbreviated Injury Scale;²⁵ and whether they had received compensation for their injuries via the state's road or workers' compensation systems.

Data analysis

Semi structured interviews were analysed using qualitative content analysis, based on the Braun and Clarke model of reflexive thematic analysis,^{28,29} which is an appropriate approach when describing phenomena on which there has been limited research.^{30,31} Interviews were also analysed using a longitudinal approach, whereby group-level data were compared across each of the three time points.³² An inductive process was followed, whereby one investigator (SB) first read all transcripts in their entirety and extracted all content relevant to the aims of this study. Next, two investigators (SB and CE) read and re-read the transcripts for familiarisation with the data and independently generated initial themes and sub-themes from this content using qualitative software^a. Themes were then reviewed and discussed to: develop and name higher-level themes and subthemes; identify gaps in the analysis; examine data that did not support interpretations; and critique the coding framework. Following further refinement of themes and sub-themes, transcripts were coded again. For clarity, themes were grouped under specific 'domains' that aligned with the aims of the study.²⁹ Credibility and trustworthiness were achieved by maintaining detailed records of coding and theme development decisions and through independent double coding of interviews.³³ Researcher subjectivity was addressed by ensuring a demographically and vocationally diverse interviewing and investigator team and discussing reflexivity during the collaborative analysis process.³⁴ Descriptive validity was achieved by reading the transcripts multiple times and by using multiple data sources (interview transcripts, memos recorded during interviews, and the investigators' involvement in developing themes).³⁵

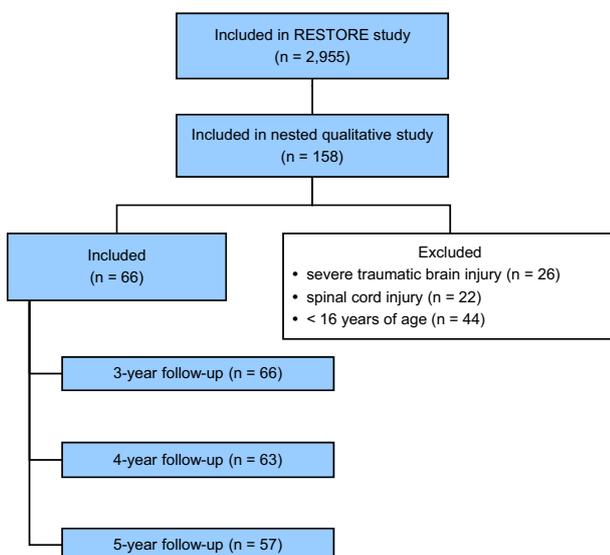


Figure 1. Participant flow chart.

RESTORE = REcovery after Serious Trauma—Outcomes, Resource use and patient Experiences.

Results

Participants

Sixty-six participants were interviewed at the 3-year time point, 63 at 4 years and 57 at 5 years (Figure 1). The mean age of participants was 50 (SD 15) years and, consistent with the larger major trauma population, the majority of participants were male (67%) (Table 1). Few participants (11%) had orthopaedic injuries only, while 55% had additional chest and/or abdominal injuries and 20% had additional mild to moderate head injuries. The median Injury Severity Score was 17 (IQR 14 to 24). Over half of all participants had transport-related injuries. As an indicator of participants' state of recovery, of those working prior to injury (73% of all participants), 74% had returned to work at the initial 3-year time point. The median interview duration at each time point ranged from 26 to 47 minutes.

Themes

Themes were grouped under Impacts (Table 2), Barriers (Table 3), Enablers (Table 4) and Longitudinal changes, with the tables

Table 1
Characteristics of participants.

Characteristic	Participants (n = 66)
Age (y), mean (SD)	50 (15)
Gender, n male (%)	44 (67)
Injuries, n (%)	
chest and/or abdominal and other associated injuries ^a	36 (55)
head and other associated injuries ^b	13 (20)
multi-trauma and other associated injuries ^c	10 (15)
orthopaedic injuries only	7 (11)
Cause of injuries, n (%)	
transport-related	36 (55)
falls	13 (20)
other ^d	17 (26)
Education, n (%) ^e	
university	15 (24)
high school (completed)	6 (10)
advanced diploma	26 (41)
high school (not completed)	16 (25)
Compensation received, n (%) ^f	
yes (Transport Accident Commission/Worksafe)	32 (49)
no	28 (43)
private healthcare	5 (8)
Region of residence, n (%) ^f	
major cities	43 (66)
inner regional	16 (25)
outer regional or remote	6 (9)
Injury Severity Score (3 to 75), median (IQR)	17 (14 to 24)
Charlson Comorbidity Index weight, n (%) ^g	
0	47 (71)
≥ 1	19 (29)
Index of Relative Socioeconomic Advantage and Disadvantage (quintiles), n (%) ^f	
1 (most disadvantaged)	7 (11)
2	8 (12)
3	18 (28)
4	19 (29)
5 (most advantaged)	13 (20)
Pre-injury disability, n (%)	
no	58 (89)
yes	8 (11)
Returned to work within 3 years, n (%) ^h	36 (74)

^a Chest and/or abdominal injury with Abbreviated Injury Scale > 2 in addition to another injury.

^b Head injury with Abbreviated Injury Scale > 2 in addition to another injury.

^c Multiple body region injuries (excluding serious neurotrauma), burns and other injuries that do not fit into any of the other groups.

