ORIGINAL ARTICLE

Leisure Time Physical Activity in a Population-Based Sample of People With Spinal Cord Injury Part I: Demographic and Injury-Related Correlates

Kathleen A. Martin Ginis, PhD, Amy E. Latimer, PhD, Kelly P. Arbour-Nicitopoulos, PhD, Andrea C. Buchholz, PhD, Steven R. Bray, PhD, B. Catharine Craven, MD, Keith C. Hayes, PhD, Audrey L. Hicks, PhD, Mary Ann McColl, PhD, Patrick J. Potter, MD, Karen Smith, MD, Dalton L. Wolfe, PhD

ABSTRACT. Martin Ginis KA, Latimer AE, Arbour-Nicitopoulos KP, Buchholz AC, Bray SR, Craven BC, Hayes KC, Hicks AL, McColl M, Potter PJ, Smith K, Wolfe DL. Leisure time physical activity in a population-based sample of people with spinal cord injury part I: demographic and injury-related correlates. Arch Phys Med Rehabil 2010;91:722-8.

Objectives: To estimate the number of minutes a day of leisure time physical activity (LTPA) performed by people with chronic spinal cord injury (SCI) and to identify the demographic and injury-related characteristics associated with LTPA in a population-based sample of people with chronic SCI.

Design: Cross-sectional telephone survey.

Setting: General community.

Participants: Men and women with SCI (N=695).

Interventions: Not applicable.

Main Outcome Measures: The number of minutes/day of LTPA performed at a mild intensity or greater.

Results: Respondents reported mean minutes ± SD of 27.14±49.36 of LTPA/d; however, 50% reported no LTPA whatsoever. In a multiple regression analysis, sex, age, years postinjury, injury severity, and primary mode of mobility each emerged as a unique predictor of LTPA. Multiple correspondence analysis indicated that being a man over the age of 34 years and greater than 11 years postinjury was associated with inactivity, while being a manual wheelchair user and having motor complete paraplegia were associated with the highest level of daily LTPA.

Conclusions: Daily LTPA levels are generally low in people with SCI. Women, older adults, people with less recent injuries, people with more severe injuries, and users of power wheelchairs and gait aids are general subgroups that may require special attention and resources to overcome unique barriers to LTPA. Specific subgroups may also require targeted interventions.

Key Words: Exercise; Leisure activities; Paraplegia; Patient participation; Tetraplegia; Rehabilitation; Sports.

FOR MANY PEOPLE, an SCI leads to a reduction or cessation of participation in PA.[1] With inactivity comes profound deconditioning, a decline in physical capacity,[2] and increased risk for secondary health problems and chronic diseases.[3] In the able-bodied population, numerous large-scale epidemiologic studies have been undertaken to determine the average number of minutes a day of PA that people typically do, and how much they must do, to improve fitness and reduce disease risk.[4] These studies have provided the basis for establishing daily PA guidelines and intervention targets for the general population.[5] However, within the SCI population, no such epidemiologic data exist. This deficiency has hindered the ongoing development of PA guidelines and interventions for people with SCI.

A few small studies have attempted to quantify daily PA in people with SCI. For instance, PA was measured in 27 adults with paraplegia by monitoring their heart rate continuously over 2 to 3 days.[6] Overall, daily energy expenditure was very low, and people with complete injuries were less active than those with incomplete injuries. In another study of 40 adults with paraplegia or tetraplegia, accelerometers were used to measure PA during inpatient rehabilitation and the year postdischarge.[7] Based on 2-day sampling periods, participants' postdischarge activity levels were substantially lower than able-bodied persons' activity levels. Younger people and those with paraplegia were more active than older adults and those with tetraplegia. These 2 studies provide robust evidence that PA levels are very low among people with SCI. Yet a draw-

List of Abbreviations

ASIA	American Spinal Injury Association
LTPA	leisure time physical activity
MCA	multiple correspondence analysis
PA	physical activity
PARA-SCI	Physical Activity Recall Assessment for People With Spinal Cord Injury
SCI	spinal cord injury
SHAPE-SCI	Study of Health and Activity in People with Spinal Cord Injury

From the Department of Kinesiology, Centre for Health Promotion and Rehabilitation, McMaster University, Hamilton (Martin Ginis, Bray, Hicks); School of Kinesiology and Health Studies (Latimer), and Centre for Health Services and Policy Research (McColl), Queen's University, and Department of Rehabilitation Medicine, St Mary's of the Lake Hospital (Smith), Kingston; Department of Family Relations and Applied Nutrition, University of Guelph, Guelph (Buchholz); Department of Medicine, Toronto Rehabilitation Institute (Craven), and Faculty of Physical Education (Arbour-Nicitopoulos), University of Toronto, Toronto; Department of Physical Medicine and Rehabilitation, University of Western Ontario, London (Hayes, Potter, Wolfe), Ontario, Canada.

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Correspondence to Kathleen A. Martin Ginis, PhD, McMaster University, Department of Kinesiology, Hamilton, ON, L8S 4K1, Canada, e-mail: *martink@mcmaster.ca.*

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back of measuring PA with accelerometers and heart rate monitors is that these devices do not distinguish between LTPA and other types of PA such as manual wheelchair use for mobility, activities of daily living, occupational activity, or incidental activity (eg, postural relief of pressure points).

