Injuries, practices and perceptions of wheelchair sports participants

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Executive Summary

Background: Wheelchair sports participants represent a subgroup of athletes that potentially have a unique risk profile for sports-related injuries. The epidemiology of injuries in non-elite wheelchair sports participants has not previously been investigated, and therefore factors related to injury risk, prevention and participation are unknown.

Objectives: The purpose of this cross-sectional study was to determine the prevalence and nature of injuries in wheelchair sports participants, explore rehabilitation practices and injury-prevention strategies, and identify perceived benefits and barriers to participation.

Methods: A survey was mailed to members of Wheelchair Sports NSW (n = 258) and responses were collected anonymously. An introductory announcement and two postal reminders were used to encourage response (Dillman's method).

Results: Seventy-one participants responded (27.5% response rate). Respondents were an average age of 47.0 years (95% CI 32.0-59.9), and the majority were male (n = 56). Only 21% percent participated regularly at the national level, suggesting respondents were representative of wheelchair athletes participating at an amateur level. Participants played sport or trained a mean 2.8 days per week (SD 1.8), and the time spent on each day they participated was a mean 2.8 hours (SD 1.8). Fifty-nine percent of respondents had sustained an injury while playing sport, and the sport where the most injuries occurred was basketball (n = 23 injuries) followed by wheelchair racing (n = 5 injuries). For 30% of injured athletes, there was no health professional assistance provided at the time of injury. Health professionals most commonly sought for assistance following injury were physiotherapists (n = 20), remedial masseurs (n = 12), general practitioners (n= 11) and sports doctors (n = 9). Injury prevention was limited to warming up and stretching before competition, cited by 72% of participants. The main reported benefits of participating in wheelchair sports were that it

improved their fitness (76% agreed or strongly agreed with the statement, n = 53), provided them with comradeship (75%, n = 53) and the possibility of making new friends (76%, n = 54). The most commonly reported barriers to participation were the travelling distance required for participation (69%, n = 49), the cost of sports wheelchairs (63%, n = 45) and the availability of adequate participants to form a team (63%, n = 45).

Conclusions: Injuries while playing wheelchair sports are common, particular during basketball, yet prevention strategies reported were primarily only warming up and stretching. Wheelchair sport participants report many barriers to participation, but the wide range of benefits reported, both physical and social, indicates there is a need to implement strategies to reduce barriers and increase participation.*:*

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Introduction

Organised sport for persons using a wheelchair has grown both locally and internationally, with athletes competing in a range of wheelchair sports such as rugby, basketball, tennis and handcycling. However, sport participation rates between able-bodied and disabled persons in Australia show a 15% discrepancy (2), with New South Wales (NSW) having the second lowest rate of sports participation amongst persons with a disability in Australia (2). Health benefits of regular exercise are well established in this population (1, 12, 14, 19, 22), and sports participation is also reported to improve quality of life in persons with disabilities (15). One possible reason for low participation is the rate of injuries while playing sport, and the considerable effects that these injuries may have on activities of daily living for persons in a wheelchair. Athletes with disabilities experience similar injury rates to able-bodied athletes (9, 17, 27). Due to the repetitive nature of propulsion, wheelchair sports participants are at greater risk of developing injuries to the upper limb, in addition to peripheral nerve entrapments, repetitive strain injuries, premature osteoporosis, and pressure sores (11, 18), which also may limit sports participation. Information regarding injury patterns, risk factors and management strategies is limited in wheelchair athletes.

The identification of injury rates and practices is critical in determining risk factors and developing preventative strategies. Data on injuries sustained by athletes with disabilities have been collected during both summer and winter Paralympic Games (5, 26, 27). These investigations have provided data on injury incidence rates, types of injuries and sports in which athletes are commonly injured. However, these mainly focus on incidence rates over a 14-day period, thus the long-term management of injuries and how injuries affect participation have not yet been explored. Furthermore, the data includes disabled athletes competing in non-wheelchair sports, who may have different injury risk factors and motivators for participation compared to wheelchair athletes. Results from Paralympic

games are only representative of elite athletes competing at an international level and therefore cannot be applied to the general population of wheelchair athletes. Additionally, individual sports have been examined for particular injuries; however no distinction has been made based on classification of disability. It is inappropriate to assume that research findings in the wider disabled athletic populations competing at an international level will generalise to wheelchair sports participants in the community.