^d Horse related; other threat to breathing; fire, flames, smoke; firearm; cutting, piercing object; struck by or collision with object or person; machinery; electricity; interpersonal violence and other specified and unspecified external cause.

^e Missing data: n = 3.

^f Missing data: n = 1.

^g A weighted index that considers the number and seriousness of comorbid diseases.

^h Only calculated for those participants who were working prior to injury.

providing supporting quotes from participants. Participants were identified by their sex, age group, injuries sustained, cause of injury, year after injury that the interview was conducted and a unique identifying number. Quotes were reported in longitudinal order (ie, from 3 to 5 years after injury).

Sub-themes relating to impacts of physical inactivity

Supporting quotes for these sub-themes are presented in Table 2.

Grieving the loss of important roles, relationships and quality of life: Physical activity restrictions were a source of distress and frustration for many participants, given the perceived impacts on their enjoyment of life, family roles and social life. For many participants, their social lives were inextricably linked to their physical activity, and the loss of physical activity participation had led to loneliness and isolation. Many people spoke about the detrimental impact of physical activity restriction on their role as parents and grandparents, or their fears for not being able to fulfil these roles in the future. These issues were spoken about mainly at the 4-year interview.

Concerns about long-term health decline as a result of physical inactivity: Several participants spoke about the impact of restricted activity on their health. In particular, many female participants talked about significant weight gain since their injury. Participants were also concerned about future cardiovascular fitness and health decline. These issues were more commonly raised at the 4-year and 5-year interviews and were often reported by participants aged ≥ 60 years who were concerned about the combined detrimental effects of ageing and injury.

Sub-themes relating to barriers to physical activity participation

Supporting quotes for these sub-themes are presented in Table 3.

A mismatch of desire and ability to be physically active: Despite wanting to be physically active, many participants experienced significant long-term physical activity restriction after injury, which persisted over each time point. Participants indicated that they understood the importance of physical activity participation and were frustrated that they could not be as active as they would like. These frustrations were particularly evident for people who were physically active before their injury. Restrictions were often related to limitations in exercise capacity, deficits in mobility and balance, impaired vision and pain.

Reduced physical activity due to mental health issues: Some participants had difficulty motivating themselves to be physically active because of mental health issues such as depression. These mental health issues were often related to the psychological impacts of the original injury. For example, participants reported that their mental state had changed since the injury, with a loss of interest in things, having less energy than before and occasionally wanting to be alone.

Avoiding activity due to fear of re-injury or of exacerbating symptoms: Some participants were scared to be physically active in case they were involved in another accident. Several participants believed that they would be capable of participating in their previous form of physical activity but conveyed a heightened sense of the potential dangers involved and a perception that it would be harder to recover from another injury. This was particularly an issue for people who were injured while being physically active, for example, while cycling, and for women. These issues were raised mainly at the 3-year time point rather than at later interviews. Others reported that they avoided physical activity so as to not exacerbate their pain or fatigue levels.

Lack of individualised transitional care from rehabilitation to community-based exercise programs: At 3 years after injury, most participants had ceased formal rehabilitation programs and no longer received compensation for physiotherapy or other forms of rehabilitation. Many participants reported that if they had more guidance from clinicians regarding safe activities, they would be more likely to be physically active, for example via supervised gym sessions or modified sports. In particular, several participants expressed frustration at financial compensation being ceased before they felt that

Table 2
Sub-themes relating to impacts of physical inactivity.

Sub-themes	Supporting quotes
Grieving the loss of important roles, relationships and enjoyment of life	<p><i>Even this morning they wanted to walk to school and I just couldn't because we walked on Monday, and I'm just too sore. That really upsets me that I can't be the kind of parent that they want, that they need.</i> Female, 18 to 39 years. Skull fracture and other injuries; unknown cause; 3 years after injury, #102130</p> <p><i>It's huge. I can't go outside and play cricket with the kids, or the kick the ball around with the kids, I can't... basically, my social life, it's non-existent.</i> Male, 18 to 39 years. Pelvic and spinal fractures, vascular and abdominal injuries; motor vehicle accident; 4 years after injury, #104688</p> <p><i>So I can't run, I can't cycle. When I say I can't, I don't because of my injuries, and I don't play hockey, which is what I used to do. And they're quite significant parts of my social life.</i> Female, 18 to 39 years. Multiple lower limb fractures and other injuries; cyclist hit by truck; 4 years after injury, #102276</p> <p><i>I used to play cricket, now going with a friend, there is no more friends, they are all I think kind of abandoned me or they just don't think I'm one of them now, and just all living on my own, entire week, seeing the doctors. I don't know what I get up every day for.</i> Male, 18 to 39 years. Concussion, lower limb fracture and knee injuries; motor vehicle accident; 4 years after injury, #105860</p>
Concerns about their long-term health decline as a result of physical inactivity	<p><i>I drive a lot more now, just because the added walking from the tram to work, it just all adds up to make it harder and harder. And that's not going to be good for my health in the future, all that time sitting in a car.</i> Female, 18 to 39 years. Multiple lower limb fractures, thoracic and other injuries; pedestrian hit by truck; 4 years after injury, #97426</p> <p><i>I've put on a lot of weight since the accident; I've put on 20 kg.</i> Female, 18 to 39 years. Head, thoracic and spinal injuries; motor vehicle accident; 4 years after injury, #97548</p> <p><i>And weight, my weight's gone up a little bit as a result of that. I've probably put on about 10 kg... 12 kg in the last 12 months.</i> Male, 18 to 39 years. Multiple fractures and other injuries; motorbike accident; 4 years after injury, #101581</p> <p><i>And it's really frustrating, annoying. I still wish I had a body of a 25-year-old. And when you get to 72, as I said, I have put on a lot of weight. I've put on a lot of weight since I had the fall.</i> Female, ≥ 60 years. Head injuries; fall; 4 years after injury, #109992</p> <p><i>And the physical effect of, as I said, the loss of muscle tone. And everyone just says that's age, but I don't think it is just age, I think it's no longer keeping as fit as you were, and it shows.</i> Female, ≥ 60 years. Head injury, spinal, pelvic and lower limb fractures; pedestrian hit by car; 4 years after injury, #97475</p> <p><i>I think my general health is suffering because of my injuries because in the last 5 years I've gained a lot of weight because I've not been moving as well as what I used to, and I find that depresses me. Over the last 12 months that's just happened more, I guess. And just the longer it goes on the more over it you get.</i> Female, 18 to 39 years. Skull fracture and other injuries; unknown cause; 5 years after injury, #102130</p>

