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Factors Influencing the Physical Activity Levels of Youths With Physical and Sensory Disabilities

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This study examined gender, disability type, age, and specific diagnostic category in relation to habitual physical activity levels (HPA), perceived fitness (PF), and perceived participation limitations (PPL) of youths, ages 6 to 20 years, in Ontario, Canada. Data collected through a mailed survey (Longmuir & Bar-Or, 1994) were reanalyzed using ANOVA and chi square statistics to provide new information. The 458 girls and 499 boys were classified by disability type: physical, chronic medical, visual, and hearing. Significant differences ($p < .01$) were between (a) HPA and disability type, specific diagnostic category, and age; (b) PF and disability type; and (c) PPL and disability type. Gender did not influence the results. Youths with cerebral palsy, muscular dystrophy, and visual impairment had the most sedentary lifestyles.

Physical Activity Levels of Youths with Physical and Sensory Disabilities

Research indicates low fitness and physical activity levels among youths with disabilities (Canada Fitness Survey, 1986; Longmuir & Bar-Or, 1994; Suzuki, Saitoh, Tasaki, Shimomura, Makishima, & Hosoy, 1991; Watkinson & Bentz, 1986). However, specific measures of habitual activity level are needed in order to identify those disability groups that have the greatest risk of a sedentary lifestyle and therefore should be the highest priority for the development of intervention programs (Sallis & Hovell, 1990). Only two studies in the 1990s examined the habitual activity levels of a large sample of youths with disabilities.

Longmuir and Bar-Or (1994) investigated the habitual activity of 987 youths with disabilities who completed a mailed survey that was a modification of the

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Canada Fitness Survey (1983a). Results indicated that (a) 39% of youths with disabilities were active while 29% were sedentary, (b) lifestyles became more sedentary with increasing age, and (c) data were similar for boys and girls. Participants included youths with physical disabilities, chronic illnesses, and visual and hearing impairments.

A study to examine the nutritional status of youths with disabilities included measures of daily pedometer counts (Suzuki et al., 1991). Pedometers were worn for one 24-hr period (weekday) by 473 boys and 329 girls with hearing, visual, physical, and cognitive disabilities. Results indicated that the mean pedometer counts of those with hearing impairments were higher (more active) than those with visual or cognitive disabilities. Youths with physical disabilities had significantly lower pedometer counts than all other groups ($p < .05$). Suzuki et al. noted that the activity data varied considerably by age and gender, but these data were not reported.

The studies of Longmuir and Bar-Or (1994) and Suzuki et al. (1991) indicate that youths with impairments have a sedentary lifestyle. Further analyses of the large database of information about physical activity and youths with disabilities created through previous research (Longmuir & Bar-Or, 1994) present a unique opportunity to identify factors that may be associated with the development of sedentary lifestyles within a sample of youths with disabilities that is representative of a large Canadian province.

The purpose of this study, therefore, was to reanalyze the data previously collected in order to determine the influence of (a) gender; (b) disability type; (c) age; and (d) specific diagnostic category on measures of habitual physical activity levels, perceived fitness, and perceived participation limitations. Four hypotheses were examined for each dependent variable:

1. There is no significant difference between genders.
2. There is no significant difference between disability types.
3. There is no significant difference by age.
4. There is no significant difference between specific diagnostic categories.

Method

Participants

This paper presents a reanalysis of data on 987 youths (458 girls and 499 boys) in Ontario, Canada, ages 6 to 20 years ($M = 12.89$, $SD = 3.61$) (Longmuir & Bar-Or, 1994). This database was established through (a) the help of 18 provincial service agencies that mailed surveys to the children for whom they provided services ($n = 1560$) and (b) the responses of volunteers to public requests for participants ($n = 135$). The sampling design was purposive, with all participants meeting three criteria: (a) existence of a permanent disability, (b) 6 to 20 years of age, and (c) capability to understand and respond to the survey.