Shoulder injuries are the most common of upper limb injuries sustained by wheelchair sports participants and non-athletic wheelchair users (10, 20, 27), however there is little research on other types of injuries. The incidence of shoulder injuries and pain has been reported ranging from 26 to72% amongst various studies examining both wheelchair sports participants and non-athletic wheelchair users (4-7, 11, 18). This variation is likely due to diversity of the population studied. Recent studies have begun to examine possible risk factors for shoulder pain. Lack of trunk control and using a wheelchair seat that is parallel to the ground have both been found to increase pain in wheelchair athletes (13, 29). Whilst this research is a promising step in the identification of risk factors and the movement towards developing preventative strategies, more data are required to support these findings and identify risk factors for all injury types sustained by this population. Furthermore, the epidemiology of injuries in Australian wheelchair sports participants has not yet been investigated. The identification of such injuries and current preventative strategies is essential in the formation and implementation of further evidence-based prevention policies at a local, state and national level.

Information regarding barriers to participation in wheelchair sports and perceived benefits is limited. Perceived benefits and barriers to wheelchair sports have been primarily investigated in five studies (3, 16, 21, 25, 28). Perceived benefits are reported as social,

personal, and physical, whilst barriers include organisational factors, limited information available on wheelchair sports, and the physical demand of sports (3, 16, 21, 24). These studies have evaluated elite athletes, individual sporting codes and single disability groups individually with a variety of outcome measures and methodologies. Consequently, there is a lack of quantitative data examining perceived benefits and barriers to wheelchair sports participation in athletes across a broad community population participating in a variety of sports. By identifying facilitators and barriers to participation in wheelchair sports, the findings from the current study may potentially inform strategies to bridge the current gap in the rate of sports participation between able-bodied and disabled persons in Australia.

The purpose of this cross-sectional study was to determine the prevalence and nature of injuries in wheelchair sports participants, explore rehabilitation practices and injury-prevention strategies used, and identify perceived benefits and barriers to participation. These findings will provide essential resources for the development of evidence-based strategies to reduce the risk of injuries in and raise participation rates of wheelchair athletes.

Methods

This descriptive cross-sectional study was conducted in collaboration with Wheelchair Sports (WS) NSW. Research ethics approval was obtained through The University of Newcastle Human Research Ethics Committee.

Participants

Members of WS NSW were invited to participate in the study. Subjects who were unable to complete the survey in either written or spoken English were excluded, as were WS NSW members less than eighteen years of age. Consent was implicit in returning the survey.

Instrumentation

The questionnaire was constructed in collaboration with a convenience sample of wheelchair sports participants, representatives from WS NSW and the research team. Structured open-ended interviews were conducted with seven wheelchair sports participants and three representatives. The responses were analysed for themes and categorised into domains of interest, and these provided the basis for item selection and wording within the questionnaire. The same participants then examined the questionnaire to ensure face validity and clarity in the phrasing of questions, and to determine the time needed to complete the survey.

The questionnaire was structured into three sections: (1) demographics and sports played, (2) sporting injuries, and (3) attitudes regarding wheelchair sports participation. The demographics and sports section included questions on age, gender, current and previous sports played, level of competition, and time spent training and playing. The sporting injuries section included a table of injuries sustained (including for each injury the perceived causes, body part(s) injured, type of injury(ies), immediate treatment received or sourced, and sport played when injured), and questions on prevention strategies and management (self or sourced). The participation attitudes section consisted of 43 items scored in a Likert format, with answers ranging from one to six. The questions in this section assessed respondents' reasons for participating in wheelchair sports, attitudes towards their sport, and perceived benefits and barriers. Twenty-two items were scaled by "strongly agree" to "strongly disagree" and assessed perceived benefits. Fifteen items were scaled by "very likely" to "very unlikely" to determine perceived barriers to participation. Six semantic differential statements were included, which measured the connotative meaning of concepts to assess respondents' attitudes towards their sport. Two bipolar adjectives anchored the scale for

each of these items, for example “motivated” and “discouraged”, and these were also scored one to six.

