Published in final edited form as:
Child Health Care. 2009 ; 38(4): 321–351. doi:10.1080/02739610903237352.

Predictors of Change Over Time in the Activity Participation of Children and Youth with Physical Disabilities

Gillian King[1], **Janette McDougall**[2], **David DeWit**[3], **Theresa Petrenchik**[4], **Patricia Hurley**[4], and **Mary Law**[4]

Gillian King: gking27@uwo.ca; Janette McDougall: janettem@tvcc.on.ca; David DeWit: ddewit@uwo.ca; Theresa Petrenchik: petrent@mcmaster.ca; Patricia Hurley: phurley@mcmaster.ca; Mary Law: lawm@mcmaster.ca

[1] Bloorview Research Institute, 150 Kilgour Road, Toronto Ontario Canada M4G 1R8

[2] Thames Valley Children's Centre, 779 Base Line Road East, London Ontario Canada N6C 5Y6

[3] Centre for Addiction and Mental Health, 100 Collip Circle, Suite 200, UWO Research Park, London Ontario Canada N8G 4X8

[4]*CanChild* Centre for Childhood Disability Research and School of Rehabilitation Science, McMaster University, 1400 Main Street West, Room 408, Hamilton Ontario Canada L8S 1C7

Abstract

Little is known about predictors of change over time in the intensity of the leisure and recreational activity participation of children with physical disabilities. This study reports data from 402 children/youth with physical disabilities (216 boys and 186 girls), ages 6 to 15, collected on three occasions over a 3-year period. Latent growth curve modeling was used to determine the significant child, family, and community predictors of change in the intensity of their participation in five types of activities (recreational, active physical, social, skill-based, and self-improvement). Differences in predictors were examined for boys versus girls, and older versus younger children. Significant predictors of change were found only for recreational and active physical activities. The findings indicate that factors associated with change in participation intensity are dependent on the type of activity, and vary as a function of children's sex and age. Implications for research and service delivery are discussed, including the importance of a contextualized, holistic, and developmental approach to intervention.

Keywords

participation; activity; longitudinal; leisure; recreation; children; disability

The intensity of children's participation in leisure and recreational activities is associated with their well-being (Brown & Gordon, 1987; King, Law, King, Rosenbaum, Kertoy et al., 2003; Larson & Verma, 1999). A variety of positive developmental processes and related outcomes result from participation in different types of activities, including improved school outcomes (Masten & Coatsworth, 1998) and greater social adjustment (i.e., fewer emotional and behavioral problems, reduced loneliness) (Sandler et al., 2004; Simpkins et al., 2005). There is a critical gap, however, in our knowledge of the factors that promote the participation of children with disabilities (Mancini et al., 2000). Their participation in everyday activities is a goal shared by parents, service providers, and organizations involved in children's

Corresponding author: Dr. Gillian King (gking27@uwo.ca).

rehabilitation (Law et al., 2006). Remarkably, the factors that enable, promote, and reinforce the participation of children with physical disabilities have not been comprehensively studied.

In comparison with peers without disabilities, adolescents and young adults with disabilities display less diverse participation (Margalit, 1981), greater participation in passive recreational activities (such as watching television) (Brown & Gordon, 1987), and less social participation (Stevenson et al., 1997). Furthermore, boys and girls with physical disabilities participate in different activities compared to their able-bodied peers (King et al., 2008). Little is known, however, about the influence of child, family, and environmental factors on changes over time in the intensity of children's participation in various activities, and about the influence of children's sex and age on these changes. The purpose of the present study, therefore, was to examine predictors of change in the intensity of the participation of children/youth with physical disabilities.

There have been few longitudinal studies of children with chronic disorders (Wallander & Varni, 1998) and no previous studies of predictors of change in participation intensity for any population of children (general or in special circumstances). It is important to determine whether change occurs, the nature of this change (increasing or decreasing participation), and whether changes are due to child factors (e.g., interests and abilities), family factors (e.g., family interests and income), and/or environmental factors (e.g., the availability of activities or the presence of environmental barriers). Understanding the nature of these predictive factors is an important area for research (Bouffard et al., 2006), as it can assist in the development of preventive strategies and policies/programs to ensure participation (Taylor et al., 1998).

It is rare for studies to examine a full range of activities for children/youth. Studies of youth without physical disabilities have tended to focus on a single domain or small cluster of activities, leading to incomplete knowledge of the patterns of participation in leisure and recreational activities outside of school (Ben-Arieh & Ofir, 2002; Feldman & Matjasko, 2007). Accordingly, we set out to examine participation in a comprehensive set of out-of-school leisure and recreational activities, as measured by the Children's Assessment of Participation and Enjoyment (King et al., 2004). Five types of activities were examined, including recreational activities (e.g., playing board games, watching television, playing with a pet), active physical activities (e.g., playing sports), social activities (e.g., talking on the phone, visiting with others), skill-based activities (e.g., learning to dance, playing a musical instrument), and self-improvement activities (e.g., reading, doing homework, chores).