The number of participants within selected age groups (6-10 years, 11-14 years, 15-20 years), gender, and disability strata was proportional to the Ontario population of youths with disabilities. A minimum of 10 participants were assigned to each cell. The disability strata, based on agency or parental reports, were:

1. Physical Disability (PD): muscular and neurological impairments affecting gross motor skill or mobility (e.g., cerebral palsy, spina bifida, muscular dystrophy, head injury), $n = 342$
2. Chronic Medical Conditions (CM): impairments requiring continuous monitoring by medical professionals (e.g., cystic fibrosis, kidney disease, cardiac defects, arthritis), $n = 372$
3. Hearing Impairments (HI): impairments that reduce the volume or type of sounds detected (e.g., deaf, hard of hearing), $n = 164$
4. Visual Impairments (VI): impairments that reduce visual acuity or the visual field (e.g., partial or total loss of sight), $n = 77$

Instrument

Data for this study came from a modified version of the Canada Fitness Survey instrument (1983a), which was validated to enable mail distribution (McLean & Longmuir, 1990). Test-retest reliability ranged from 0.66 to 1.00. The instrument included familial activity levels, school physical education, activities of daily living (e.g. chores), activity at work, and leisure time physical activity. Perceived limitations to physical activity and activity interests, such as current activities, future interests, and desired activity settings (e.g., coparticipants, location, time) were also included.

Procedure

Data were collected through a mail survey, as previously reported (Longmuir & Bar-Or, 1994). Telephone follow-up, via researcher or agency staff, was completed to encourage participation. Surveys were available in English, French, or Braille, and sign language interpreters were used by some respondents. Survey materials were sent to the participants' parent or guardian along with a letter explaining the purpose of the study. If the survey was returned, it was assumed that the parent had given consent for participation.

Habitual activity scores were calculated for each participant as a weighted sum of scores for (a) involvement in activities done all year (50 points); (b) summer activities (25 points); (c) winter activities (25 points); (d) perceived fitness relative to peers (6 points); (e) household chores, transport to school, activity at school and work, leisure time activity, and physical education participation (5 points each); (f) competitive sport participation (4 points); (g) intensity of activity with friends (3 points); and active clubs or lessons (2 points). Scores for each factor were based on the reported frequency, duration, and intensity of participation (Longmuir & Bar-Or, 1994). Activity levels were assigned based on the total habitual activity score: active = > 24 points; moderately active = 16 to 24 points; sedentary = < 16 points.

Perceived fitness relative to peers was determined by the question: "Think about yourself and your friends who are the same age as you. Would you say that you can: do more, do less, or do the same amount of exercise?" Contribution of perceived fitness to the habitual activity score was determined via points awarded based on the level of fitness indicated by the response (Do more = 6 points; Same = 3 points; Do less = 0 points).

Perceived limitations were determined by asking "Are you limited in the type or amount of physical activity you can do?" Responses were coded as Yes or Sometimes = limited; No = not limited.

Data previously collected (Longmuir & Bar-Or, 1994) were reanalyzed by ANOVA and chi-square, using the Statgraphics statistical program (Statgraphics 4.0, 1989) to provide new information. An alpha level of $p < .01$ was used for all statistical tests. Effect size (ES) (omega squared or w index) was calculated and reported when findings were significant (Sutlive & Ulrich, 1998).

Results

Activity levels, perceived fitness, and perceived participation limitations varied by disability type and specific diagnostic category (Table 1). The influence of age and gender was similar to the findings previously reported (Longmuir & Bar- Or, 1994) for all participants ($n = 987$). Youths with VI and PD had significantly lower activity levels, $F(3, 953) = 29.86$, $p = .001$; ES = 0.08. Among those with PD, youths with cerebral palsy and muscular dystrophy had the highest incidence of sedentary lifestyles, $F(3, 327) = 16.55$, $p = .001$; ES = 0.12.

Habitual Physical Activity Levels

Gender. The hypothesis that there was no significant difference between genders for the habitual activity level was supported for the participants as a whole, $X^2 (2, 957) = .65$, $p = .72$, and for each disability type. Therefore, the results for boys and girls were combined for subsequent analyses.

Disability Type. Levels of habitual activity differed markedly by disability type (Table 2). The percentage of youths with CM and HI who were active (47% and 53%, respectively) was significantly higher than for youths with PD (26%) or VI (27%), $X^2 (6, 957) = 59.73$, $p = .001$; ES = 0.25. The percentage of moderately active youth (29% to 35%) was similar for all disability types. The percentage of sedentary youth varied by disability: 39% for PD and VI, 24% for CM, and 17% for HI.

