

Participation in Leisure Activities among Canadian Children with Arthritis: Results from a National Representative Sample

Sabrina Cavallo, Annette Majnemer, Barbara Mazer, Gevorg Chilingaryan, and Debbie Ehrmann Feldman

ABSTRACT. Objective. To describe the level of participation in leisure activities among children and youth with arthritis, as well as to identify the sociodemographic (age, sex, family income), disease-related (functional limitations, disease duration, pain, medication use, child's need for assistance), and contextual factors (use of rehabilitation services, proximity of local recreation facilities, cost of activities) that may be associated.

Methods. Data from the Participation and Activity Limitation Survey (PALS) 2006, a Canadian postcensus survey, was analyzed. Bivariate and multivariable linear regression analyses were applied to examine the associations between the sample's level of participation in leisure activities, and sociodemographic, disease-related, and contextual characteristics.

Results. In Canada in 2006, an estimated 4350 children ranging in age from 5 to 14 years were living with arthritis. Fifty-six percent of parents reported that arthritis restricted their child's participation in leisure activities. Bivariate analysis showed that the availability of local recreational facilities, the affordability of activities, and the child not requiring any assistance were all associated (modified Bonferroni correction $\alpha < 0.005$) with greater participation in various types of leisure activities. Multiple linear regressions showed that higher family income (β 0.47, 95% CI 0.09, 0.85) and greater perceived pain (β 0.59, 95% CI 0.07, 1.10) were positively associated with involvement in informal leisure.

Conclusion. Our findings underline the importance of considering contextual factors in developing treatment plans aimed at improving participation in leisure activities among children with arthritis. Future longitudinal studies targeting children living with arthritis could provide pertinent information on participation over fluctuations in disease status. (First Release May 15 2015; J Rheumatol 2015;42:1002–10; doi:10.3899/jrheum.131377)

Key Indexing Terms:

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DETERMINANTS

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In Canada, childhood arthritis is among the most common chronic disabling diseases of childhood, with a prevalence of 0.12% and a yearly incidence of 17.8 per 100,000 children and youth^{1,2}. Children affected by arthritis report chronic pain, joint stiffness, fatigue, and limitations in mobility that may restrict their participation in age-appropriate daily activities (e.g., mobility, self-care, and leisure), both at home and at school^{3,4,5}. One-third of those diagnosed with arthritis have physical limitations, such as difficulties with fine motor (e.g., buttoning one's shirt) or gross motor tasks (e.g., climbing stairs), which may persist well into adulthood⁶.

The psychosocial implications of living with arthritis (such as emotional distress, impaired family functioning, mood disorders, stress, and pain) may affect a child's participation in school and social activities^{7,8}. Participation in leisure activities is of critical importance to maintaining a fit lifestyle, forming friendships, and refining life skills needed throughout adulthood, as well as developing social contacts⁹. Research suggests that if participation in active leisure activities remains limited on a longterm basis, children and adolescents may not have enough social contact with peers, may be less able to make friends, may experience greater social isolation, and may be at greater risk for depression¹⁰. Among Dutch children living with chronic juvenile arthritis, global self-esteem and amount of spontaneous social interaction did not differ from their healthy counterparts, but they did report lower competency in athletics, possibly owing to the decreased opportunity to participate in sports¹¹.

Lower levels of physical activity lead to decreases in muscle mass and function, as well as eventual bone abnormalities (e.g., osteopenia) and possible cardiovascular implications^{4,12}. Children with arthritis have greater limitations in aerobic fitness and muscle strength when compared with healthy children, presumably caused by decreased involvement in physical activity secondary to disease symptoms¹³. Physical activity interventions have been documented to reduce pain, the number of swollen joints, and medication use, as well as to increase overall aerobic endurance in children and youth with arthritis^{13,14,15,16,17}. However, little is known regarding patterns and determinants of leisure activities in children with arthritis.

Involvement in leisure activities plays an important role in children's development and health and deserves consideration¹⁸. Participation is a key component of the International Classification of Functioning, Disability and Health – Child and Youth version (ICF) endorsed by the World Health Organization. This classification depicts how a child's participation in activities is influenced by health condition (e.g., disease severity), as well as personal factors (such as age, sex) and environmental factors (e.g., accessibility to services)^{19,20}. The ICF provides a framework whereby we can quantitatively identify both intrinsic (i.e., related to the person) and extrinsic (i.e., related to the environment) determinants that may affect participation in leisure. The ICF

contends that children with similar levels of intrinsic impairment may achieve differing levels of participation across settings.

The aim of our study was to describe the level of participation in leisure among a nationally representative sample of Canadian children aged 5 to 14 years with arthritis in terms of diversity and frequency, as well as to identify associated sociodemographic, disease-related, and contextual factors.

MATERIALS AND METHODS

Design. The 2006 Participation and Activity Limitation Survey (PALS) was carried out in Canada shortly after the 2006 National Census, specifically in November 2006 and February 2007. The PALS was funded by Human Resources and Social Development Canada. The PALS design was a 2-phase stratified design in which the 2006 census questionnaire was first distributed randomly to about every fifth household across Canada and then only participants reporting an activity limitation were approached for the PALS postcensus survey²¹.