they had fully recovered, or feeling that gym sessions or classes that were not supervised by a clinician were unsafe for people with complex injuries. These issues were mainly raised at the 3-year and 4-year time points.

Sub-themes relating to enablers of physical activity participation

Supporting quotes for these sub-themes are presented in Table 4.

The need to compromise on activity options and adapt to injury: Rather than decreasing their level of physical activity, some participants: had found alternative forms of activity that were lower impact (eg, swimming) or used different parts of the body; had learnt to pace themselves; or had used adaptive equipment in order to avoid exacerbating their pain or fatigue levels. Some participants discussed needing to reduce the intensity of their chosen form of physical activity (eg, taking rest breaks during activity to avoid becoming fatigued).

Recognising the importance of self-motivation and self-management: Self-motivation, determination, perseverance, goal-setting, defiance and competitiveness were all personal attributes identified by participants that had helped them resume physical activity after injury. Many participants accepted the fact that they were going to be sore after exercising and did it anyway. Despite a discontinuation of inpatient and outpatient rehabilitation, many participants were using self-management strategies, including home exercise and group classes. These strategies were utilised at all time-points up to 5 years after injury.

Support from other people and services: For some participants, the social aspect of physical activity was what motivated them to participate. Participants also valued the support of injury and health insurers in providing funding to facilitate access to modified activities, such as clinical Pilates and hydrotherapy. Being supervised by clinicians, these activities were able to be adapted to the participant's level of ability.

Longitudinal changes

Fear of re-injury as a limiting factor was discussed more at the 3-year time point than at later time points. At 3 years, participants also spoke about the importance of receiving assistance from clinicians and financial support from insurers in order to maintain activity levels. At later interviews more importance was placed on self-management, self-motivation and perseverance.

At the 4-year interview, fatigue as an activity-limiting factor was raised for the first time. The 4-year time point was also the first time that participants expressed their concerns about weight gain and long-term health decline as a result of inactivity. The exacerbation of limitations due to ageing was also discussed for the first time at this interview.

No new themes were generated from the 5-year interviews. However, participants were still experiencing issues with pain, stiffness and fatigue at this time point, which limited their ability to be active and were perceived to be worsening with age. The main theme discussed at this interview was difficulty maintaining weight due to activity limitations.

Discussion

At 3 to 5 years after trauma, participants perceived a high level of physical activity restriction relating to pain, fear of re-injury and a lack of clinical guidance. These restrictions were a source of distress, given the perceived impacts on social lives, family roles and health. Participants who were participating in regular physical activity recognised the value of social supports, sources of funding and their own self-motivation in promoting participation. Certain concerns, such as weight gain and ageing, were only highlighted by participants at the 4-year and 5-year interviews. However, overall there was little change in participants' perceived impacts, barriers and enablers over time, suggesting that physical activity recovery may have plateaued for many participants at 3 years after injury.

Table 3
Sub-themes relating to barriers to physical activity participation.