Age. The mean ages of active, moderately active, and sedentary participants within each disability type and specific diagnostic category were compared. For the total group, there was a significant difference by age on activity level, $F(2, 954) = 9.75$, $p = .001$; ES = 0.02. Active and moderately active participants were younger than those who were sedentary. There was no significant difference between three activity levels on age for all subgroups except chronic medical conditions and congenital heart disease.

Sedentary participants with chronic medical conditions (CM) were significantly older than more active youths with CM, $F(2, 371) = 8.90$, $p = .001$; ES = 0.04. Active and moderately active youths with congenital cardiac defects were significantly younger than sedentary youths with congenital cardiac defects, $F(2, 264) = 6.08$, $p = .003$; ES = .04.

Specific Diagnostic Category. Activity levels were significantly influenced by the specific diagnostic category for PD (Table 2). Youths with head injuries (49%) and spina bifida (40%) reported significantly more activity than those with cerebral palsy (18%) or muscular dystrophy (13%), $X^2 (6, 331) = 43.77$, $p = .001$; ES = .26. Diagnostic category did not significantly influence activity level for those with CM.

Table 1 Demographic Data and Findings by Type of Disability

Disability X gender	Habitual activity			Perceived fitness relative to peers			Perceived limitation	
Age	*N*	*M*	*SD*	More	Same	Less	Yes	No
Physical disability	342	19.2	10.7	26	61	66	262	73
Cerebral palsy	196	16.9	9.7	20	64	99	158	34
Female	93	16.7	8.5	11	31	48	77	12
6-10	38	16.8	7.5	2	13	22	31	6
11-14	23	18.3	9.5	3	8	11	18	3
15-20	32	15.5	9.0	6	10	15	28	3
Male	103	17.1	10.6	9	33	51	81	22
6-10	28	16.6	10.2	2	8	16	19	9
11-14	36	18.9	10.7	2	9	20	32	4
15-20	39	15.8	10.9	5	16	15	30	9
Head injury	51	24.7	11.7	13	25	11	24	26
Female	18	24.4	15.1	6	8	3	6	11
6-10	2	32.0	6.0	1	1	0	0	2
11-14	7	33.5	13.6	3	4	0	2	5
15-20	9	15.6	12.9	2	3	3	4	4
Male	33	24.9	9.7	7	17	8	18	15
6-10	8	27.6	10.6	3	3	2	4	4
11-14	6	30.1	7.8	1	3	2	2	4
15-20	19	22.1	9.2	3	11	4	12	7
Spina bifida	60	24.8	9.7	13	31	15	51	9
Female	30	23.1	8.7	8	14	8	26	4
6-10	12	25.5	7.4	2	6	4	9	3
11-14	10	19.8	5.7	3	5	2	9	1
15-20	8	23.5	12.6	3	3	2	8	0
Male	30	26.5	10.5	5	17	7	25	5
6-10	9	27.5	11.5	3	5	0	7	2
11-14	12	27.7	12.6	2	4	6	9	3
15-20	9	23.9	6.0	0	8	1	9	0
Muscular dystrophy	24	14.7	9.2	2	6	16	20	3
Female	10	18.0	11.7	1	4	5	7	3
6-10	2	14.8	18.0	0	1	1	2	0
11-14	2	33.0	7.0	1	0	1	1	1
15-20	6	14.0	7.7	0	3	3	4	2
Male	14	12.3	6.3	1	2	11	13	0
6-10	4	16.6	3.3	0	1	3	3	0
11-14	4	16.2	4.6	1	0	3	4	0
15-20	6	6.9	4.6	0	1	5	6	0
Chronic medical condition	374	25.9	13.4	57	103	207	140	228
Congenital cardiac defect	267	26.0	13.1	42	154	67	87	175
Female	133	25.0	12.0	22	76	33	43	86
6-10	38	25.7	10.0	3	29	6	8	28
11-14	46	26.6	11.4	8	24	12	17	27
15-20	49	23.0	13.7	11	23	15	18	31
Male	134	26.9	14.1	20	78	34	44	89
6-10	38	27.1	12.0	5	24	8	13	24
11-14	53	30.7	14.8	9	29	15	14	39
15-20	43	22.1	13.8	6	25	11	17	26

(*continued*)

Table 1 (*continued*)