Sample. The PALS sample included all persons living in private and collective households in the 10 provinces and 3 territories in Canada (excluding persons living in institutions and on First Nations reserves) who reported the presence of a disability (yes, sometimes; yes, often) on 1 or both of the 2 census filter questions regarding disability and activity limitations. The sample was further restricted with the following questions: Does this person have any difficulty hearing, seeing, communicating, walking, climbing stairs, bending, learning, or doing any similar activities? Does a physical condition or mental condition or health problem reduce the amount or the kind of activity this person can do at home, at work or school, or in other activities (e.g., transportation or leisure)? Participants who responded yes to the above filter questions were also asked to identify their specific health diagnosis: Does this person have any of the following longterm conditions that have been diagnosed by a health professional?²²

A representative sample ($n = 8954$) of Canadian children with activity limitations was selected from the 2006 census for participation in the 2006 PALS postcensus survey. The parent or guardian of the child living with a disability were interviewed over the telephone, resulting in a 79.7% response rate. If it was established that the parent or guardian was not available, another adult in the household was asked to respond as a proxy. Data were weighted to ensure that all Canadian children with a disability were represented. Weights were applied as described by Statistics Canada with data adjusted for nonresponse and child characteristics as reported in the census (province of residence, age, sex, and severity of the limitation)²³. Children younger than 5 years were excluded from our analysis because no data on participation and activity limitations were collected for this age group. Over 18 common childhood conditions were identified in the postcensus survey, including arthritis and rheumatism. For the purposes of our study we analyzed data exclusively from children aged 5 to 14 years for whom a parent reported a diagnosis of arthritis or rheumatism on the PALS in 2006.

Main outcome. Participation in leisure activities, our study's outcome, was described in terms of diversity (number of different activities) and frequency of participation. The physical leisure activities included in the survey questionnaire were grouped as follows: sports with a coach or instructor; lessons or instructions in other organized physical activities with a coach or instructor, such as dance, gymnastics, or martial arts; and unorganized sports or physical activities without an instructor. Sedentary leisure activities listed were watching television; playing computer or video games; talking on the phone with friends; reading alone (by himself/herself) for pleasure; having books read to (him/her); using the Internet to participate in newsgroups or chat groups for personal interest or entertainment; and using e-mail to stay in touch with friends. Non-sport skill-based activities were taking lessons or instruction in music, art, or other non-sport activities; and taking part in clubs, groups, or community programs such as church groups or Girl or Boy Scouts. We further categorized participation in these same activities as

formal (led by a coach or instructor) and informal (unstructured or spontaneous) activities. Diversity was defined as the sum of the different activities completed weekly by the child, where 0 = not completed and 1 = completed. The number of possible leisure activities ranged from 0 to 11 for overall leisure, 0 to 3 for active physical, 0 to 6 for sedentary, 0 to 2 for non-sport skill-based, 0 to 4 for formal, and 0 to 7 for informal activities. We quantified the frequency at which the child participates in each activity as follows: 0 = never participating, 1 = participating yearly, 2 = participating monthly, 3 = participating weekly, and 4 = participating daily. The measures of diversity and frequency were applied to all identified levels of leisure (overall leisure, active physical, sedentary, non-sport skill-based, formal, informal)²³.

Potential determinants. In line with the ICF model¹⁹, factors under study and potentially associated with participation in active physical and sedentary leisure activities were age, sex, family income, difficulty walking, difficulty using hands, disease duration, pain, medication use, use of rehabilitation services, child's need for assistance, proximity of community services, and cost of leisure activities. The following questions from the PALS helped to discern limitations in walking and in hand use: "Because of a condition or health problem, does [your child] have any difficulty walking? This means walking on a flat firm surface, such as a sidewalk or floor."; "Because of a condition or health problem, does [your child] have any difficulty using (his/her) hands or fingers to grasp or hold small objects, such as a pencil or scissors?". Pain was defined as: "How would you describe the usual intensity of [the child's] pain or discomfort?" We defined levels of functional limitations and perceived pain as 0 = none; 1 = mild; 2 = moderate to severe. We described medication use as 0 (less than once a week) and 1 (at least once a week). A large number of children who do not respond to nonsteroidal drug treatment are often prescribed weekly doses of the disease-modifying antirheumatic drug methotrexate. The use of rehabilitation services was scored as 0 when received less than once a month, and 1 reflected use at least once a month. Finally, we recoded the answers to this question: "What prevents [your child] from doing more social or physical leisure activities?" The answers were listed as yes = 1 and no = 0, for each of the following: availability of local recreational facilities, cost of leisure activities, and the child's need for assistance.

Statistical analysis. All statistical analyses were performed using the SAS 9.3 statistical software as well as the SAS-callable SUDAAN for Windows (release 9.0.0), to account for the PALS sample survey design and to allow the estimates of the coefficients of variation for the corresponding variables of statistical analyses. Weights were applied to the data to obtain representative estimates. Weighted results were rounded to the nearest 10 and percentages to the nearest 1 to respect Statistics Canada data disclosure regulations. For all inferential statistical analyses, the significance level was fixed at $\alpha = 0.05$. For the calculation of our independent t tests, given that we have conducted 11 independent t tests for each of our 6 outcomes, it was necessary to control for type 1 error (familywise error) by applying a modified Bonferroni correction. This enabled us to adjust for a predefined α level of 0.05 (adjusted α : $0.05/11 = 0.005$).