It is important to recognize that the predictors of participation intensity at a *given point in time* may be different from the predictors of *rates of change*. For example, children's preferences for particular types of activities are associated with their levels of participation intensity (King, Law, Hanna et al., 2006), but preferences may be quite stable and, therefore, unlikely to be associated with *change* in activity intensity over time. Both cross-sectional and longitudinal approaches are therefore required for a full understanding of the determinants of participation patterns, and changes in these patterns. Understanding the nature of the variables that are most highly associated with change and how they operate together to increase or decrease participation will add to our knowledge about the complexities of participation, and inform us about combinations of variables that may be most highly amenable to intervention.

In the present study, we report results from a prospective, longitudinal investigation of the predictors of the participation of boys and girls with a variety of physical disabilities, in which participation was assessed on three occasions over a 3-year period. We examined the predictors of change for using latent growth curve modeling, and we examined whether there were differences in predictors for boys versus girls, and for older versus younger children. Few studies of everyday activities have included children in middle childhood (Ben-Arieh & Ofir,

2002). It is important to know what leads both younger (6 to 10 years) and older children (11 to 15 years) to change their participation in activities (Simpkins et al., 2005), and to obtain a developmental perspective by examining similarities and differences for these two groups.

Selection of Predictor Variables

The selection of predictor variables was informed by (a) a conceptually- and empirically-based model of child, parent/family, and community predictors of children's participation (King, Law, King, Rosenbaum, & Kertoy, 2003), based on Bronfenbrenner's bioecological model (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 2006), and (b) the findings of a study identifying the significant predictors of children's formal and informal participation intensity at a single point in time (King, Law, Hanna et al., 2006). The significant predictors in this study included child variables (child functional ability, child preferences), family variables (family cohesion, family intellectual-cultural orientation, family recreational orientation), and community variables (supportive relationships for the child; unsupportive physical, social, and attitudinal environments).

Several other variables were included that we felt might be associated with *change* in children's participation intensity, including parent ethnicity, household income, family life changes in the past four months, parent physical and mental health, and children's mental health difficulties (i.e., emotional functioning, behavioral functioning, hyperactivity, peer problems, and prosocial behavior). Previous studies have indicated that ethnicity, family life events, and parent mental and physical health have important effects on children's activities (American Academy of Pediatrics, 2003; Bouffard et al., 2006). Family income has been found to exert an important, although at times indirect, influence on the participation of children with physical disabilities (Finch et al., 2001; King, Law, Hanna et al., 2006). In addition, we felt that children's emotional and behavioral problems might be particularly potent predictors of change in participation rates for social activities.

The resulting set of 23 predictors included child factors (i.e., demographic characteristics, preferences, and resources), parent/family factors (i.e., socio-demographic characteristics, personal resources, and family environment), and community factors (i.e., parents' perceptions of the community environment) that we felt would influence children's rates of participation in leisure and recreational activities over time. Since there may be different predictors of engagement in different types of activities (Medrich et al., 1982), we examined recreational, active physical, social, skill-based, and self-improvement activities.

The Influence of Children's Sex and Age on Changes in Participation Intensity

Researchers have pointed to the importance of examining children's sex and age as determinants of participation patterns (e.g., Medrich et al., 1982; Simpkins et al., 2005). Patterns of activity participation and time-use of socially and economically disadvantaged children have been found to differ as a function of children's sex and ethnicity (Bouffard et al., 2006; Simpkins et al., 2005), presumably due to differences in interests, skills, and opportunity structures (Medrich et al., 1982).

Studies have primarily focused on sex differences in physical activity (e.g., Allison, 1996; Trost et al., 1997). To our knowledge, only one study has examined differences in determinants of change in participation rates as a function of sex or age. DiLorenzo, Stucky-Ropp, Vander Wal, and Gotham (1998) reported changes over time in the determinants of engagement in physical exercise for boys and girls. Medrich et al. (1982) conducted a 5-year study of the out-of-school activity patterns of 764 sixth-grade students, which indicated that leisure time activity patterns look more alike when children are younger but diverge notably in adolescence. This study did not directly examine the nature of the determinants of these age differences.

Based on the literature, we expected to see significant change over the 3-year study period in children's trajectories of participation in recreational, active physical, and social activities, but not in skill-based or self-improvement activities, which show more consistent intensity patterns across age groups of children with physical disabilities (King et al., 2008). Research with socially and economically disadvantaged children has reported declining recreational participation as children age (Larson & Richards, 1991; Posner & Vandell, 1999). Children with disabilities have been found to become less involved with physical activities as they age (Longmuir & Bar-Or, 2000) and to decline in their social participation (Stevenson et al., 1997), although these studies used cross-sectional samples and therefore could not establish longitudinal trends within children.

Objectives

The primary objective was to examine the influence of a set of child, family, and community variables as predictors of change in the participation intensity of children with physical disabilities in five types of activities. A secondary objective was to examine the moderating influence of children's sex and age on the nature of the significant predictors. We did not examine the role played by type of disability. Rather, we adopted a non-categorical approach to disability, in which there is an emphasis on commonalities in the issues and experiences of children (Pless & Pinkerton, 1975).

We examined intraindividual changes (i.e., growth trajectories) and the variables associated with these trajectories using a latent growth curve approach (Bijleveld & van der Kamp, 1998). Trajectories are considered to be the most appropriate focus for analyses of change (Barnes et al., 2000; Rogosa et al., 1982). Latent growth curve methodology is useful for addressing questions concerning important predictors of change (e.g., Chan et al., 2000). We are not aware of prior work that has applied an integrated analytical model to longitudinal data in order to describe intraindividual changes in participation and interindividual differences in these changes.