Disability X gender	Habitual activity			Perceived fitness relative to peers			Perceived limitation	
Age	*N*	*M*	*SD*	More	Same	Less	Yes	No
Cystic fibrosis	33	27.1	14.5	4	18	11	10	23
Female	15	25.0	14.0	1	10	4	6	9
6-10	5	20.7	4.4	0	4	1	3	2
11-14	6	35.2	15.1	0	5	1	2	4
15-20	4	15.0	11.8	1	1	2	1	3
Male	18	28.9	15.0	3	8	7	4	14
6-10	6	27.9	12.9	1	3	2	2	4
11-14	6	27.4	20.9	1	1	4	1	5
15-20	6	31.4	12.5	1	4	1	1	5
Arthritis	25	22.2	13.1	1	15	9	13	11
Female	14	22.1	11.1	0	9	5	9	5
6-10	4	21.1	10.5	0	3	1	2	2
11-14	6	25.4	12.9	0	5	1	3	3
15-20	4	18.3	10.3	0	1	3	4	0
Male	11	22.3	15.9	1	6	4	4	6
6-10	5	19.0	9.1	0	3	2	3	2
11-14	1	48.4	0.0	0	1	0	0	1
15-20	5	20.4	18.9	1	2	2	1	3
Kidney disease	17	22.5	11.0	4	5	7	15	2
Female	10	25.1	12.0	4	2	4	9	1
6-10	2	27.4	7.7	0	0	2	2	0
11-14	4	20.5	11.0	1	2	1	3	1
15-20	4	28.5	15.7	3	0	1	4	0
Male	7	18.7	8.8	0	3	3	6	1
6-10	1	16.5	0.0	0	0	0	1	0
11-14	4	23.0	9.2	0	2	2	3	1
15-20	2	11.4	4.8	0	1	1	2	0
Hearing impairment	164	28.7	14.5	26	92	34	33	130
Female	82	27.6	12.2	12	44	22	18	64
6-10	17	31.7	12.4	3	10	4	6	11
11-14	25	29.5	14.7	1	15	8	9	16
15-20	40	24.8	9.9	8	19	10	3	37
Male	82	30.0	16.5	14	48	12	15	66
6-10	20	28.4	16.8	6	10	1	2	18
11-14	22	32.0	14.6	4	11	6	4	17
15-20	40	29.3	17.6	4	27	5	9	31
Visual impairment	77	19.8	11.2	10	35	26	61	12
Female	32	18.2	11.4	5	13	13	27	3
6-10	8	18.6	8.9	0	4	4	6	2
11-14	13	19.0	12.4	2	5	6	11	1
15-20	11	17.1	12.7	3	4	3	10	0
Male	45	20.9	11.1	5	22	13	34	9
6-10	15	20.2	6.9	1	9	4	12	3
11-14	15	21.8	12.8	2	6	5	10	3
15-20	15	20.6	13.1	2	7	4	12	3

Table 2 Number of Participants with Each Habitual Activity Rating

Disability	*N*	Active	Moderate	Sedentary
All participants	957	372	302	283
Physical disability	342	89	118	135
Cerebral palsy	196	36	64	96
Head injury	51	25	15	11
Spina bifida	60	24	28	8
Muscular dystrophy	24	3	9	12
Chronic medical condition	374	175	109	90
Cong. cardiac defect	267	125	79	63
Cystic fibrosis	33	16	11	6
Arthritis	25	8	9	8
Kidney disease	17	5	6	6
Hearing impairment	164	87	49	28
Visual impairment	77	21	26	30

Perceived Fitness Level

Gender. Gender did not significantly influence perceived fitness relative to peers, either for the study sample as a whole, X^2 (2, 916) = 1.12, $p = .57$, or by disability type. Therefore, the data on perceived fitness level were analyzed for boys and girls combined.

Disability Type. Perception of fitness relative to peers was significantly influenced by disability type, X^2 (6, 916) = 35.77, $p = .001$; ES = 0.20. A small percentage (14% to 17%) of participants considered themselves to be *more fit* than their peers, regardless of disability type (Table 1). Participants with CM (72%) and HI (78%) considered themselves to be more fit or as fit as their peers (16% and 56%, 17% and 61%, respectively). Participants with PD (85%) and VI (86%) considered themselves to be either as fit or less fit than their peers (40% and 45%, 49% and 37%, respectively).