Sub-themes	Supporting quotes
A mismatch of desire and ability to be physically active	<p><i>It's probably my biggest issue. I almost feel sometimes that I've been penalised for being interested in the things that I was. There's almost not one thing that I was interested in before, in terms of hobbies and lifestyle, that I've been able to continue with. All my hobbies involved being physically capable. Lots of outdoor sports and cycling, different work, leisure activities, so nothing's the same anymore. Male, 18 to 39 years. Multiple fractures and other injuries; motorbike accident; 3 years after injury, #101581</i></p> <p><i>Oh, well, I used to be a half marathon runner, and that really says it all, I can't do that anymore. It's really, really restricted what I can do. And even if I really, really want to walk more... there's a limit to how much my legs can cope with, even if the rest of me wants to keep going. So it's a constant compromise every single day. Female, 18 to 39 years. Multiple lower limb fractures, thoracic and other injuries; pedestrian hit by truck; 3 years after injury, #97426</i></p> <p><i>I think it's taken at least 40% out of my life. I used to be so active and do a terrible lot of things, I find I can't now. Male, ≥ 60 years. Asphyxia and vertebral artery dissection; intentional self-harm; 4 years after injury, #105751</i></p>
Loss of motivation to be active due to mental health issues	<p><i>I used to do leisurely stuff, go for walks, go out with the grandkids, down to sort of a local playground and chase them around down there, I find that at some stages, it's not all the time, but at some stages, I just want stay at home, shut the door, shut the curtains and not see the world. Male, 40 to 59 years. Cervical and lower extremity fractures; motorbike accident; 3 years after injury, #101509</i></p> <p><i>I use to like to walk, don't do that anymore. I've sort of lost interest in a lot of things, which I'm trying not to do that. I don't know whether it's because I don't have the energy or I'm depressed, I don't know which one it is. You wake up and you think I don't feel too bad today but by the time you crawl out of bed and you think I can take all these different medications but I don't want to do that because they're addictive, I don't want that. I just want to be able to go for a walk. Female, ≥ 60 years. Spinal fractures; motor vehicle accident; 4 years after injury, #97377</i></p>
Avoiding activity due to fear of re-injury or of exacerbating symptoms	<p><i>I can ride a bike, which is great, even though I'm reluctant to do that anywhere aside a bike path, away from cars and trucks... and trucks, mainly trucks. Just because I now know if anything happens again I'm in a much worse position to recover than I was first time around. Female, 18 to 39 years. Multiple lower limb fractures, thoracic and other injuries; pedestrian hit by truck; 3 years after injury, #97426</i></p> <p><i>Well I don't ride bikes anymore... I don't know that I could cope with falling off the bike, just with the nature of my injuries. It wouldn't play out for me very well... getting back on the road I just have no desire to do that now, because I have learnt how little control you have over the situation around you, so I don't think there is any need to put myself out there again. Female, 18 to 39 years. Multiple lower limb fractures and other injuries; cyclist hit by truck; 3 years after injury, #102276</i></p> <p><i>So there is some impact upon sport because I don't want to get hard hit on that side again... Obviously, not getting younger either. I don't really want to get injured like that again. Male, 40 to 59 years. Chest and arm injuries; high fall; 3 years after injury, #106641</i></p> <p><i>It's a lot harder to cope with when things can happen and you've got no control over it... Whereas before the accident I had all the confidence in the world, now it's completely different. Male, 40 to 59 years. Head and thoracic injuries; motor vehicle accident; 4 years after injury, #101547</i></p> <p><i>... I can't do anything where I might fall off because if I get my leg caught or I fall I'm in big trouble. That's the thing. I could ride, I know I could. I know I could get up. But I know if I got into trouble it would be stupid, having had many falls off horses in my life. Female, ≥ 60 years. Head injury, spinal, pelvic and lower limb fractures; pedestrian hit by car; 4 years after injury, #97475</i></p>
Lack of individualised transitional care from rehabilitation to community-based exercise programs	<p><i>Obviously, I'm confined to a wheelchair... so I can't drive... so I'm basically stuck at home. Yeah, if someone points me in the right direction I'd be happy to do wheelchair basketball, wheelchair tennis or wheelchair darts, or whatever; I'd give anything a go, just to get out of the house. Male, 18 to 39 years. Pelvic and spinal fractures, vascular and abdominal injuries; motor vehicle accident; 3 years after injury, #104688</i></p> <p><i>Well, yeah, there's no services now... Ideally, there would be some ongoing availability of service. The challenge I have now is that my fitness has reached a certain point, a lot of that is my own maintenance, but it would be nice to know that I can go back to someone who understood my history if I have problems. And I know there is likely to be problems in the future. Female, 18 to 39 years. Multiple lower limb fractures and other injuries; cyclist hit by truck; 4 years after injury, #102276</i></p> <p><i>But I just feel like I was thrown out of a professional environment and then like off you go to the gym. Well, as I said, that doesn't work for me. I keep getting injured and sore and then I have to go and sort that out. I think the transition is a problem... It'd be great if the TAC had a gym where you could go along and become a member and have correct supervised exercises. You can't leave clinical Pilates and then go and do a pump class at the local gym, it just doesn't work. Female, ≥ 60 years. Head injury, spinal, pelvic and lower limb fractures; pedestrian hit by car; 4 years after injury, #97475</i></p>

Some strengths of this study included the relatively large sample size, long duration of follow-up and high participant retention. Furthermore, interview questions were broad, covering topics such as work, transport and recreation. This meant that participants were not led to raise the issue of physical activity, which is often misunderstood to mean only sport and exercise, thereby allowing an investigation of physical activity in its broadest sense.¹⁴ A potential limitation was that the study sample included a diverse range of participants, with diverse injuries, which reduced applicability of findings to singular trauma types. However, this sample reflected the diversity that exists within the wider trauma population. One group not included in this study was those who were non-English speaking; this is an area for further research.

Most participants recognised the importance of physical activity participation for maintaining and improving health. While this may indicate successful uptake of public health messaging about the benefits of physical activity, restricted physical activity contributed to

a fear of future health decline among the participants. In a meta-synthesis of qualitative studies on physical activity in people with spinal cord injury, fears about health deterioration were also common and largely associated with concerns about losing independence and becoming a burden on friends and family.¹⁴ In our study, these fears were particularly relevant for older participants. The 'double jeopardy' of disability and ageing has been highlighted in the spinal cord injury literature, suggesting that the effects of one often compound the other.³⁶ Women of all ages were also troubled by weight gain, which many attributed to reduced physical activity. Notably, these concerns were mainly raised at the 4-year and 5-year interviews, which may indicate the length of time taken for these issues to manifest. Previous qualitative research with spinal cord injury³⁶ and traumatic brain injury populations¹⁵ have also noted weight concerns in women, possibly as a result of a greater social pressure on women to be thin.³⁷ Excess adiposity is a well-established risk factor for chronic conditions such as diabetes and cardiovascular disease.³⁸ In

Table 4

Sub-themes relating to enablers of physical activity participation.