Method

Participants

The study used three waves of data from a 3-year longitudinal study of the participation of children with physical disabilities, in which data were collected at approximately 9-month intervals, following a panel design (Bijleveld & van der Kamp, 1998). At Time 1, the participants were 427 parents and their children (229 boys and 198 girls) with physical functional limitations (one child per family) in two age cohorts (225 children ages 6 to 10 years; 202 children ages 11 to 15 years). A total of 402 parents and children (216 boys and 186 girls) completed data collection at all three time points (a small dropout rate of 5.9%).

We compared those who dropped out (n= 25) to those present at all three time points (n= 402). An attrition variable was created and cross-classified with the demographic, ethnic, and socio-demographic variables presented in Table 1, each collapsed into two categories (with the exception of child's age, which was measured continuously). There were significant effects for parental respondent's education, income, age, and ethnicity. Respondents in the lowest education category (completed elementary/some high school) and income category (<30,000) were significantly more likely to drop out than those in the higher categories. Younger parental respondents (ages 20 to 39) were more likely to drop out than those aged 40 to 59. Finally, non Caucasians were more likely to drop out than Caucasians.

Ethical approval for the study was obtained from McMaster University. Eleven publicly funded regional children's rehabilitation centers and one children's hospital in the province of Ontario,

Canada, assisted with recruitment. A full description of sampling and recruitment procedures is reported elsewhere (King, Law, Hanna et al., 2006; King et al., 2004; Law et al., 2006). Children with the following primary diagnoses or conditions were included: cerebral palsy or related (*n*= 217), skeletal (*n*= 54), spinal or related (*n*= 52), acquired brain injury (*n*= 25), neuromuscular (*n*= 20), minor motor (*n*= 19), central nervous system—other (*n*= 15), musculoskeletal—other (*n*= 13), and developmental delay (*n*= 12). For purposes of analysis, children were grouped into those with central nervous system (CNS) disorders (79.6%) and musculoskeletal disorders (20.4%), as done by Law et al. (2004).

The characteristics of the participating children, parents, and families are presented in Table 1. Mothers were the primary parent respondents (89%) and the majority of children lived in two-parent households (83%). Participants were predominantly of Caucasian background (81%). Just over 53% of families reported annual household incomes of less than $60,000. The median family income in the province of Ontario at the time of data collection was $61,000 (Statistics Canada, 2001), indicating that the sample had middle to low middle socio-economic status.

Procedure

A package of self-administered questionnaires was mailed to the family, with measures to be completed by either the parent or child prior to a home visit. The parent-completed measures included a demographic questionnaire, the Child Health Questionnaire-50 (Landgraf et al., 1996), the Family Environment Scale (Moos & Moos, 1994), the Impact on Family Scale (Stein & Riessman, 1980), the Strengths and Difficulties Questionnaire (Goodman, 1997), the Craig Hospital Inventory of Environmental Factors (Whiteneck et al., 2004), and the SF-36 health survey (Ware et al., 1993). The child-completed measures included phase one of the Children's Assessment of Participation and Enjoyment (CAPE) (King et al., 2004), and the Activities Scale for Kids (Young et al., 2000). Parents also completed the Communication Domain of the Vineland Adaptive Behavior Scales (Sparrow et al., 1984) via a phone interview.

Families were contacted by one of 15 experienced study interviewers to arrange a home-based interview in which the child completed the following measures: phase two of the CAPE (King et al., 2004), Preferences for Activities of Children (King et al., 2004), the Peabody Picture Vocabulary Test-Third Edition (Dunn & Dunn, 1997), and the Social Support Scale for Children (Harter, 1985). As part of the study's quality control procedures, interviewers received training workshops, written materials, and feedback on videotapes of their interviews.

Nine measures contained variables included in the present study (see Table 2).

Measures

Demographic questionnaire—This questionnaire was completed by the parent. It provided measures of child's sex and age (in years), parent/caregiver's ethnicity, annual household income (measured in 5 categories), and the presence/absence of major life changes in the past 4 months.

Strengths and Difficulties Questionnaire (SDQ)—The SDQ (Goodman, 1997) was completed by the parent. It consists of 25 questions providing measures of the child's Emotional Problems, Conduct Problems, Hyperactivity, Peer Problems, and Prosocial Behavior. The SDQ has satisfactory internal consistency (mean Cronbach's alpha of .73) and satisfactory test-retest reliability (mean correlation of .62 over 4 to 6 months) (Goodman, 2001).

Activities Scale for Kids (ASK)—The ASK (Young et al., 2000) is a child-report instrument that provides a measure of physical functioning for children 5 to 15 years of age.

The ASK has excellent reliability (internal consistency, test-retest, inter-rater, and intra-rater reliabilities of .94 or greater) and good construct and criterion validity (Young et al., 2000).

Vineland Adaptive Behavior Scales (VABS)—The VABS (Sparrow et al., 1984) is a widely used measure, with excellent reliability and content, construct, and criterion validity. The Vineland is completed by the parent and provides a measure of the child's adaptive function in the areas of communication, daily living skills, socialization, and motor skills. We used the Overall Communications standard score.