Age. Perceived fitness relative to peers was not significantly related to age, $F(2, 913) = 0.89$, $p = .41$. Participants who stated that they were more fit than their peers were the same age ($M = 13.20$, $SD = 3.44$, $n = 141$) as those who stated they were less fit ($M = 12.86$, $SD = 3.68$, $n = 311$) or the same ($M = 12.74$, $SD = 3.60$, $n = 464$).

Specific Diagnostic Category. Among participants with PD, those with spina bifida (53%) or a head injury (51%) reported being *as fit* as their peers (Table 1). A significantly higher proportion of those with cerebral palsy (54%) or muscular dystrophy (67%) reported being *less fit* than their peers, X^2 (6, 315) = 31.70, $p = .001$; ES = 0.32. Perceived fitness relative to peers was not related to specific diagnostic category for youths with CM.

Perceived Participation Limitations

Gender. Perceived limitations for physical activity were not influenced by gender either for disability type, X^2 (1, 939) = 0.33, $p = .56$, or specific diagnostic category. Therefore the data were analyzed for girls and boys combined.

Disability Type. Most youths with PD and VI (78% and 84%, respectively) reported being limited in physical activity participation (Table 1). Among those with CM (62%) or HI (80%), a significantly larger proportion reported that they were not limited, X^2 (3, 939) = 215.98, $p = .001$; ES = 0.48.

Age. Age was not significantly related to perceived participation limitations, either for the study sample as a whole, $F(1, 937) = 1.07$, $p = .30$, or by disability type. Participants who said they were limited ($n = 496$, $M = 13.01$, $SD = 3.68$) were the same age as those who said they were not limited ($n = 443$, $M = 12.77$, $SD = 3.54$).

Specific Diagnostic Category. Perceived activity limitation was significantly influenced by the specific diagnostic category for youths with PD or CM (Table 1). Youths with head injuries (48%) were less likely, X^2 (3, 325) = 30.91, $p = .001$; ES = .31, to state that they were limited than participants with other physical disabilities (cerebral palsy 82%, spina bifida 85%, muscular dystrophy 87%). Youths with cystic fibrosis (30%) or cardiac defects (33%) were less likely, X^2 (3, 336) = 24.37, $p = .001$; ES = 0.27, to state that they were limited in their ability to participate in physical activity than those with arthritis (54%) or kidney disease (88%).

Discussion

Data were presented on the habitual activity levels of 957 youths with disabilities, 6 to 20 years of age. The sample used in this study is unique in its size, scope, and the distribution of disability types that were representative of a large Canadian province. The hypotheses that habitual activity level, perceived fitness, and perceived activity limitation would not differ by disability type or specific diagnostic category were not supported by the data obtained. Youths with HI or CM had higher levels of habitual activity, perceived themselves to be as fit or more fit than their peers, and were less likely to be limited in physical activity participation than youths with PD or VI (Table 1). Specific diagnostic category also significantly influenced the three physical activity variables evaluated. These results indicate that some youths with impairments have an increased incidence of sedentary lifestyles relative to youths with other disabilities or medical conditions.

The main findings of this study were that youths with visual impairment or physical disabilities, specifically cerebral palsy and muscular dystrophy, have significantly lower levels of habitual physical activity, consider themselves less fit relative to their peers, and report more limitations for physical activity participation. Gender and age effects were not observed among these participants, presumably because of their initially low levels of activity. Since physical disability was defined as neurological and musculoskeletal conditions that affect gross motor skill or mobility, it is not surprising that these participants reported significantly lower levels of activity.