Subthemes
Supporting quotes
The need to compromise on activity options and adapt to injury
<i>Oh, it's turned me into a rower instead of a cyclist. Male, 40 to 59 years. Thoracic, abdominal and orthopaedic injuries; motor vehicle accident; 3 years after injury, #101394</i>
<i>I was never really a very enthusiastic swimmer. Running was my exercise of choice, but I can swim. Female, 18 to 39 years. Multiple lower limb fractures, thoracic and other injuries; pedestrian hit by truck; 3 years after injury, #97426</i>
<i>Instead of bowling freely as normal bowlers would, I've been given a mechanical arm that stops me from having to bend down, and I feel as if I'm at the end of my bowling years using one of these. But, of course, if I want to continue to play I have to use it. Male, 60+ years. Spinal and rib fractures, thoracic injury; fall; 3 years after injury, #102092</i>
<i>My energy levels are not as high as they used to be but I'm making sure that I get to bed at a decent hour and that I don't overstretch myself, and then I make sure I have rests when I'm working in the garden or if I'm out on the bike, that sort of stuff. Female, 60+ years. Thoracic, eye and orthopaedic injuries; motor vehicle accident; 4 years after injury, #96529</i>
Recognising the importance of self-motivation and self-management
<i>You just get sick of always limiting yourself because of your injuries, which is something that you didn't want, you had no control over, and now you're still paying and you will pay for the rest of your life, so eventually you just go, well, you know what, I want to go to the park so I'm going to do that, and then if I have to lie in bed the next day, that's just the way it'll be. Female, 18 to 39 years. Multiple lower limb fractures, thoracic and other injuries; pedestrian hit by truck; 3 years after injury, #97426</i>
<i>I didn't wait for them to say go. People at [name of service] taught me how you had to go and hurt yourself big time. Male, 40 to 59. Thoracic, abdominal and orthopaedic injuries; motor vehicle accident; 3 years after injury, #101394</i>
<i>I thought when I stopped the physio at the hospital and the swimming at the rehabilitation I had to do something for myself, so I joined a gymnasium where I do swimming, exercise and physical exercise to help the arm and the rest of me. I don't think there's any more that they could really do. Female, 40 to 59 years. Upper extremity fracture; fall; 3 years after injury, #106672</i>
<i>I make sure that I keep positive and I do keep busy, and keep myself moving... As long as I keep the exercise going, well, then, I keep going. Female, 40 to 59 years. Upper extremity fracture; fall; 4 years after injury, #106672</i>
<i>Physical activity makes [the pain] worse. Heavy physical activity makes it worse. I could sit on my chair or stay in bed all day and I wouldn't have any pain. But that's not much of a life is it? Male, 60+ years. Spinal and rib fractures, thoracic injury; fall; 4 years after injury, #102092</i>
Support from other people and services
<i>When you have an injury like I did, I lost my job, I couldn't pursue my sports, I couldn't pursue my social activities and I was quite isolated. And the one place where I was actually able to socialise with people who also were combating injury or surgery was in the hydrotherapy pool. So it was physically and emotionally a wonderful thing. Female, 60+ years. Head injury, spinal, pelvic and lower limb fractures; pedestrian hit by car; 3 years after injury, #97475</i>
<i>[I was] lucky enough to have some mates who are into rowing and said, 'Come around to the rowing shed', and I rowed with them... got to the point where we were doing three nights a week. Male, 40 to 59 years. Thoracic, abdominal and orthopaedic injuries; motor vehicle accident; 3 years after injury, #101394</i>
<i>... so they went to TAC and got me a gym membership, three-monthly physio membership at the gym. And it's been good. Female, 60+ years. Thoracic, eye and orthopaedic injuries; motor vehicle accident; 3 years after injury, #101453</i>
<i>... what [the TAC] have done for me with helping me to purchase this bike, or purchasing this bike for me, it's at least made cycling a possibility again, and I've been able to get out and do some small rides and at least get the legs turning again. Male, 18 to 39 years. Multiple fractures and other injuries; motorbike accident; 3 years after injury, #101581</i>

major trauma populations, there is evidence of an increased risk of diabetes, hypertension and coronary artery disease with incremental increases in injury severity.³⁹ Our findings of reduced physical activity and weight gain suggest a potential mechanistic pathway between major trauma and the development of chronic disease.