Preferences for Activities of Children (PAC)—The PAC (King et al., 2004) was used to assess children's self-reported preferences for recreational, active physical, social, skill-based, and self-improvement activities. It has demonstrated good internal consistency (reliabilities ranging from .67 to .84) and construct validity (King, Law, Hanna et al., 2006; King et al., 2004). With respect to construct validity, children's preferences for activities are significantly correlated with their self-perceived areas of competence and there are significant predicted sex differences, with boys preferring active physical activities and girls preferring skill-based and self-improvement activities (King, Law, King et al., 2006).

MOS 36-Item Short-Form Health Survey (SF-36)—The SF-36 was used to profile parent reported health. The instrument contains 36 items and yields an 8-scale profile of functional health and well-being, including a Physical Functioning Scale and a Mental Health Scale, which were used in the present study (Ware & Sherbourne, 1992). The scales are widely used and have evidence of construct validity (McHorney et al., 1993). Clinical group comparisons have indicated, for example, that patients with serious medical conditions score significantly lower on all eight scales compared to patients with minor medical conditions (McHorney et al., 1993).

Family Environment Scale (FES)—The FES is a parent-completed instrument, which provides measures of Family Cohesion, Active-Recreational Orientation, and Intellectual-Cultural Orientation (Moos & Moos, 1994). The Family Cohesion scale measures the degree of commitment, help, and support that family members provide to one another. The Active-Recreational Orientation scale taps the extent of the family's participation in social and recreational activities, and the Intellectual-Cultural Orientation scale assesses the family's degree of interest in political, social, intellectual, and cultural activities. The FES has been widely used and has adequate test-retest reliability (scores for the 10 subscales range from .52 to .89) and adequate internal consistency reliability (scores ranging from .61 to .78) (Moos & Moos, 1994).

Craig Hospital Inventory of Environmental Factors (CHIEF)—The CHIEF (Whiteneck et al., 2004) was completed by the parent. It is a 25-item scale that quantifies the degree to which aspects of the physical, social, and political environment act as barriers to full participation. The CHIEF contains 5 subscales (Policies, Physical/Structural, Work/School, Attitudes/Support, and Services/Assistance), which have good test-retest reliability (intra-class correlation coefficients ranging from .77 to .89) and good internal consistency reliability (Cronbach's alphas ranging from .76 to .81), and evidence of content, construct, and discriminant validity (Whiteneck et al., 2004). We used the frequency-magnitude product scores (overall impact scores) from the CHIEF, which range from 0 to 8; these are the product of a frequency score (a 5-point scale ranging from "daily" to "never") and a magnitude score (a dichotomous scale of "big problem" or "little problem").

The Policies subscale measures multiple characteristics of a child's institutional environment (e.g., organizations, school, businesses) and political environment (including lack of available community programs and services, unsupportive government programs and policies, and

barriers imposed by the policies and rules of organizations and programs). The Physical/Structural scale measures the extent to which the design and layout of a child's home, school/work environment, and community pose a barrier to participation, and includes both characteristics of the natural environment (e.g., temperature, terrain, climate) and built environment (e.g., lighting, noise, crowding). The Work/School subscale measures the relative ease or difficulty of obtaining the help of others, the degree to which other people's attitudes are a problem, and the extent to which a lack of support and encouragement from others is problematic for a child or youth. The Attitudes/Support subscale measures the extent to which people's attitudes at home and in the community are a barrier to a child's participation. The Services/Assistance subscale measures the availability of resources (e.g., transportation, health care services, medical care, personal equipment, adapted devices) and the availability of information, training, and assistance in the child's home and community.

Children's Assessment of Participation and Enjoyment (CAPE)—The CAPE was used to assess the intensity of children's participation in leisure and recreation activities outside of mandated school activities. The CAPE is a reliable and valid self-report measure of participation for children/youth ages 6 to 21 that includes both formal and informal domains, and five activity types: recreational, active physical, social, skill-based, and self-improvement activities (King et al., 2004; King, Law, King et al., 2006). The conceptual strengths of the CAPE include its measurement of multiple dimensions of participation (Imms, 2008).

The design and content of the CAPE were informed by (a) a comprehensive literature review examining the factors that influence children's participation (King, Law, King, Rosenbaum, & Kertoy, 2003), (b) expert review, and (c) pilot testing. The CAPE's items are inclusive of voluntary activities outside of school. The five main activity types were based on two principal components analyses of activity preference data, and correspond well to types of everyday activities discussed in the literature. The specific activities assessed by the scales are presented in Table 3. In initial testing, the internal consistency reliabilities of the scales were found to range from .30 (Skill-Based) to .65 (Recreational), and test-retest reliabilities for the activity type intensity scores ranged from .72 (Social) to .81 (Active Physical) (King et al., 2004).

In the present study, the CAPE consisted of 49 items and was administered in two phases: (a) a self-administered questionnaire (with parent/caregiver assistance, as needed) to determine what activities the child participated in (in the previous 4 month period) and how often (on a 7-point scale from 1= '1 time in the past 4 months' to 7= '1 time a day or more'), followed by (b) a home interview, which gathered information about with whom the child took part in activities, where, and their enjoyment of the activities.