The results for youths with visual impairment or cerebral palsy are also supported by the published literature. Other researchers have reported that activity levels and mobility are limited, and energy requirements for ambulation are increased for those with visual impairments (Hopkins, Gaeta, Thomas, & Hill, 1987; Longmuir, 1998; Shindo, Kumagai, & Tanaka, 1987; Skaggs & Hopper, 1996). Similar results were obtained by van den berg-Emons, Saris, de Barbanson, Westerterp, Huson & van Baak (1995) who used doubly-labeled water to evaluate total energy expenditure among children with and without cerebral palsy ($N = 20$). Their results indicated that youths with cerebral palsy were significantly less active ($p < .05$) than a control group of youths without disabilities. Research has also indicated that children with neuromuscular disabilities and chronic medical conditions often have a higher rating of perceived exertion (RPE) for a given workload than their peers without disabilities (Bar- Or & Reed, 1987; Ward, Blimkie, & Bar-Or, 1986). Further research is required to determine whether increased ratings of perceived exertion are a cause of the low levels of habitual activity observed. Given the low activity levels observed (Table 2), youths with cerebral palsy, muscular dystrophy, and visual impairment are at particular risk of sedentary lifestyles throughout their lifespan. Further research is required to identify the cause(s) of the sedentary behavior in order that physical activity professionals can develop effective intervention strategies to promote physically active lifestyles. It was not within the scope of this research to determine whether the physical disability or visual impairment was solely responsible for the reduced level of activity, or whether additional limitations were imposed by the participants' perceptions of their ability to participate. Since the less active participants (PD and VI) also perceived themselves to be less fit than their peers, it is possible that a lack of fitness (either real or perceived) was contributing to the lower levels of physical activity.

Gender

The hypotheses that habitual activity, perceived fitness, and perceived activity limitation would not differ by gender were supported by this research. The lack of gender influence on activity levels was surprising and consistent for all participant groups. These results contrast with published data for youths without disabilities (Canada Fitness Survey, 1983b; Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucette, Iannotti, Killen, Klesges, Petray, Rowland, &Taylor, 1992) that indicate that girls are less active than boys are. In contrast, van den berg-Emons et al. (1995) found no gender differences among children with cerebral palsy. It is possible that the presence of a disability limits the participants' physical activity to a lower level, one that is more commonly associated with "female" levels of participation. Further investigation is required to determine why anticipated gender differences were not identified within the sample of youths with disabilities since the type of intervention strategies required will be influenced by whether the girls' activity levels are higher, or the boys' are more sedentary than among youths without disabilities.

Age

The study hypothesis that age would not be significantly different was rejected for habitual activity level but was accepted for perceived fitness and perceived participation limitation. The influence of age on activity level was similar to that reported for youths without disabilities (Canada Fitness Survey, 1983b). A decline in activity occurred with age for participants with physical disabilities or chronic medical conditions. The lack of age effect for participants with a hearing impairment was probably influenced by the strong physical activity component at the residential schools from which most participants were recruited. In fact, physical education was mandatory in all grades for these students, in contrast to public schools that require physical education only during the elementary years. The reason for the lack of age effect for participants with visual impairments is unknown, although the low levels of activity among the youngest participants, and the relatively small sample size ($n = 77$) may have limited our ability to detect a decline with age. The lack of age effect among participants with cerebral palsy may also have been influenced by the low activity levels among the younger participants.

Type of Disability and Specific Diagnostic Category

Physical activity levels, perceived fitness relative to peers, and perceived activity limitations were all influenced by the type of disability and specific diagnostic category (Table 1). Therefore, these hypotheses were rejected. Participants with hearing impairments were recruited primarily through schools for Deaf youths, most of which were residential and provided extensive in-school and after-school activity programs. Therefore, it is not surprising that these participants had the highest levels of physical activity participation (Table 2). These results are congruent with previous research indicating that the psychomotor behaviors of youths with hearing impairments are more similar to, than different from, their peers without a hearing impairment (Goodman & Hopper, 1992). Among youths with cardiac defects, cystic fibrosis, arthritis, or kidney disease, medical status varied considerably (e.g., preoperative, palliative repair, full repair for cardiac defects) and no doubt influenced physical activity.

For most participants, reported activity levels and perceived participation limitations followed the expected pattern. However, youths with arthritis, kidney disease, and spina bifida have active lifestyles despite reporting significantly limited opportunities for participation (Table 1). Activity levels among youths with arthritis or kidney disease were similar to the active lifestyles reported by other youths with chronic medical conditions. The relatively higher activity levels of participants with spina bifida (40% active, 47% moderately active; Table 2) also require further investigation given that 85% of these participants said that they were limited in their ability to participate in physical activity. Other researchers (Coutts, McKenzie, Loock, Beauchamp, & Armstrong, 1993) have found "normal" fitness levels among youths with spina bifida. This supports the suggestion that low levels of fitness in this group result from a sedentary lifestyle and are not an inevitable consequence of the disability. The growth in, and increased awareness of, wheelchair sports may also have contributed to the active lifestyles observed since 65% of youths with spina bifida used a manual wheelchair for mobility. Connor-Kuntz, Dummer, and Paciorek (1995) also found that youths with spina bifida who used a manual wheelchair were more likely to be active in physical education and after-school sports than those who walked without assistive devices.