Beyond these health implications, many participants recognised that a lack of opportunities to be physically active was contributing to social isolation. This known risk factor for both mental health problems and chronic disease was particularly evident among those who had previously engaged in team sports and group exercise.⁴⁰ Psychological issues, such as depression and loss of confidence, were commonly cited as barriers to participating in physical activity. As such, patients may experience a 'vicious circle' of reduced physical activity leading to loneliness and isolation, subsequent depression and further reductions in physical activity. In the spinal cord injury literature, several authors have highlighted the improved social integration that comes with physical activity participation^{41,42} and, in turn, improved quality of life.⁴³

Fear of re-injury was raised by participants as a barrier mainly at the 3-year time point, possibly because their traumatic events were more recent and therefore easier to recall. While depression and loss of confidence have previously been raised as barriers to physical activity in people with spinal cord injury and traumatic brain injury,^{14,15} fear of re-injury appears to be less prevalent. It is possible that, given the higher level of disability in those with spinal cord injury and

severe traumatic brain injury, there is less possibility of re-engaging in high-risk activities and therefore less fear. People with less severe disability, such as those recovering from knee injuries⁴⁴ and hip fractures,⁴⁵ commonly cite fear of injury as a barrier to physical activity, particularly in the early stages of recovery. Early identification of these issues may assist clinicians to target those in need of counselling to facilitate a return to pre-injury activities.

The majority of participants had ceased receiving funding from injury insurers at 3 years after injury. Given the financial strain often experienced by people recovering from trauma,⁴⁶ a lack of funding for gym memberships, swimming passes, hydrotherapy and specialised equipment was a major barrier to physical activity participation. These findings are echoed in previous spinal cord injury research.¹⁴ At 3 years after injury in particular, participants spoke about a care-gap between ceasing clinical treatment and commencing exercise activities in the community. At this juncture, participants perceived a need for information, education, supervision or exercise options set up by clinicians who understood their injuries. Studies in spinal cord injury and traumatic brain injury populations have reported similar findings, highlighting the lack of knowledge and/or communication amongst clinicians about modified physical activity options for people with disabilities.^{14,15} Previous studies have highlighted the lack of clarity within the healthcare system as to the roles and responsibilities of different clinical specialties in physical activity promotion, and while

physiotherapists may perceive a role for themselves in this area, there are ongoing deficiencies in knowledge, skills and interest.^{47,48}

In lieu of clinical guidance, people with spinal cord injury have spoken about turning to peers for advice and guidance on physical activity options.¹⁴ The role of social interaction has been widely discussed as a driver of physical activity participation in people with injury and disability.^{14,16,17} In our study, while the importance of social support was frequently raised by participants in motivating them to be active and providing a sense of competition, there was no mention of this social support coming from their peers (other trauma survivors). Given the current lack of peer support networks and advocacy groups for people with non-neurological trauma in Australia, this could be an important area for future research and investment.

Several participants discussed persevering through pain and fatigue in order to enjoy the benefits of physical activity, particularly at later time points. As noted in the traumatic brain injury literature, while pain was a barrier to physical activity for some, others saw physical activity as a way of managing pain.¹⁷ Positive messaging from clinicians about the role of physical activity in pain control could help some individuals overcome fear-avoidance of activity. Participants also talked about finding new activities (eg, swimming replacing running) or finding new ways of doing them (eg, taking rest breaks). The implication is that, despite not achieving full recovery, some participants had come to accept their limitations and adapt accordingly. Acceptance and adaptation have been shown to be positive strategies for optimising recovery.⁴⁹ As such, there may be a role for physiotherapists and other clinicians to communicate realistic expectations of recovery to patients, particularly at transition points (eg, at discharge from rehabilitation).⁴⁴ Physiotherapists may also be able to help people adapt to their disabilities by helping them to set new goals in relation to physical activity, rather than persisting with pre-injury physical activity targets.^{15,50} Furthermore, as opposed to structured exercise, communicating the benefit of incidental activity, such as active transport, or breaking up prolonged sitting, may be appropriate for people with lower exercise capacity.¹⁷

It is also likely that people who maintain a level of physical activity after trauma possess higher exercise self-efficacy, defined as the judgement of one's capacity to perform a specific action (ie, exercise).⁵¹ In a study of people with traumatic brain injury, exercise self-efficacy was shown to be the strongest predictor of physical activity level 15 years after injury.⁵² Helping patients improve their exercise self-efficacy through behavioural change interventions could improve physical activity participation after trauma. However, some have argued that this trait is relatively fixed, and that people who were physically active before their injury see physical activity as part of their identity and are those most likely to be active after injury.^{14,16} One author suggested that patients should be encouraged to find their 'inner athlete' to increase and maintain physical activity participation over time.¹⁶ As a note of caution, if patients are motivated to be physically active but are unable to because of a lack of opportunity or societal or environmental barriers, this could lead to further frustration and disengagement from physical activity.⁵³ It is therefore vital that individual factors are considered within the wider context of the healthcare system and society.

What was already known on this topic: Improved trauma management has led to more people living longer with injury-related disability. Disability is associated with higher rates of physical inactivity, obesity and chronic disease. Most qualitative research into physical activity participation after trauma has examined people with traumatic brain injury or spinal cord injury. **What this study adds:** Long-term reduced physical activity after major non-neurological trauma was often related to a fear of re-injury or of exacerbating pain and fatigue. This was despite concerns about weight gain, health decline and reduced physical fitness. Participants valued the specialised supports and recognised the importance of adaptation, goal-setting, self-motivation and determination to be physically active despite limitations. Physiotherapists may use this information to help people be physically active after trauma.

Footnotes: ^a NVivo Version 11, QSR International Pty Ltd, Melbourne, Australia.

Addenda: Appendix 1 can be found online at <https://doi.org/10.1016/j.jphys.2020.06.008>.

Ethics approval: Ethics approval was received by the Monash University Human Research Ethics Committee and all participating hospitals. All participants gave written informed consent before data collection began.