Participation intensity was calculated by dividing the sum of item frequency by the number of possible activities in each activity type scale. Intensity scores therefore represent the average frequency of the total number of activities possible, rather than the average frequency of the activities the child actually takes part in. Low intensity scores can be obtained by participating in very few activities with high frequency or by participating in a number of activities with low frequency. Intensity scores provide a relative indicator of participation frequency, which is useful for comparing participation across activity types, groups of individuals, or occasions (Imms, 2008).

Overview of Data Analytic Approach

All analyses were performed using Mplus version 4.0 software (Muthén & Muthén, 2006). We first estimated a series of unconditional growth models (i.e., models without predictors) to determine, for each activity type separately, whether there was significant change in intensity over the three measurement occasions. We then specified conditional models to determine the significance of the 23 selected predictor variables for the types of activities on which there was

significant variability in growth. Last, in a series of auxiliary analyses, we conducted multisample or multiple-group analyses (McArdle, 1989) to examine the significance of the predictors for boys versus girls, and for older versus younger children. In each estimated model, we fixed the loadings on the intercept factors to a value of 1 and the loadings on the slope factors to values of 0, 1, and 2 to establish linear growth over time, and allowed the latent intercepts and slopes to co-vary (Chan et al., 2000; Wickrama et al., 1997).

Missing values on the dependent variables for the unconditional models were handled using the FIML (Full-Information Maximum Likelihood) procedure in Mplus. Missing cases for the predictors in the conditional models were assigned to the mean (for interval/ratio variables) or modal category (for nominal or ordinal level variables). There were very few missing cases (< 6 percent of the sample). The study used a cluster sampling design in which families (parents and children) were nested within agencies. Consequently, all model estimates were adjusted for non-independence of observations as a result of families being nested within agencies.

Model fit was tested using several widely used standardized fit statistics: the comparative fit index (CFI) (Bentler, 1990), the Tucker-Lewis Index (TLI) (Tucker & Lewis, 1973), and the root mean square error of approximation (RMSEA) (Steiger, 1990). These indices have different sensitivities to misspecifications of growth shape in latent growth modeling, and therefore are used simultaneously to inform decisions about the linear growth hypothesis. A good fitting model is indicated by CFI and TLI values at or above .90, and RMSEA less than . 06 (Hu & Bentler, 1999; Thompson, 2000).

Results

Initial Tests for Growth (Change) in Types of Activities

Figure 1 shows the pattern of change in participation intensity across the three occasions for the five types of activities, and Table 4 presents the initial tests for growth in each activity. Statistically significant negative mean growth (declining slopes for the group as a whole) and significant variability around the negative group mean value were found for recreational, active physical, and social activities. The variance around the slope was *not* significant for skill-based and self-improvement activities, so these were not considered further. The shape of the negative growth was linear and each of the models had excellent goodness of fit (CFI and TLI standardized indices were greater than .95 and RMSEA was below .04). Chi-square difference tests in most models revealed values that were small and non-significant, indicating that a linear growth trajectory represented the nature of individual change over the 3 time points.

We then estimated conditional growth models for recreational, active physical, and social activities only, in order to account for unexplained variance. In each model, we entered 23 predictors, which were treated as fixed covariates (measured at Time 1 or the beginning of the growth process) (see Simons-Morton & Chen, 2005). Each model controlled for the responding parent/caregiver's age and sex, to enable generalization to parent respondents.

Predictors of Change in Participation in Types of Activities

Tables 5 to 7 present the significance of the predictors in accounting for change in recreational, active physical, and social activities, respectively. Each model had good fit, as measured by CFI, TLI, and RMSEA. Latent growth models allow one to study predictors of change separately from correlates of initial status (Duncan & Duncan, 1994). The intercept column in each table provides information about the significant correlates or predictors of children's participation intensity at Time 1, whereas the slope column provides information about the significant predictors of rate of change. Coefficients are standardized and indicate the effect

of a given predictor on the latent slope parameter, with a positive coefficient signifying an accelerated or steeper decline in negative growth associated with a given predictor.

The model for recreational activities accounted for 14% of the variance in the slope or pattern of change. In order of magnitude, the significant predictors of the slope were: perceived barriers in the services environment (.240), parent/caregiver's physical functioning (.149), perceived barriers in the physical environment (−.135), and household income (−.126). Thus, greater declines in the intensity of recreational participation were associated with less supportive services environments and better parent physical functioning, whereas less steep declines were associated with less supportive physical environments and higher household income.

The model for active physical activities accounted for 30% of the variance in the slope. There were four significant predictors of the slope: child's age (−.367), child preferences for physical activities (−.185), parent/caregiver's ethnicity (.182), and child communicative functioning (.107). Thus, greater declines in the intensity of active physical participation were associated with non-Caucasian ethnicity of the parent/caregiver and better child communicative functioning, whereas less steep declines were associated with older child age and greater child preferences for physical activities.

The model for social activities accounted for approximately 14% of the variance in the slope. There were no significant predictors of slope.