Descriptive statistics were carried out to characterize the sample in terms of frequencies, percentages, means, and CI. Bivariate analysis (t tests) was used to explore relationships between each independent variable and outcomes. Outcomes included the following: overall leisure, active physical, sedentary, non-sport skill-based, formal, and informal by diversity (total number of different activities) and frequency of participation in different activities.

We entered all potential predictors at once in multiple linear regression models to assess the potential associations between predictors and the frequency of leisure participation for each activity subcategory. Receipt of rehabilitation services and restriction in mobility and in hand use were placed in separate models to control for their multicollinearity (variance inflation factor > 7). All multiple linear regression models were adjusted for age and sex.

RESULTS

Sample. In Canada in 2006, an estimated 174,810 children

aged 5 to 14 years had a disability. Among them, 3% had arthritis. The mean age of children with arthritis was 10.7 years, 65% were girls, and 59% reported disease duration at 5 years or longer (Table 1). The mean household income for families living with a child with arthritis was Can\$79,811 (95% CI 65,070, 94,549), which is 4.3% lower than that reported for the average Canadian household in the 2006 census (\$83,407)²⁴. Nearly 40% of the PALS participating families had an income of less than \$60,000 per year. Further, 25% of parents reported that their child was unable to participate in activities they would have enjoyed because the activ-

Table 1. Demographic and clinical characteristics (weighted n = 4350).

Characteristics	Weighted n (%)
Child's age, yrs (mean 10.7, 95% CI 0.4, 9.9)	
≥ 5 and ≤ 11	2550 (58)
≥ 12	1810 (42)
Sex	
Female	2810 (65)
Male	1540 (35)
Region of residence [†]	
Atlantic	290 (7)
Quebec	840 (19)
Ontario	1790 (41)
Western	1410 (32)
North	20 (1)
Family income, Can\$ (mean 79,811, 95% CI 65,070, 94,549)	
≤ 30,000	630 (14)
> 30,000 and < 60,000	1130 (25)
≥ 60,000	2710 (61)
Disease duration, yrs (mean 4.7, 95% CI 1.5, 7.6)	
< 5	1770 (41)
≥ 5	2580 (59)
Difficulty walking	
None	2750 (63)
Mild	1180 (27)
Moderate to severe	420 (10)
Difficulty using hands	
None	2840 (65) [‡]
Mild	800 (18)
Moderate to severe	710 (16)
Pain intensity	
None	2390 (57)
Mild	760 (18)
Moderate to severe	1020 (24)
Medication [§] use	
None	1080 (25)
At least once weekly	3270 (75)
Rehabilitation services	
None	2630 (62)
At least once yearly	1200 (28)
At least once monthly	440 (10)

[†] Regions of residence: Atlantic: Prince Edward Island, Nova Scotia, New Brunswick, Newfoundland/Labrador; Quebec; Ontario; Western Canada: British Columbia, Alberta, Manitoba, Saskatchewan; North: Nunavut, Yukon, Northwest Territories. [‡]The sum of the values for each category may differ from the total because of rounding to the 10th unit. [§] Medication use includes both prescription and nonprescription medication taken by the participant.

ities were not adapted to their child's needs. Fourteen percent of parents reported that most of their child's activities were restricted by pain or discomfort. Ambulatory restrictions (i.e., difficulty walking) and hand function restrictions (i.e., difficulty grasping or holding objects) were reported in 37% and 34% of cases, respectively. Seventy percent of children with arthritis participated in physical activity at least once weekly, whereas only 33% participated daily (Figure 1). Forty percent of participants took part in non-sport skill-based activities weekly, but none participated in these activities daily. On the other hand, nearly all claimed to engage in daily sedentary behavior (Figure 2). Most children participated in weekly

informal activities and 70% in formal leisure. Fifty-six percent of parents reported arthritis restricted their child's participation in leisure. When asked directly about what reasons could have explained their child's limited participation, these parents identified the lack of locally available recreational facilities (19%), the high cost of activities (30%), and their child's need for assistance (61%) as potential factors.

Girls took part in a greater number of non-sport skill-based activities and participated in them more frequently than did boys (Tables 2 and 3). Children and youth who took medication at least once weekly participated in a larger number of