Youths with cerebral palsy may have had fewer opportunities to participate in wheelchair sports since a much smaller percentage of these individuals (28%) utilized a wheelchair for activities of daily living. In addition, physical therapists may not encourage wheelchair sports for youths without or with minimal movement limitations since interest in gait training declines once a child can effectively propel a wheelchair (Garber, 1991). Individuals with cerebral palsy are often allowed access only to cerebral palsy sports programs, which are governed by different organizations than wheelchair sports. While CP sport organizations offer training and competition in both wheelchair and ambulatory sports, opportunities for local participation are often limited. Therefore, the low activity levels among participants with cerebral palsy may relate to their receiving little encouragement or opportunity to participate in physical activity or cerebral palsy sport programs. Clearly, creating more physical activity opportunities for youths with cerebral palsy should be given a high priority.

It is enticing to attribute the low levels of physical activity among participants with muscular dystrophy to the rapid deterioration of voluntary movement that accompanies the Duchenne type. However, additional factors require investigation since 42% of the participants were girls and therefore probably had forms of muscular dystrophy or muscular atrophy that were not the Duchenne type. Also of interest is the finding that 63% of the participants (50% of boys, 80% of girls) did not require a wheelchair for activities of daily living. Physical activity programs designed for youths with muscular dystrophy often focus on swimming or games that utilize a wheelchair (e.g., power wheelchair hockey, archery, bowling, fishing; Sherrill, 1998). Additional opportunities for physical activity should be developed for youths with muscular dystrophy who may have reduced movement ability but do not utilize a wheelchair.

Although activity levels were higher among youths with chronic medical conditions or hearing impairments, the percentage of active youth was only about 50% (Table 2). This is well below desired health promotion targets that suggest that 90% of youths should be regularly involved in physical activity (U.S. Public Health Service, 1991). That half of the most active subgroups with disabilities rate themselves as moderately active or sedentary is a serious concern in terms of long term health implications (Sallis et al., 1992). Given that activity levels in adulthood are usually lower than during childhood (Godin & Shephard, 1986; Kemper & van Mechelen, 1995; Sallis et al., 1992), and prior exercise experience is a significant determinant of adult exercise behavior (Bar-Or, 1994; Godin, Valois, Shephard, & Desharnais, 1987; Sallis et al., 1992), additional efforts are required to enhance the physical activity levels of all youths with disabilities.

Sampling bias is always a concern in survey research, but every attempt was made to assure that participants in this study were representative of the Canadian population. All of the participants were living in the community with their own families except for most of the children with hearing impairments. These individuals attended residential schools but usually returned home on weekends. Other participants were recruited through 18 organizations providing services to youths with special needs. These included medical clinics, family support groups, and special education facilities believed to be representative of all such service agencies in Ontario. Public announcements requesting volunteers also assured representation.

A precise medical diagnosis describing the severity of the impairment was available through only one agency. If it is assumed that youths with mild disabilities do not access agency services, then there might be concern about sampling bias. However, our review of individual and agency records indicated that youths with diverse severity levels do access agency services. It seems prudent, nevertheless, to generalize our findings only to youths who use or have used agency services.

Since this research excluded youths who did not have the cognitive capacity to respond to the survey, additional research is required to determine the activity behaviors of youths who have intellectual disabilities in addition to a physical disability.

Conclusions

Disability significantly influences habitual physical activity levels, perceived participation limitations, and perceived fitness relative to peers. Gender and age influences on activity level are not consistent and may be limited by the influence of the specific condition. Youths with hearing impairments and chronic medical conditions are more active than those with physical disabilities or visual impairments. Participants with cerebral palsy, muscular dystrophy, and visual impairments are the most limited.

Our findings suggest that new initiatives are required to develop effective intervention strategies for youths with disabilities. Of particular importance are strategies that address the needs of youths with disabilities that limit mobility but do not require the use of a wheelchair for daily living activities. This is particularly important for youths with cerebral palsy, muscular dystrophy, or visual impairment.

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