Predictors of Change in Participation as a Function of Children's Sex

Table 8 presents the significant predictors of change in participation intensity for boys versus girls, for the three types of activities. For recreational activities, family cohesion, perceived barriers in the policies environment, emotional functioning, and prosocial behavior were moderate, positive predictors (.246 to .329) of declines in the intensity of recreational activities for girls but not for boys. Thus, greater family cohesion, less supportive policies environment, poorer child emotional functioning, and less prosocial behavior were associated with greater declines in the intensity of recreational participation for girls.

For physical activities, parent/caregiver's ethnicity and perceived barriers in the policies environment were significant predictors of the intensity of physical activities for boys but not for girls (boys had steeper declines when of non-Caucasian background and less steep declines when the policies environment was poorer), whereas the physical environment and household income were significant negative predictors for girls (girls had less steep declines in intensity of participation in physical activities when the physical environment was less supportive and when household income was higher).

For social activities, the policies environment was a significant predictor of intensity for girls but not for boys: the less supportive the policies environment, the steeper the decline in the intensity of social activities for girls.

Predictors of Change in Participation as a Function of Children's Age

Table 9 presents the predictors of change in participation intensity for older versus younger children. For 11 to 15 year-olds, household income was a significant negative predictor of recreational activities; whereas parent/caregiver's physical functioning was a significant positive predictor. Thus, for children aged 11 to 15, the higher the household income, the less steep the decline in intensity of recreational activities; the better the parent/caregivers' physical functioning, the steeper the decline in intensity of recreational activities.

For physical activities, parent/caregiver's ethnicity was a significant positive predictor for 11 to 15 year-olds (thus, if a parent/caregiver's ethnicity is non Caucasian, the steeper the decline

in intensity of physical activities). For 6 to 10 year-olds, the policies environment was a significant negative predictor and child behavioral functioning was a significant positive predictor (thus, less supportive policies environments were associated with less steep declines in the intensity of physical activities for children ages 6 to 10, whereas worse behavioral functioning was associated with steeper declines).

For social activities, household income was a significant predictor of intensity of social activities for children aged 6 to 10 but not for those aged 11 to 15. Thus, the higher a family's income, the steeper the decline in intensity of social activities for children aged 6 to 10.

Discussion

This study investigated the patterns and predictors of change, over a 3-year period, in the participation intensity of children/youth with physical disabilities in five types of leisure and recreational activities. The intensity of children's participation in recreational, active physical, and social activities declined as children aged over the 3-year study period. The intensity of involvement in skill-based and self-improvement activities did not show appreciable change, perhaps because these activities are more parent-controlled, and parents are more likely to ensure that these activities continue. The slow decline in the intensity of recreational activities is consistent with previous findings for children without disabilities (Larson & Richards, 1991; Posner & Vandell, 1999). The pattern of decline in social activities is noticeably different from age cohort comparisons of children with physical disabilities, which show greater social participation intensity for older children (12 to 14 year-olds) compared to younger children (King et al., 2008).

The results illuminate the effects of an array of child, family, and community predictors. The discussion highlights four main aspects of the findings: (a) activity-specific determinants of change, (b) differences in predictors of initial participation levels versus predictors of change, (c) predictors of declining participation in recreational and physical activities, and (d) differences in predictors of change as a function of children's sex and age. Implications for research and service provision are discussed.

Activity-Specific Determinants of Change in Participation Intensity

The findings indicate that change is influenced by different child, family, and community factors, depending on the type of activity. Different patterns of association between growth parameters and individual predictors were found for recreational and physical activities, and for boys versus girls as well as older versus younger children (11 to 15 vs. 6 to 10 years of age). The findings point to the context specificity of the developmental processes underlying activity participation. They also strongly support a social-ecological conceptual framework, which emphasizes the multiple, interrelated contexts within which children develop (Bronfenbrenner, 1979; Feldman & Matjasko, 2005).

There were substantial differences in the predictors of longitudinal change for recreational and physical activities, but no significant predictors of change in social activities. This indicates the worth of looking at activity types rather than viewing participation as an undifferentiated conglomerate. Medrich et al.'s (1982) study of the time-use of typically developing school-age children also found considerable divergence across domains of activities.

The findings indicate the importance of eight particular aspects of the child's life, including child factors (age, preferences, communicative functioning), family factors (income, parent physical functioning, ethnicity), and the broader community environment (the physical and services environments). A number of variables had no associations with change in any of the analyses. These variables included perceived barriers in work/school and attitudinal

environments, family intellectual and recreational orientations, major life changes in the past four months, parent mental health, and children's hyperactivity, peer problems, and physical functioning. In hindsight, it would appear that these are more "fixed" factors, which would be less likely to occur and/or influence change in the relatively short time period of the study. In fact, many of these factors were related to initial levels of participation intensity, which leads us to a discussion of cross-sectional versus longitudinal determinants.

Cross-Sectional and Longitudinal Determinants of Activity Participation

The findings indicate the importance of differentiating between cross-sectional determinants of status and longitudinal determinants of change in activity participation. For example, children's preferences for particular activities were significant predictors of the intensity of their participation, but not of change (the one exception was for physical activities, in which preferences were significant predictors of both initial status and change). A number of variables (children's activity preferences, age, and physical functioning; parent ethnicity; household income; and family recreational orientation) predicted initial levels of intensity across types of activities, indicating that the determinants of individual differences in initial status may be more robust across types of activities than are the variables affecting change.