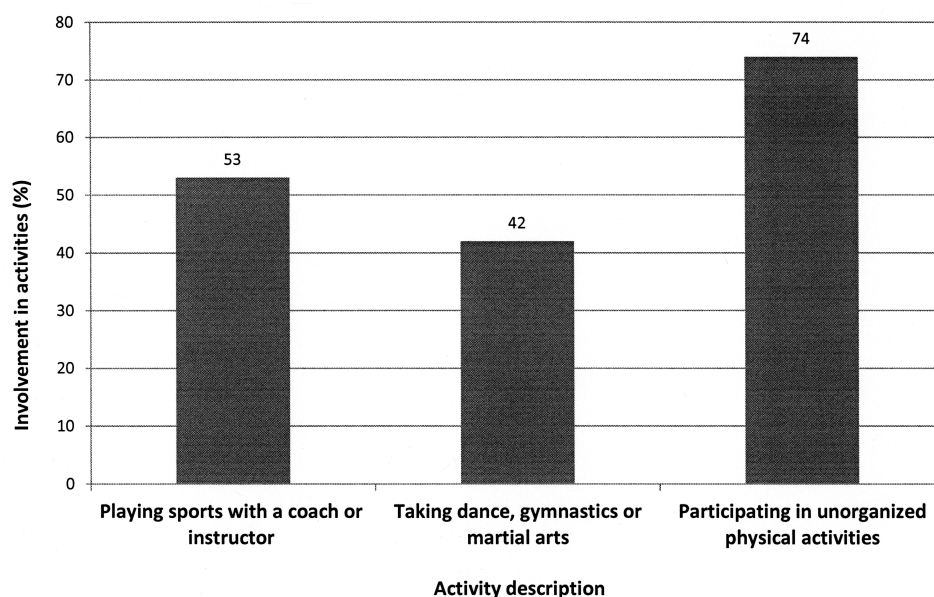


Figure 1. Percentage of weekly active physical involvement per activity group.

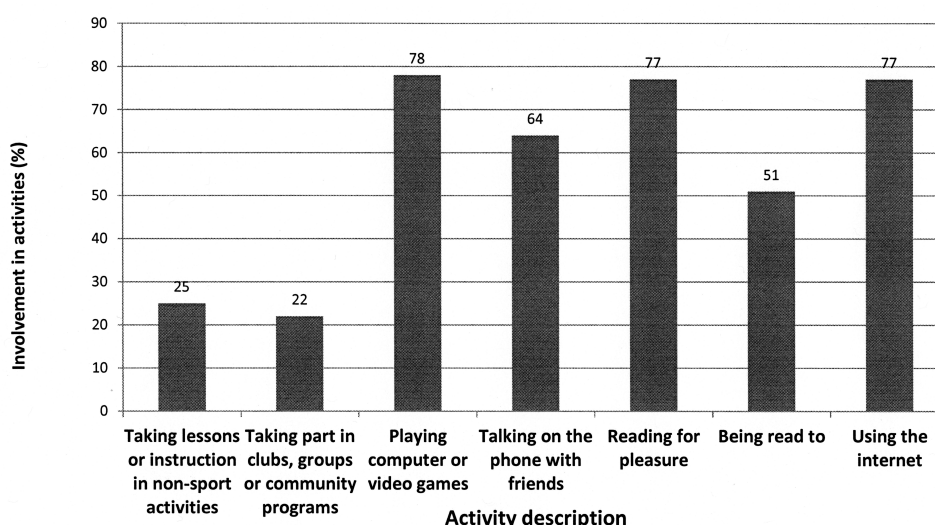


Figure 2. Percentage of weekly non-active physical involvement per activity group. Note: Nearly all participants watched television daily.

Table 2. Difference in mean scores for diversity of participation in overall, active physical, sedentary, non-sport skill-based, formal, and informal leisure activities according to sociodemographic and disease-related factors. Data are mean (95% CI), excluding missing values.