Data collection

Questionnaires were administrated following Dillman’s Tailored Design Method for postal surveys (8). Participants received a notification letter informing them about the survey, followed by the questionnaire with a cover letter, information statement and a reply-paid self-addressed envelope in which to return the questionnaire. A follow-up postcard was sent the following week, which thanked participants who had returned the survey and reminded any non-respondents to complete the survey. Finally, non-respondents who were identified by the use of removable codes on the originally posted questionnaire were sent a second copy of the survey. Responses from the returned questionnaires were entered into an Excel Access database (Microsoft, Redmond, WA), and data imported into STATA 11.0 (StataCorp LP, College Station, TX) for analysis.

Data analysis

An item analysis was conducted to maximise the reliability and internal consistency of the survey. This was administered on the third section of the survey due to the nature of questions in that section. An inter-item correlation matrix was formed for items making up subscales relating to the domains of benefits and barriers to participation. This ensured each item mapped to the correct subscale. These subscales included social benefits pertaining to skills, opportunities and knowledge, in addition to physical benefits. Subscales for the domain of barriers to participation were environment, accessibility and knowledge. If a negative correlation with other items of the same subscale existed due to wording, scale values of items were inverted. Items were discarded if the item-total correlation was less than 0.2 (23). Cronbach’s coefficient alpha was used to assess internal consistency

reliability. The aim was to achieve an alpha coefficient for each subscale greater than 0.7 (23); items in the subscale that significantly reduced the total alpha value were removed after step-wise assessment.

Following the item analysis, responses from the valid items pertaining to individual domains were analysed in relation to the particular domain of interest. Descriptive statistics including median response and interquartile range were calculated for the demographics and injuries sections, providing quantitative data on the prevalence and nature of sports injuries, in addition to specific prevention strategies and management practices.

Results

A total of 71 participants responded to the questionnaire from a pool of 258 potential respondents (27.5% response rate). Demographic details can be seen below in table 1.

Participation

The sports that the participants report playing or have played in the past can be seen in Table 2. Basketball, hand/cycling and tennis are the most common sports played, although 30% of participants would like to take part in a sport other than the ones they currently play, with hand/cycling being again a common preference.

Injuries

42 (59%) of respondents had sustained an injury whilst participating in wheelchair sport, with 20 (28%) sustaining their injury within the last 12 months and 1 (1.4%) within the last week.

Of the 71 participants, 11 reported injuries to their shoulder or upper arm in the last 12 months, with seven injuring either their head/face/neck or hand /fingers and six injuring their

elbow or forearm. Basketball was cited as the most common sport for causing injury (n=23), followed by wheelchair racing (n=5) (as seen in table 2), with overuse injury reported in 14 cases and contact injury in 11. The most common types of injuries were muscle tears or strains (n=11) or ligament or joint sprains (n=6).

Management

No one assisted 30% of people at the time of their initial injury, with a physiotherapist assisting in 21%. After the injury occurred, 69% of participants continued to play, 3% left the field and returned later, 21% left the field and did not return and 7% needed offsite medical treatment. 70% of participants felt they had enough knowledge and support to manage the injuries they sustained. Health professionals most commonly sought immediately after injuries occurred were physiotherapists (n=20), remedial masseurs (n=12), general practitioners (GP) (n=11) and sports doctors (n=9). On the day following the injury, most participants sought care from a physiotherapist (n=19), GP (n=6) or sports doctor (n=6). In regards to injury prevention, 72% of participants report taking steps such as warming up and stretching.