Competing interests: None.

Source(s) of support: The RESTORE project was funded by National Health and Medical Research Council (NHMRC) of Australia [GNT1061786]. The Victorian State Trauma Registry is funded by the Transport Accident Commission and the Department of Health and Human Services. Christina Ekegren was supported by a NHMRC Early Career Fellowship, Belinda Gabbe by a Future Fellowship from the Australian Research Council and Peter Cameron by an NHMRC Practitioner Fellowship.

Acknowledgements: We would like to thank the investigators, steering committee and participating hospitals of the VSTR and express our appreciation to the participants. We would like to thank Mandy Brown and Dan Myles for their assistance with the interviews.

Provenance: Not invited. Peer reviewed.

Correspondence: Christina L Ekegren, Rehabilitation, Ageing and Independent Living (RAIL) Research Centre, Monash University, Melbourne, Australia. Email: christina.ekegren@monash.edu

References

1. Global Health Estimates 2016. *Disease Burden by Cause, Age, Sex, by Country and by Region, 2000-2016*. Geneva: World Health Organization; 2018.
2. Australian Institute of Health and Welfare: Pointer SC. *Trends in Hospitalised Injury, Australia 1999-00 to 2014-15*. Cat. no. INJCAT 190. Canberra: AIHW; 2018.
3. Cameron P, Gabbe B, Cooper D, Walker T, Judson R, McNeil J. A statewide system of trauma care in Victoria: effect on patient survival. *Med J Aust*. 2008;189:546-550.
4. Chandran A, Hyder AA, Peek-Asa C. The global burden of unintentional injuries and an agenda for progress. *Epidemiol Rev*. 2010;32:110-120.
5. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017. *Lancet*. 2018;392:1789-1858.
6. Australian Institute of Health and Welfare. *Health Status and Risk Factors of Australians with Disability 2007-08 and 2011-12*. Cat. no. DIS 65. Canberra: AIHW; 2016.
7. Froehlich-Grobe K, Jones D, Businelle MS, Kendzor DE, Balasubramanian BA. Impact of disability and chronic conditions on health. *Disabil Health J*. 2016;9:600-608.
8. Ekegren CL, Beck B, Climie RE, Owen N, Dunstan DW, Gabbe BJ. Physical activity and sedentary behavior subsequent to serious orthopedic injury: a systematic review. *Arch Phys Med Rehabil*. 2018;99:164-177.
9. Fleig L, McAllister MM, Brasher P, Cook WL, Guy P, Puyat JH, et al. Sedentary behavior and physical activity patterns in older adults after hip fracture: a call to action. *J Aging Phys Act*. 2016;24:79-84.
10. Brown WJ, Bauman AE, Bull FC, Burton NW. *Development of Evidence-based Physical Activity Recommendations for Adults (18-64 years)*. August 2012.
11. Tremblay MS, Aubert S, Barnes JD, Saunders TJ, Carson V, Latimer-Cheung AE, et al. Sedentary Behavior Research Network (SBRN) - Terminology Consensus Project process and outcome. *Int J Behav Nutr Phys Act*. 2017;14:75.
12. Ekelund U, Steene-Johannessen J, Brown WJ, Fagerland MW, Owen N, Powell KE, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? *Lancet*. 2016;388:1302-1310.
13. Biswas A, Oh PI, Faulkner GE, Bajaj RR, Silver MA, Mitchell MS, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: a systematic review and meta-analysis. *Ann Intern Med*. 2015;162:123-132.
14. Williams TL, Smith B, Papatthomas A. The barriers, benefits and facilitators of leisure time physical activity among people with spinal cord injury: a meta-synthesis of qualitative findings. *Health Psychol Rev*. 2014;8:404-425.
15. Self M, Driver S, Stevens L, Warren AM. Physical activity experiences of individuals living with a traumatic brain injury: a qualitative research exploration. *Adapt Phys Act Q*. 2013;30:20-39.
16. Lorenz LS, Charrette AL, O'Neil-Pirozzi TM, Doucett JM, Fong J. Healthy body, healthy mind: a mixed methods study of outcomes, barriers and supports for exercise by people who have chronic moderate-to-severe acquired brain injury. *Disabil Health J*. 2018;11:70-78.
17. Analytis P, McKay A, Hamilton M, Williams G, Warren N, Ponsford J. Physical activity: perceptions of people with severe traumatic brain injury living in the community. *Brain Inj*. 2018;32:209-217.
18. Driver S, Ede A, Dodd Z, Stevens L, Warren AM. What barriers to physical activity do individuals with a recent brain injury face? *Disabil Health J*. 2012;5:117-125.
19. Australian Institute of Health and Welfare. *Australia's Hospitals 2016-17 at a Glance*. Cat. no. HSE 204. Canberra: AIHW; 2018.
20. Bradley C, Harrison J. *Descriptive Epidemiology of Traumatic Fractures in Australia*. INJCAT. 57 ed. Adelaide: AIHW; 2004.
21. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med*. 2014;89:1245-1251.