	Overall Leisure	Active Physical	Sedentary	Non-sport Skill-based	Formal	Informal
Age, yrs						
5 to ≤ 11	6.5 (5.5, 7.5)	1.6 (1.1, 2.1) [§]	4.3 (3.8, 4.8) [§]	0.6 (0.2, 1.0) ^E	1.5 (0.8, 2.2) [§]	5.0 (4.6, 5.4)
≥ 12	5.8 (4.0, 7.0)	1.3 (0.8, 1.9) [§]	4.1 (3.3, 4.9) ^E	0.3 (0.1, 0.5) ^E	1.1 (0.7, 1.5) [§]	4.7 (3.7, 5.6)
Sex						
Female	6.3 (5.3, 7.4)	1.3 (0.8, 1.9) [§]	4.1 (3.5, 4.7) ^E	0.6 ^d (0.3, 1.0) ^E	1.0 (0.4, 1.6)	5.0 (4.3, 5.6) [§]
Male	6.0 (4.8, 7.1)	1.6 (1.1, 2.1)	4.4 (3.7, 5.1) [§]	0.2 ^d (0, 0.4) ^E	1.5 (0.9, 2.1)	4.8 (4.1, 5.5)
Total family income (Can\$/yr)						
< 60,000	5.6 (4.7, 6.5)	1.1 (0.6, 1.6) [§]	4.2 (3.6, 4.8) [§]	0.3 (0.1, 0.6) ^E	1.0 (0.4, 1.6) ^E	4.6 (4.2, 5.1)
≥ 60 000	6.6 (5.5, 7.7)	1.8 (1.2, 2.3)	4.3 (3.7, 4.9) [§]	0.6 (0.2, 1.0) ^E	1.6 (1.0, 2.2) [§]	5.0 (4.3, 5.8)
Difficulty walking						
None	6.1 (5.1, 7.1)	1.4 (0.9, 1.8) [§]	4.3 (3.7, 4.9) [§]	0.5 (0.1, 0.8) ^E	1.1 (0.7, 1.6) [§]	5.0 (4.3, 5.6)
Mild to severe	6.3 (5.0, 7.6)	1.7 (1.0, 2.4) [§]	4.1 (3.4, 4.7) ^E	0.5 (0.2, 0.8) ^E	1.6 (0.8, 2.4) [§]	4.7 (4.0, 5.3)
Disease duration, yrs						
< 5	6.3 (5.3, 7.3)	1.6 (0.9, 2.4)	4.1 (3.5, 4.7) [§]	0.6 (0.3, 0.8) ^E	1.5 (0.8, 2.3)	4.8 (4.2, 5.3)
≥ 5	6.1 (5.0, 7.3)	1.4 (1.0, 1.8)	4.3 (3.7, 4.9) ^E	0.4 (0, 0.8) ^E	1.2 (0.7, 1.8)	4.9 (4.2, 5.7)
Difficulty using hands						
None	6.3 (5.2, 7.3)	1.4 (0.9, 1.8)	4.4 (3.8, 5.0) [§]	0.5 (0.2, 0.9) ^E	1.3 (0.7, 1.8) [§]	5.0 (4.4, 5.7)
Mild to severe	6.0 (4.8, 7.3)	1.8 (1.0, 2.5) [§]	3.9 (3.3, 4.6) ^E	0.4 (0, 0.7) ^E	1.5 (0.7, 2.3) [§]	4.6 (3.9, 5.3)
Pain intensity						
No pain	6.4 (5.2, 7.5)	1.6 (1.0, 2.2) [§]	4.2 (3.6, 4.8) [§]	0.6 (0.2, 1.0) ^E	1.5 (0.9, 2.2) [§]	4.9 (4.2, 5.5)
Mild to severe	6.0 (5.0, 7.0)	1.3 (0.9, 1.8)	4.3 (3.6, 5.0) ^E	0.4 (0.1, 0.1) ^E	1.1 (0.6, 1.6) [§]	4.9 (4.2, 5.7)
Medication use						
Never	5.0 (3.8, 6.2) ^a	1.0 (0.4, 1.6) [§]	3.8 (3.0, 4.6) [§]	0.2 (0, 0.4) ^E	0.7 ^g (0.1, 1.2) ^E	4.3 (3.4, 5.2)
At least once weekly	6.6 (5.8, 7.4) ^a	1.7 (1.3, 2.1)	4.4 (3.9, 4.9) ^E	0.6 (0.2, 0.9) ^E	1.6 ^g (1.1, 2.1)	5.1 (4.5, 5.6)
Rehabilitation services received						
< once monthly	6.4 (5.5, 7.2)	1.5 (1.1, 2.0)	4.4 (3.9, 4.8) [§]	0.5 (0.2, 0.8) ^E	1.4 (0.9, 1.9) [§]	5.0 (4.5, 5.5)
≥ once monthly	5.3 (3.4, 7.1) [§]	1.3 (0.7, 1.8) [§]	3.7 (2.7, 4.7) ^E	0.3 (0, 0.7) ^E	0.9 (0.2, 1.6) ^E	4.4 (3.2, 5.7)
Locally available recreational facilities						
No	4.0 ^b (2.6, 5.4) [§]	0.3^c (−0.1, 0.7)^E	3.5 (2.0, 5.1) [§]	0.2 (−0.1, 0.5) ^E	0.3 ^h (−0.1, 0.7) ^E	3.7 [§] (2.4, 5.1)
Yes	6.0 ^b (4.7, 7.3)	1.3^c (0.8, 1.9)[§]	4.3 (3.9, 4.8) ^E	0.5 (0.2, 0.8) ^E	1.2 ^h (0.6, 1.8) [§]	4.8 (4.1, 5.6)
High cost of leisure activities						
Yes	4.6 (3.5, 5.7)	0.7 (0.0, 1.4) ^E	3.7 (2.5, 5.0) ^E	0.1 ^e (−0.1, 0.3) ^E	0.4 (−0.1, 1.0) ^E	4.1 (3.1, 5.1)
No	6.2 (4.7, 7.7)	1.3 (0.8, 1.9) [§]	4.4 (3.9, 4.8) [§]	0.6 ^e (0.3, 0.9) ^E	1.3 (0.6, 2.0) [§]	4.9 (3.9, 5.8)
Child's need for assistance						
Yes	5.0 (3.6, 6.4)	0.9 (0.2, 1.6) [§]	3.9 (3.0, 4.9) ^E	0.2 ^f (−0.1, 0.1) ^E	0.7 (0.2, 1.2) ^E	4.3 (3.3, 5.3)
No	6.8 (5.2, 8.3)	1.5 (1.0, 2.1) [§]	4.4 (4.0, 4.9) [§]	0.6 ^f (0.3, 1.0) ^E	1.6 (0.7, 2.6) [§]	5.2 (4.4, 5.9)

[§] 16.6% < Coefficient of variation ≤ 33.3% → use with caution. ^E Coefficient of variation > 33.3% → unreliable. Pairs statistically significant for α levels ($\alpha = 0.05$) are assigned the same letter; pairs that remain significant based on adjusted Bonferroni correction (i.e., $\alpha/11 = 0.005$) are in bold face. Possible range for diversity leisure scores (minimum, maximum): overall leisure (0–11); active physical (0–3); sedentary (0–6); non-sport skill-based (0–2); formal (0–4); informal (0–7).

different activities overall ($p = 0.029$) and in formal leisure activities ($p = 0.016$; Table 2). Similarly they reported more frequent participation in overall ($p = 0.023$), active physical ($p = 0.024$), non-sport skill-based ($p = 0.037$), and formal ($p = 0.014$) leisure activities (Table 3). Persons who had access to recreational facilities had higher mean diversity and frequency scores for overall and formal activities (Tables 2 and 3). Additionally, having fewer locally available recreational facilities was associated with less frequent participation in physical activities (Table 3). Children and adolescents who required assistance with leisure activities displayed lower mean frequency scores in overall leisure and non-sport skill-based activities (Tables 2 and 3). Frequency of participation in non-sport skill-based activities was lower when costs of activities were higher ($p = 0.004$). When adjusted for

family type 1 error, the differences in mean of physical activity (diversity and frequency) by the availability of recreational facilities and the differences in mean of non-sport skill-based frequency by activity cost and child's need for assistance remained significant at $\alpha < 0.005$.