Benefits/barriers

Reported benefits of participating in wheelchair sports, as seen from the participants point of view can be seen in Tables 3 & 4 below. Overall, participants feel that playing wheelchair sport improves their fitness and strength, whilst making them feel more motivated and confident.

Barriers to wheelchair sport participation can be seen in Table 5, with the availability of wheelchair sports in the local area being shown as the most likely barrier to participation, and the need for carers or medical attendants being the most unlikely.

Conclusion

While contact injuries are common in sports such as basketball where the players compete in close proximity to each other, overuse injuries such as muscle tears and strains are also prevalent. The only prevention strategies reported were warming-up and stretching. Wheelchair sport participants report many barriers to participation, primarily in regards to having to travel to participate, as availability of local events was limited. However, a wide range of both physical and social benefits were reported, indicating there is a need to implement strategies to reduce perceived barriers and increase participation in sports, while ensuring effective injury prevention strategies are undertaken.

Supporting Documentation

Table 1: Participant demographics.

	Males (n=56)	Females (n=15)	Total (n=71)
Age (years):	48.8 (32.7-61.8)	44.5 (30.9-52.1)	47.0 (32.0-59.9)
Live:			
Capital city	23 (42.6%)	6 (42.9%)	29 (42.6%)
Regional centre	21 (38.9%)	4 (36.8%)	25 (36.8%)
Rural area	9 (16.7%)	4 (28.6%)	13 (19.1%)
Remote area	1 (1.8%)	0 (0%)	1 (1.5%)
For any given sport:			
(Highest level of participation)			
Social	13 (18.3%)	3 (4.2%)	16 (22.5%)
Local	13 (18.3%)	2 (2.8%)	15 (21.1%
State	8 (11.3%)	1 (1.4%)	9 (12.7%)
National	25 (35.2%)	10 (14.1%)	35 (49.3%)
(Usual level of participation)			
Social	19 (26.8%)	5 (7.0%)	24 (33.8%)
Local	18 (25.3%)	0 (0%)	18 (25.3%)
State	10 (14.1%)	4 (5.6%)	14 (19.7%)
National	10 (14.1%)	5 (7.0%)	15 (21.1%)
Average number of days per week spent playing/training	2.63±1.7	3.38±1.8	2.8±1.8
Average hours spent playing/training	2.80±2.2	2.56±2.2	2.7±2.2

Table 2: Sports that are currently being played, have been played in the past or would like to play and the reported number of injuries due to that sport.

	Presently participating in this sport*	Have participated in this sport in the past	Would like to play this sport, but currently do not	Reported number of body part injuries due to the sport in the past year#
Archery	1	6	3	1
Arm cranking	1	6		
Basketball	26	10	1	23
Boxing	2	-		
Fun run	1	-		
Cycling / hand cycling	10	1	6	2
Hockey	1	2		
Lawn bowls	9	2		3
Powerlifting	3	2	1	
Rugby / wheelchair rugby	6	4	2	
Rugby league	3	2	1	
Sailing	1	1	2	
Shooting / pistol / target	5	1	1	
Skating	1	-		
Skiing	2	3	1	
Surfing	1	3	1	
Swimming	4	7		1
Table tennis	2	2	2	2
Tag	1	-		
Tennis / wheelchair tennis	9	6	2	3
Racing / wheelchair racing	3	1		5
Track and road	1	2		
Volleyball	1	2		
Weights / weight lifting	2	2	1	
Athletics		2	1	1
Fencing		2		
Indoor cricket		1		
Field events				
Flying		1		
Snooker		1		
Soccer		1	1	

* Participants were able to report playing multiple sports

Number refers to different body parts injured. Multiple body parts may have been injured in a single incident.

Table 3: Ranked responses using Likert scales (1-6) in regards to wheelchair sports participation.