It is interesting to note that child physical functioning influenced initial levels of participation, but was not associated with the slope of change, indicating that physical functional limitations may affect where a child begins on a participation trajectory, but not the rate of change. Thus, factors other than physical disability play more important roles with respect to changes in levels of participation over time. This is in line with models that portray an indirect rather than direct effect of physical functioning on children's outcomes (King et al., 2005). For over 20 years, the literature has consistently indicated that chronic physical health status has little direct effect on adaptation (Lavigne & Faier-Routman, 1992), and that attention needs to be paid to the psychosocial implications of reduced physical functioning, including the roles played by other factors and the indirect or mediating processes that lead to better or worse outcomes for children at risk (Wallander & Varni, 1998).

Predictors of Declining Participation in Recreational and Physical Activities

Recreational activities—There is little information in the literature with which to compare the findings of the present study. The predictors of declines in the intensity of recreational activities were distal or extrinsic factors (i.e., factors "outside the child"), including family/parent factors (income and parent physical functioning) and parents' perceptions of participation restrictions in the physical and services environments. These findings suggest a confluence of factors working in combination to restrict participation over time, operating sometimes in unexpected ways.

The findings suggest the utility of adopting a holistic view of children's participation, in which frequency of participation in one type of activity affects another (Feldman & Matjasko, 2005). As one might expect, greater declines in recreational participation were associated with less supportive services environments (lack of available resources such as transportation, health care services, adapted devices, etc.), whereas less steep declines were associated with higher household income. However, greater declines also were associated with *better* parent physical functioning, and less steep declines were associated with *less supportive* physical environments (barriers in terms of layout and design, etc.). When parents have better physical functioning, they may be more able to support their child's involvement in activities other than quiet recreational activities, which generally are home-based. When physical environments are poorer, children may more frequently participate in home-based recreational activities. These speculations require examination in future studies.

Physical activities—In contrast to recreational activities, the predictors of change in intensity of physical activities were more proximal to the child—they involved the child (age, preferences, and communication ability) and the ethnicity of the family. As one might expect, less steep declines were associated with older child age and greater child preferences for physical activities. As well, greater declines in physical activity were associated with better child communicative functioning and non-Caucasian ethnicity (Black and Asian, predominantly). When children have better communicative functioning, they may be more likely to take part in non-physical activities such as social activities. North American families of non-Caucasian background have varying preferences for physical activities (Posner & Vandell, 1999), which may reflect parents' beliefs about what constitutes valuable childhood experiences (Göncü, 1999; Holloway & Valentine, 2000); these beliefs may lead parents either to provide opportunities or place limitations on children's activities.

In summary, the significant predictors of change for recreational activities (i.e., parent and environmental factors) and physical activities (i.e., child and parent factors) may be explained by adopting a holistic view of children's out-of-school activities, in which higher levels of participation in one type of activity are seen to affect participation in other areas.

Differences in Predictors of Change as a Function of Children's Sex and Age

There were numerous differences in the significant predictors of change for boys versus girls and for older (ages 11 to 15) versus younger children (ages 6 to 10), indicating differences in the applicability of the overall models for boys and girls, and for children in different age cohorts. Although there were no significant predictors for the social activity model overall, there were significant differences in predictors of social activity as a function of sex and age.

For girls, greater declines in recreational and social participation were associated with less supportive policy environments (i.e., lack of programs and opportunities), suggesting greater vulnerability of girls with physical functional limitations to restrictions imposed by policies. As well, there were greater declines in girls' recreational participation when they had poorer emotional functioning, less prosocial behavior, and greater family cohesion. This finding suggests that cohesive families may make stronger efforts to support their daughters' participation in activities outside of home-based recreation. Girls also displayed less decline in physical activity intensity when the family's household income was higher and when the physical environment was poorer, suggesting that lack of accessible community environments may be associated with increased physical activity in contexts close to home.

For boys, greater declines in physical activity were associated with non-Caucasian background, as might be expected from the high value placed on physical activity in Caucasian families. Counter intuitively, greater declines in physical activity for boys also were associated with *better* policy environments. Perhaps less restrictive policies encourage boys to engage in activities beyond the typical activities expected of boys, namely active physical pursuits.

There were fewer significant predictors of differences in rates of change as a function of child age, in comparison to sex. The findings indicated the importance of the policy environment and behavioral functioning for younger children, and household income, ethnicity, parent physical functioning for older children. A noteworthy finding was that higher household income was associated with greater declines in the intensity of social activities for children aged 6 to 10, but with less steep declines in recreational activities for children aged 11 to 15.

Although the findings indicate that different variables are restrictors and enablers of different types of activities for boys and girls, and for older and younger children, three variables were important in both sets of moderating analyses: the policy environment, household income, and ethnicity. Thus, adopting a socio-demographic level of analysis (i.e., focusing on sex and age

differences) reveals the importance of policies, income, and ethnicity as determinants of change in participation.

Study Limitations and Implications for Research

The usual caution regarding the generalizability of the findings should be noted. The limited number of observations and the short distance between the three time points may have limited the amount of change that could be seen. As well, changes may have been influenced by the responsiveness of the CAPE, which has not yet been studied in detail.