Families reporting a yearly family income greater than \$60,000 tended to participate in almost twice the number of activities ($p = 0.061$) and more frequently ($p = 0.051$) than families earning less (Tables 2 and 3).

The multiple regression models revealed no significant associations with diversity of leisure activity participation. However, frequency of both overall participation and informal leisure activity were associated with higher family income (Table 4). Also, a report of mild to severe pain intensity was associated with participation in sedentary

Table 3. Difference in mean scores for frequency of participation in overall, active physical, sedentary, non-sport skill-based, formal, and informal leisure activities according to sociodemographic and disease-related factors. Data are mean (95% CI), excluding missing values.

	Overall Leisure	Active Physical	Sedentary	Non-sport Skill-based	Formal	Informal
Age, yrs						
5 to ≤ 11	2.2 (1.8, 2.5)	1.9 (1.4, 2.5)	2.6 (2.4, 2.9) [§]	1.3 (0.6, 1.9) ^E	1.4 (0.8, 2.0)	2.6 (2.4, 2.9)
≥ 12	2.0 (1.6, 2.4)	1.6 (1.0, 2.2)	2.7 (2.2, 3.1) [§]	0.7 (0.2, 1.1) ^E	1.0 (0.7, 1.4)	2.6 (2.1, 3.1)
Sex						
Female	2.2 (1.9, 2.6)	1.9 (1.3, 2.5)	2.7 (2.3, 3.0) [§]	1.3 ^f (0.8, 1.9) ^E	1.5 (1.0, 2.0)	2.6 (2.3, 3.0)
Male	1.9 (1.6, 2.3)	1.6 (1.0, 2.2)	2.6 (2.3, 2.4) [§]	0.5 ^f (0, 1.0) ^E	0.9 (0.3, 1.4)	2.6 (2.2, 2.9)
Total family income, Can\$/yr						
< 60,000	1.9 (1.6, 2.2)	1.3 (0.8, 1.9)	2.6 (2.3, 2.9) [§]	0.7 (0.2, 1.2) ^E	0.9 (0.4, 1.4)	2.5 (2.2, 2.7)
≥ 60,000	2.3 (1.9, 2.7)	2.1 (1.6, 2.6)	2.7 (2.4, 3.1) [§]	1.3 (0.7, 1.9) ^E	1.5 (1.0, 2.0)	2.7 (2.3, 3.1)
Disease duration, yrs						
< 5	2.2 (1.7, 2.6)	1.9 (1.1, 2.7)	2.6 (2.3, 2.9) [§]	1.2 (0.6, 1.9) ^E	1.4 (0.7, 2.1)	2.6 (2.2, 2.9)
≥ 5	2.1 (1.7, 2.4)	1.7 (1.2, 2.3)	2.7 (2.3, 3.0) [§]	0.9 (0.3, 1.5) ^E	1.1 (0.7, 1.6)	2.6 (2.3, 3.0)
Difficulty walking						
None	2.1 (2.4, 2.1)	1.7 (1.2, 2.2)	2.7 (2.4, 2.9) [§]	0.9 (0.4, 1.4) ^E	1.1 (0.7, 1.5)	2.6 (2.3, 2.9)
Mild to severe	2.2 (1.7, 2.7)	3 (1.3, 2.7)	2.6 (2.2, 3.1) ^E	1.3 (0.5, 2.0) ^E	1.5 (0.8, 2.2)	2.6 (2.2, 3.1)
Difficulty using hands						
None	2.1 (2.4, 2.1)	1.7 (1.2, 2.2)	2.7 (2.4, 3.0) [§]	1.0 (0.4, 1.6) ^E	1.2 (0.7, 1.7)	2.6 (2.3, 2.9)
Mild to severe	2.2 (1.7, 2.7)	2.0 (1.3, 2.8)	2.6 (2.3, 3.0) ^E	1.1 (0.4, 1.8) ^E	1.4 (0.6, 2.1)	2.6 (2.3, 3.0)
Pain intensity						
No pain	2.1 (1.7, 2.5)	1.9 (1.2, 2.6)	2.6 (2.3, 2.8) [§]	1.1 (0.4, 1.8) ^E	1.4 (0.8, 2)	2.5 (2.2, 2.9)
Mild to severe	2.1 (1.8, 2.5)	1.7 (1.2, 2.2)	2.8 (2.4, 3.2) [§]	1.0 (0.5, 1.5) ^E	1.1 (0.7, 1.6)	2.7 (2.3, 3.1)
Medication use						
Never	1.7 ^a (1.3, 2.1)	1.1 ^d (0.5, 1.8)	1.9 (1.5, 2.3)	0.5 ^g (-0.3, 1.0) ^E	0.6 ^l (0.1, 1.1)	2.3 (1.9, 2.7)
At least once weekly	2.3 ^a (2.0, 2.5)	2.0 ^d (1.6, 2.5)	2.4 (2.1, 2.6)	1.2 ^g (0.7, 1.7) ^E	1.5 ^l (1.0, 1.9)	2.7 (2.5, 3.0)
Rehabilitation services received						
< once monthly	2.2 (1.9, 2.5)	1.8 (1.4, 2.3)	2.3 (2.1, 2.6) [§]	1.1 ^h (0.6, 1.6) ^E	1.3 (0.9, 1.7)	2.7 (2.4, 2.9)
≥ once monthly	1.8 (0.2, 2.5)	1.5 (0.9, 2.1)	1.9 (1.2, 2.6) [§]	0.8 ^h (-0.1, 1.7) ^E		2.3 (1.7, 3.0)
Locally available recreational facilities						
No	1.4 ^b (1.0, 1.7)	0.4^e (-0.2, 0.9)^E	1.7 (1.2, 2.2) ^E	0.3 ⁱ (-0.2, 0.8) ^E	0.3 ^m (-0.1, 0.6) ^E	2.0 (1.5, 2.5)
Yes	2.0 ^b (1.6, 2.3)	1.6^e (1.0, 2.3)	2.1 (1.8, 2.4) [§]	1.1 ⁱ (0.6, 1.6) ^E	1.1 ^m (0.6, 1.7) [§]	2.5 (2.8, 2.1)
High cost of leisure activities						
Yes	2.0 (1.6, 2.4)	0.8 (0.0, 1.6) ^E	1.8 (1.5, 2.2) ^E	0.3^j (-0.1, 0.7)^E	0.4 (-0.1, 1.0) ^E	2.2 (1.8, 2.6)
No	6.1 (1.2, 1.9)	1.7 (1.0, 2.4) [§]	2.1 (1.8, 2.5) [§]	1.2^j (0.7, 1.7)^E	1.2 (0.6, 1.9) [§]	2.4 (2.1, 2.8)
Child's need for assistance						
Yes	1.6 ^c (1.2, 2.0)	1.1 (0.3, 1.9) ^E	1.8 (1.5, 2.2) [§]	0.4^k (0, 0.8)^E	0.6 (0.2, 1.1) [§]	2.2 (1.8, 2.7)
No	2.2 ^c (1.9, 2.6)	1.9 (1.2, 2.6)	2.4 (2.0, 2.7) [§]	1.4^k (0.8, 1.9)^E	1.6 (0.7, 2.4) [§]	2.6 (2.4, 2.8)