Participating in wheelchair sport:		1	2	3	4	5	6
		1: Strongly agree					6: Strongly disagree
…is helpful for managing my pain		17 (26%)	9 (14%)	9 (14%)	14 (22%)	6 (9%)	10 (15%)
… is helpful in managing any strength and flexibility problems		28 (39%)	16 (23%)	11 (15%)	7 (10%)	4 (6%)	5 (7%)
…helps me control my weight		25 (36%)	14 (20%)	13 (19%)	7 (10%)	2 (3%)	9 (13%)
…improves my fitness		41 (59%)	12 (17%)	6 (9%)	6 (9%)	0 (0%)	5 (7%)
…improves my strength		43 (61%)	8 (11%)	8 (11%)	4 (6%)	2 (3%)	6 (8%)
…teaches me better ways of managing my disability		24 (34%)	17 (24%)	14 (20%)	6 (8%)	3 (4%)	7 (10%)
…improves my mobility of my joints		23 (32%)	16 (23%)	19 (27%)	5 (7%)	4 (6%)	4 (6%)
…improves the function of my joints		19 (27%)	19 (27%)	15 (21%)	7 (10%)	6 (8%)	5 (7%)
…provides me with comradeship with fellow competitors		41 (58%)	12 (17%)	5 (7%)	1 (1%)	3 (4%)	9 (13%)
…provides the possibility of making new friendships		44 (62%)	10 (14%)	5 (7%)	2 (3%)	3 (4%)	7 (10%)
Participation in wheelchair sports makes me feel:							
1: motivated	6: discouraged	41 (58%)	23 (32%)	5 (7%)	0 (0%)	1 (1%)	1 (1%)
1: isolated	6: connected	1 (1%)	1 (1%)	3 (4%)	4 (6%)	27 (39%)	33 (48%)
1: purposeful	6: aimless	30 (43%)	24 (35%)	12 (17%)	2 (3%)	0 (0%)	1 (1%)
1: helpless	6: empowered	0 (0%)	0 (0%)	2 (3%)	11 (16%)	22 (33%)	32 (48%)
1: physically vulnerable	6: physically confident	0 (0%)	2 (3%)	3 (4%)	10 (14%)	5 (30%)	33 (48%)
1: confident	6: anxious	31 (45%)	25 (36%)	8 (12%)	4 (6%)	0 (0%)	1 (1%)

Table 4: Factors associated with involvement and engagement in wheelchair sport.

Involvement and engagement	1: Strongly agree					6: Strongly disagree
	1	2	3	4	5	6
It is important to have the opportunity to engage in wheelchair sports	52 (73%)	8 (11%)	5 (7%)	0 (0%)	1 (1%)	5 (7%)
Involvement in wheelchair sport:	1: Strongly agree			6: Strongly disagree		
…provides opportunities to "give back" to my sport and to the people in the wheelchair sport community	35 (49%)	16 (23%)	11 (15%)	6 (8%)	1 (1%)	2 (3%)
… provides opportunities to travel that I would not otherwise have	40 (57%)	9 (13%)	5 (7%)	6 (9%)	5 (7%)	5 (7%)
… helps me to set and achieve personal goals	32 (46%)	18 (26%)	13 (19%)	2 (3%)	2 (3%)	3 (4%)
… sport assists me to develop skills in other aspects of life	27 (38%)	20 (28%)	12 (17%)	7 (10%)	0 (0%)	5 (7%)
… teaches me to focus better in other areas of my life	23 (33%)	20 (29%)	19 (27%)	3 (4%)	1 (1%)	4 (6%)
… assists me to improve my organisational skills	19 (27%)	17 (24%)	23 (33%)	6 (9%)	2 (3%)	3 (4%)
…has improved my knowledge of my own body and how it functions	20 (29%)	21 (30%)	18 (26%)	6 (9%)	2 (3%)	3 (4%)
…allows me to develop new physical skills	25 (36%)	20 (29%)	18 (26%)	3 (4 %)	2 (3%)	2 (3%)
…improves my ability to care for myself	18 (26%)	16 (23%)	24 (34%)	4 (6%)	4 (6%)	4 (6%)
…provides opportunities to learn how to better manage my disability from other wheelchair sport participants	24 (34%)	15 (21%)	18 (26%)	8 (11%)	4 (6%)	1 (1%)
…improves opportunities for finding employment	9 (13%)	3 (4 %)	21 (31%)	14 (21%)	9 (13%)	12 (18%)

Table 5: Barriers to wheelchair sport participation.