22. Gabbe BJ, Braaf S, Fitzgerald M, Judson R, Harrison JE, Lyons RA, et al. RESTORE: REcovery after Serious Trauma—Outcomes, Resource use and patient Experiences study protocol. *Inj Prev*. 2015;21:348–354.
23. Cameron P, Finch C, Gabbe B, Collins L, Smith K, McNeil J. Developing Australia's first statewide trauma registry - What are the lessons? *Aust N Z J Surg*. 2004;74:424–428.
24. Victorian State Trauma Registry Outcomes and Monitoring (VSTORM) group. Victorian State Trauma System and Registry Annual Report 2016–17; 2018. <https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/acute-care/state-trauma-system/state-trauma-registry>.
25. Association for the Advancement of Automotive Medicine. *Abbreviated Injury Scale 2005 - Update 2008*. Barrington, IL: AAAM; 2008.
26. Charlson M, Pompei P, Ales K, MacKenzie C. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987;40:373–383.
27. National Centre for Classification in Health. *The International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM)*. 7th ed. Sydney: National Centre for Classification in Health: Faculty of Health Sciences, The University of Sydney; 2010.
28. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101.
29. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual Res Sport Exerc Health*. 2019;11:589–597.
30. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24:105–112.
31. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res*. 2005;15:1277–1288.
32. Grosseohme D, Lipstein E. Analyzing longitudinal qualitative data: the application of trajectory and recurrent cross-sectional approaches. *BMC Res Notes*. 2016;9:136.
33. Creswell J, ed. *Qualitative Inquiry & Research Design: Choosing Among Five Approaches*. 2nd ed. Thousand Oaks (CA): Sage Publications; 2007.
34. Hall WA, Long B, Bermbach N, Jordan S, Patterson K. Qualitative teamwork issues and strategies: coordination through mutual adjustment. *Qual Health Res*. 2005;15:394–410.
35. Maxwell J. Understanding and validity in qualitative research. *Harv Educ Rev*. 1992;62:279–300.
36. Pentland W, Walker J, Minnes P, Tremblay M, Brouwer B, Gould M. Women with spinal cord injury and the impact of aging. *Spinal Cord*. 2002;40:374–387.
37. Runfola CD, Von Holle A, Peat CM, Gagne DA, Brownley KA, Hofmeier SM, et al. Characteristics of women with body size satisfaction at midlife: results of the Gender and Body Image (GABI) Study. *J Women Aging*. 2013;25:287–304.
38. Australian Institute of Health and Welfare. *Impact of Overweight and Obesity as a Risk Factor for Chronic Conditions: Australian Burden of Disease Study. Australian Burden of Disease Study series no.11. Cat. no. BOD 12. BOD*. Canberra: AIHW; 2017.
39. Stewart IJ, Sosnov JA, Howard JT, Orman JA, Fang R, Morrow BD, et al. Retrospective analysis of long term outcomes after combat injury: a hidden cost of war. *Circulation*. 2015;132:2106–2107.
40. Leigh-Hunt N, Bagguley D, Bash K, Turner V, Turnbull S, Valtorta N, et al. An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health*. 2017;152:157–171.
41. Price P, Stephenson S, Krantz L, Ward K. Beyond my front door: the occupational and social participation of adults with spinal cord injury. *OTJR*. 2010;31:81–88.
42. Stephens C, Neil R, Smith P. The perceived benefits and barriers of sport in spinal cord injured individuals: a qualitative study. *Disabil Rehabil*. 2012;34:2061–2070.
43. Martin Ginis KA, Jorgensen S, Stapleton J. Exercise and sport for persons with spinal cord injury. *PM R*. 2012;4:894–900.
44. Filbay SR, Crossley KM, Ackerman IN. Activity preferences, lifestyle modifications and re-injury fears influence longer-term quality of life in people with knee symptoms following anterior cruciate ligament reconstruction: a qualitative study. *J Physiother*. 2016;62:103–110.
45. Taylor NF, Barelli C, Harding KE. Community ambulation before and after hip fracture: a qualitative analysis. *Disabil Rehabil*. 2010;32:1281–1290.
46. Braaf S, Ameratunga S, Ponsford J, Cameron P, Collie A, Harrison J, et al. Traumatic injury survivors' perceptions of their future: a longitudinal qualitative study. *Disabil Rehabil*. 2019. <https://doi.org/10.1080/09638288.2019.1571116>.
47. Williams TL, Smith B, Papathomas A. Physical activity promotion for people with spinal cord injury: physiotherapists' beliefs and actions. *Disabil Rehabil*. 2018;40:52–61.
48. Kunstler BE, Cook JL, Freene N, Finch CF, Kemp JL, O'Halloran PD, et al. Physiotherapists use a small number of behaviour change techniques when promoting physical activity: a systematic review comparing experimental and observational studies. *J Sci Med Sport*. 2017;21:P609–P615.
49. Livneh H. Psychosocial adaptation to chronic illness and disability: a conceptual framework. *Rehabil Couns Bull*. 2001;44:151–160.
50. Kehn M, Kroll T. Staying physically active after spinal cord injury: a qualitative exploration of barriers and facilitators to exercise participation. *BMC Public Health*. 2009;9:168.
51. Bandura A. *Self-Efficacy: The Exercise of Control*. New York, NY: W.H. Freeman; 1997.
52. Reavenall S, Blake H. Determinants of physical activity participation following traumatic brain injury. *Int J Ther Rehabil*. 2010;17:360–369.
53. Smith B, Perrier M-J. Disability, sport and impaired bodies: a critical approach. In: Schinke RJ, McGannon KR, eds. *The Psychology of Sub-Culture in Sport and Physical Activity. Critical perspectives*. London: Routledge; 2014.