[§] 16.6% < coefficient of variation ≤ 33.3% → use with caution. ^E Coefficient of variation > 33.3% → unreliable. Pairs statistically significant for α levels ($\alpha = 0.05$) are assigned the same letter; pairs that remain significant based on adjusted Bonferroni correction (i.e., $0.05/11 = 0.005$) are in bold face.

(screen time and reading) and informal leisure activity (Table 4). Although statistically insignificant ($p = 0.073$), the effect size (β 0.75, 95% CI -0.07, 1.58) for income on active physical leisure was the largest of all other regression variables (Table 4).

DISCUSSION

A greater proportion of children with arthritis participated in weekly informal activities (owing in large part to sedentary pursuits) compared to formal activities. Although similar trends are found among children without chronic conditions^{25,26}, those with juvenile idiopathic arthritis (JIA) show higher tendencies for sedentary behavior compared to their healthy counterparts²⁷. Interestingly, the percentage of children with arthritis from our study who participated regularly in organized sports closely resembled that of Canadian children in 2005²⁸.

Possibly, those with arthritis who are highly motivated and interested in organized sports may undertake these despite potential challenges posed by their illness²⁹.

Despite the lack of a healthy comparator group, our findings have contributed to illustrating the patterns of leisure participation among Canadian children living with arthritis.

The association of age and sex with participation is frequently studied³⁰. The younger the children, the more active they tend to be^{31,32}; however, similar to other research findings^{30,33}, ours showed no statistically significant association between age and any level of leisure participation. Moreover, we found no association between sex and physical activity, even though others have reported that boys are more physically active than girls^{9,30,33,34}. We found girls to be more involved than boys in non-sport skill-based activities, which mirrors other studies^{9,30,33,34}.

Table 4. Multiple linear regression: factors explaining participation in overall, active physical, sedentary, non-sport skill-based, formal, and informal leisure activities. Models are adjusted for age and sex variables of the child. Data are β coefficient (95% CI).