Involvement and engagement	1: Very likely					6: Very unlikely
How likely or unlikely are the following to prevent or limit your participation in wheelchair sport?	1	2	3	4	5	6
The cost of sports wheelchairs	14 (21%)	19 (29%)	12 (18%)	6 (9%)	9 (14%)	6 (9%)
The availability of suitable transport with sufficient space for equipment and personal needs	13 (19%)	12 (17%)	17 (24%)	6 (9%)	11 (16%)	11 (16%)
The distance I would need to travel to compete or train	21 (30%)	11 (16%)	17 (25%)	4 (6%)	8 (12%)	8 (12%)
Encountering unfamiliar physical environments	11 (16%)	6 (9%)	11 (16%)	13 (19%)	12 (18%)	15 (22%)
The availability of wheelchair accessible accommodation when competing	13 (19%)	12 (18%)	11 (16%)	4 (6%)	13 (19%)	15 (22%)
Wheelchair accessibility of sporting venues	19 (28%)	18 (26%)	5 (7%)	8 (12%)	8 (12%)	10 (15%)
The availability of competition or training venues permitting wheelchair use	18 (26%)	16 (24%)	6 (9%)	7 (10%)	13 (19%)	8 (12%)
Knowing what wheelchair sports are available	12 (18%)	11 (16%)	12 (18%)	12 (18%)	6 (9%)	14 (21%)
The availability of wheelchair sports in which to participate in the area I live	24 (35%)	14 (20%)	5 (7%)	5 (7%)	8 (12%)	13 (19%)
The availability of wheelchair sports competition in the area I live	21 (30%)	11 (16%)	11 (16%)	6 (9%)	8 (12%)	12 (17%)
The availability of enough participants to form a team or group	21 (30%)	12 (18%)	12 (18%)	7 (10%)	6 (9%)	10 (15%)
Competing with or against people with a similar level of disability	14 (20%)	5 (7%)	14 (20%)	7 (10%)	10 (14%)	19 (28%)
Access to information about wheelchair sports in your local area	9 (13%)	13 (19%)	14 (20%)	10 (14%)	8 (12%)	15 (22%)
Balancing my time between my sport and other commitments	12 (17%)	19 (27%)	14 (20%)	8 (11%)	9 (13%)	9 (13%)
The need for carers or attendant medical support when I am travelling to compete or train	6 (8%)	3 (4%)	7 (10%)	3 (4%)	12 (17%)	40 (56%)

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Summary Report

This cross-sectional survey sought to determine the prevalence and nature of injuries during wheelchair sports, current prevention and rehabilitation strategies used, and benefits and barriers to participation. Seventy-one wheelchair athletes registered with Wheelchair Sports NSW responded to a postal survey (27.5% response rate). The shoulder/upper arm was the most common area injured and the sport during which the majority of injuries occurred was basketball where contact injuries were common. The only prevention strategies reported were warming-up and stretching. Participants reported that playing wheelchair sport improved their fitness and strength and that increased motivation and confidence were benefits to playing. The most common barrier to participation was a perceived lack of competition available in the local area. The results suggest that players perceive many benefits to participating in wheelchair sports, although finding a suitable sport locally may be a concern for many.

Key Messages

- Injuries are common during wheelchair sports, yet few prevention strategies are currently used by wheelchair athletes
- Wheelchair athletes report a wide range of benefits from participation, including physical (fitness, strength) and social (comradeship, new friendships) benefits.
- Barriers to wheelchair sports participation are primarily related to the availability of participation opportunities (distance to venues, cost, and availability of adequate numbers to form a team), rather than injury frequency.