LTPA is PA that one chooses to do during free time, such as walking/wheeling, playing sports, or exercising at a gym.[8] In the able-bodied population, considerable epidemiologic evidence indicates that greater LTPA is associated with lower risks of morbidity and all-cause mortality.[5,9] Likewise, in people with SCI, accumulating data suggest that LTPA—but not necessarily activities of daily living—is associated with better fitness and health.[10-13] Together, this evidence has been used as the basis for recommending LTPA as a key component of health interventions for people with SCI.[3,14,15]

Currently, very little is known about LTPA participation in the SCI population.[6,12,16] Studies that reported on LTPA have limited generalizability. For instance, in the study of 27 adults with paraplegia,[6] 56% self-reported at least 1 bout of LTPA (eg, weight-training, arm or leg cycling) over the observation period of 2 to 3 days. Mean bout duration ± SD was 49±31 minutes. However, the study was restricted to a relatively healthy sample of people with paraplegia. Findings cannot be generalized to those with tetraplegia or common chronic diseases such as diabetes and heart disease. LTPA was also assessed in a measurement validation study involving 158 men and women with paraplegia or tetraplegia.[12] Participants reported a mean ± SD of 40.4±50.11min/d of LTPA, with men reporting more activity than women and younger people reporting more activity than older people. However, the sample was not necessarily representative of the general SCI population because many participants were recruited from PA programs. It is essential that LTPA and its correlates be studied in sufficiently large, representative samples in order to estimate daily LTPA properly and to identify segments of the SCI population in greatest need of activity-enhancing interventions.[7]

Given these needs, the primary purpose of the present study was to quantify the average number of minutes a day that people with chronic SCI engage in LTPA. A secondary purpose was to identify demographic and injury-related characteristics associated with LTPA. Consistent with previous research, age, sex, and injury characteristics were expected to be associated with LTPA. The study objectives were addressed in a large representative sample of people living with SCI.

METHODS

Participants were 695 men and women enrolled in SHAPE-SCI.[17] SHAPE-SCI is a multicenter, prospective study of LTPA and health in people with traumatic SCI. Sample size was based on the goal of accurately measuring self-reported LTPA within 5min/d. Sample size was estimated using preliminary LTPA data derived from 102 men and women with SCI.[16] These data were applied to the formula

$$n = [2\ (s^2\ \text{pooled})/y]$$

where s^2 pooled is the pooled variance across lesion levels (paraplegic and tetraplegic) and injury completeness (complete and incomplete), and y represents a 10% error tolerance. A sample size of 720 allowed for 5% to 10% participant attrition while still enabling estimation of LTPA within 5min/d. SHAPE-SCI is the largest epidemiologic study of LTPA in the SCI population to date. Participant demographic and injury-related characteristics are presented in table 1.

Baseline data collection occurred between January 2006 and June 2007 and was conducted from 4 regional SCI rehabilitation and research centers in Ontario, Canada. At each site, participants were recruited primarily from a database of patients who had given consent to be contacted for research purposes. Other recruitment methods included advertisements in local newspapers and SCI-relevant publications, presentations at events for people with SCI, mailings to SCI community groups, clinics, and word-of-mouth. Informed consent was obtained from all participants. The study was approved by the research ethics board at each participating data collection site.

Table 1: Participant Demographic and Injury-Related Characteristics

Variable	Mean ± SD	n (%)
Age (y)	47.1±13.5	693
Years postinjury	15.3±11.1	692
Preinjury LTPA (d/wk)	5.2±2.2	686
Sex		
Male		531 (76.4)
Female		164 (23.6)
Injury severity		
C1–C4, ASIA grade A–C		75 (10.8)
C5–C8, ASIA grade A–C		184 (26.5)
T1–S5, ASIA grade A–C		255 (36.7)
ASIA grade D		172 (24.7)
Cause of injury		
Vehicular		331 (47.6)
Sports/recreation		131 (18.8)
Falls		98 (14.1)
Medical/surgical complications		50 (7.2)
Disease		13 (1.9)
Violence		13 (1.9)
Other		48 (6.9)
Primary mode of mobility		
Manual chair		389 (56.0)
Power chair		221 (31.8)
Gait aid		85 (12.2)
Ethnicity		
White		616 (88.6)
Native Canadian		17 (2.4)
Black		21 (3.0)
Asian		16 (2.3)
Other		20 (2.9)
Highest level of education completed		
High school or less		241 (34.7)
College		169 (24.3)
University		121 (17.4)
Postgraduate		45 (6.5)
Other		113 (16.3)
Marital status		
Single		246 (35.4)
Common law		36 (5.2)
Married		305 (43.9)
Divorced		86 (12.4)
Widowed		15 (2.2)

NOTE. Some participants declined to respond to certain questions. Hence, n<695 for some variables.

Measures

Physical Activity Recall Assessment for People With Spinal Cord Injury. The PARA-SCI[16] was used to assess LTPA. This is an SCI-specific, 3-day activity recall measure that is