Factors	Overall Leisure	Active Physical	Sedentary	Non-sport Skill-based	Formal	Informal
Total family income, Can\$/yr						
≥ 60,000	0.45 (0.05, 0.86)*	0.75 (−0.07, 1.58)	0.34 (−0.02, 0.70)	0.29 (−0.36, 0.95)	0.41 (−0.21, 1.03)	0.47 (0.09, 0.85)*
< 60,000 (reference)	—	—	—	—	—	—
Disease duration, yrs						
< 5	−0.23 (−0.71, 0.25)	−0.13 (−1.02, 0.75)	−0.32 (−0.72, 0.07)	−0.09 (−0.97, 0.80)	−0.11 (−0.92, 0.70)	−0.30 (−0.70, 0.11)
≥ 5	—	—	—	—	—	—
Rehabilitation services						
At least once monthly	−0.19 (−1.26, 0.88)	0.07 (−1.28, 1.42)	−0.62 (−1.73, 0.50)	0.71 (−0.53, 1.95)	0.50 (−0.63, 1.62)	−0.58 (−1.73, 0.57)
None (reference)	—	—	—	—	—	—
Pain intensity						
Mild to severe	0.39 (−0.14, 0.93)	0.11 (−0.71, 0.94)	0.61 (0.11, 1.10)*	0.14 (−0.71, 0.99)	0.04 (−0.73, 0.82)	0.59 (0.07, 1.10)*
None (reference)	—	—	—	—	—	—
Medication use						
At least once weekly	0.52 (−0.11, 1.15)	0.84 (−0.18, 1.86)	0.34 (−0.26, 0.95)	0.57 (−0.15, 1.30)	0.71 (−0.10, 1.51)	0.41 (−0.22, 1.04)
None (reference)	—	—	—	—	—	—

* $p < 0.05$.

Families with annual income less than \$60,000 had children who tended to participate less frequently in active physical leisure activities. Organized activities often incur registration fees and the purchase of equipment, and may require parents to drop off the child multiple times per week for lessons or practice. Understandably, parents with lower incomes may find it more challenging to afford these added expenses. Their children might be more inclined to participate in sedentary types of activities. Similarly, higher perceived cost of activities was correlated with lower participation in non-sport skill-based activities. Our findings, however, also support that families with lower income participate less in informal activities. Therefore, expenses related to unorganized activities (e.g., biking, skating, playing video games, Internet use) may still be out of reach for some families.

Although we expected restricted ambulation and hand use to limit leisure in these children, this was not reflected in our results. We did, however, find that those reporting pain engaged more frequently in sedentary and informal activities than those who did not. Increased daily symptoms of pain are linked to reduced participation in social and school activities³⁵. Those experiencing painful symptoms frequently may opt for less-active and unstructured activities to avoid exacerbating symptoms with activity or potentially missing scheduled practices. Further, they may want to refrain from sharing their painful and often invisible symptoms with friends, peers, coaches, and instructors, to avoid scrutiny and disbelief, therefore opting for unstructured activities³⁶. Some children with arthritis may also demonstrate poor self-concept or limited competency for either athletics or other skill-based activities, leading them to prefer free play¹¹. Children with JIA may have gross motor delays³⁷, which may limit confidence in athletic abilities and readiness for sports and other active pursuits³⁸.

Interestingly, the frequency of involvement in overall, active physical, non-sport skill-based and formal activities was higher for those taking weekly medication compared to those who did not. This finding may reflect that regular medication use results in positive effects, whereas those not adhering to a prescribed medication regimen continue to experience effects of the disease, resulting in less participation³⁹. This would need to be substantiated in future studies.

Availability of local recreational facilities was associated with more frequent active physical and formal activities and higher diversity in formal activities, supporting the notion that if the infrastructure that houses community activities is not easily accessible, children may be less inclined to participate. By default, they may engage in sedentary leisure activities and informal activities, which may be more accessible and may or may not require special equipment or lessons from a hired coach or instructor. Then again, parents may favor organized physical activity to free play. Another potential barrier to participation in physical activity may be the lack of physical literacy. In light of their arthritis, certain children may be less inclined to be physically active, which may hinder the development of gross motor skills required to engaged in sports and other physical activities³⁸. Our findings underline how more accessible recreational facilities may encourage participation in active physical and formal leisure activities. Sallis, *et al* showed that a greater number of available play spaces (for example, an ice rink) within walking distance from the home was significantly associated with greater participation in physical activities among healthy children⁴⁰. However, there is a lack of information on the influence of environmental factors on the level of participation in leisure among children with arthritis.

Study limitations. Our study has limitations that should be noted. Our study relied on parental report, which may differ

from that of a child. Research on parents and their children with arthritis indicated that agreement was generally good for pain and function, but lower for adherence to medication use^{41,42}. Although our analysis may have benefited from a comparator, no data on healthy controls were collected for the PALS postcensus survey because it was tailored specifically for participants having reported a disability in the 2006 census, precluding comparison of our results to those of healthy controls. Moreover, the subjective nature of the survey may have led to an overestimation of physical activity levels. The use of accelerometers in future studies may help limit the bias in reporting on physical activity. Lastly, the cross-sectional nature of the study precludes us from accounting for any fluctuations in disease status.

Barriers to involvement in leisure among children with arthritis may extend beyond sociodemographic and disease-related factors to include contextual predictors such as proximity to recreational services. Policy changes resulting in an increased number of publicly funded recreational facilities in a given neighborhood may help improve access to leisure activities among Canadian children with arthritis. Further, to respect the right of each child to engage in leisure activities of their choosing, policies must ensure they are accessible⁴³ for all children regardless of disability⁴⁴. Ultimately, the identification of the determinants of leisure among children with arthritis may allow healthcare professionals to assess the child's health needs and develop health promotion initiatives favoring active lifestyles. Prospective national studies would be valuable in illustrating predictors of leisure while considering the fluctuations in disease status among children with arthritis.

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