Although the models provided excellent fit to the observed data, the amounts of variance accounted for ranged from 14% for social activities to 30% for physical activities, which is somewhat low, yet typical for studies of this type. Values around 40% are considered substantial (Chan et al., 2000). Important predictors may have not been included in the analyses. For example, social relationships were not included, which may be an important predictor of changes in social participation intensity. As well, we did not consider interactions between various child, family, and environmental predictors, which is a limitation of our approach.

The findings point to the utility of examining participation in types of activities rather than viewing participation as an undifferentiated conglomerate. They also point to a very complex set of determinants, which need to be examined holistically, contextually, and developmentally. Research is needed in which patterns of children's involvement in various types of activities are examined simultaneously and comprehensively. This will provide an understanding of the reciprocal impacts of activity involvement, and a broader understanding of the lives of children with disabilities.

The findings suggest the utility of taking a person-centered rather than variable-centered approach (Magnusson & Stattin, 2006) in order to understand children's experiences of participation in a holistic, interrelated, and dynamic manner. Person-centered approaches look at variability among individuals (e.g., examining "what" for "whom"), whereas variable-centered approaches consider one variable at a time. Several researchers have used a person-centered approach to look at the participation patterns of youth without disabilities (e.g., Bartko & Eccles, 2003; Shanahan & Flaherty, 2001).

It would be profitable for future studies to (a) examine differences in trajectories of activity participation as a function of types of disabilities, (b) examine meditational models, and (c) consider how the various variables identified in the present study interact with one another to promote or inhibit participation. As well, it may be profitable for future research to reconceptualize the nature of the possible predictors of change. Rather than examining the influence of discrete variables conceptualized within an ecological or systems framework, a challenge facing the field is to develop new ways of capturing the aggregated essences of the antecedents, correlates, and processes that characterize interrelated sets of activities. We need a new contextualized and developmental language by which to conceptualize the interrelated, dynamic nature of the fundamental parameters of activities, and capture the multiple aspects that operate together to drive change.

Implications for Clinical Practice

Children/youth with physical disabilities showed significant declines in their rates of participation in recreational, active physical, and social activities over the 3-year study period, but not in skill-based and self-improvement activities. It is important to note that although participation declined in these three major types of activities, children and families may be satisfied with their levels of participation.

We must be careful not to assume that more participation is better (Henry, 1998; King, Law, King, Rosenbaum, Kertoy et al., 2003). There is likely an optimal constellation of participation for each child, comprised of preferred and supported activities done with a frequency that fits other demands on the child and the family situation as a whole. The pattern of declining participation for recreational, physical, and social activities is, however, problematic for children who desire higher levels of participation in these activities, since feelings of loneliness, social exclusion, and problems in social adjustment may result. Recreational, physical, and social activities are the types of activities that tend to promote intimate interaction with peers, allowing children to develop a sense of belonging and autonomy from their parents.

Effective policy generation and intervention programming are contingent on understanding the factors that affect participation (Mactavish et al., 1997; Mancini et al., 2000; Taylor et al., 1998). A major implication of this study therefore concerns the nature of the predictors of change. If the goal of intervention is to increase the recreational, active physical, and social participation of children/youth with physical disabilities, then it is important to adopt a change-oriented viewpoint and direct efforts toward the factors most amenable to change—those most likely to increase supports, resources, and opportunities. The findings suggest the importance of targeting variables specific to the type of activity of interest, intervening on multiple levels (child, family, and environment) (Stokols, 1992), and taking the sex and age of the child into account. This is a contextualized, holistic, and developmental approach to intervention, in which the focus is on changing predisposing and enabling factors, based on an understanding of how various factors work together (Hansen & McNeal, 1996; Kraemer et al., 2001).

Depending on the specific type of activity and group of children of interest, the findings suggest that interventions should address children's communicative, emotional, behavioral, and social functioning, and their preferences. It is also important for service providers to consider the values of the family (indicated by ethnicity) and parents' physical health/limitations, and to encourage alternative activities that may be less costly (to address the issue of income). It is also important to consider parents' perceptions of the physical, services, and policies environment, since these perceptions were related to changes in participation intensity for various activities and groups of children.

In conclusion, the findings highlight the dynamic and context dependent nature of children's activity participation, and indicate the importance of adopting a nuanced view that recognizes the roles played by multiple, activity-specific determinants. Understanding how the characteristics of children, families, and environments interact to influence engagement in activities throughout childhood and adolescence is important for the development of appropriate and effective policies and programs.

Acknowledgments

This study was supported by a research grant from the National Institutes of Health (Grant HD38108-02); by CanChild Centre for Childhood Disability Research, funded in part by an operating grant from the Ontario Ministry of Health and Long-term Care; and by the Research Alliance for Children with Special Needs, funded by the Social Sciences and Research Council of Canada. We acknowledge the contributions of Susanne King, Peter Rosenbaum, Marilyn Kertoy, Nancy Young, and Steven Hanna to the project on which this article is based. Preparation of this article was supported by a senior research fellowship awarded by the Ontario Mental Health Foundation to Gillian King. Appreciation is extended to the many interviewers, organizations, and families who contributed their time and commitment to this research project.

References

Allison KR. Predictors of inactivity: An analysis of the Ontario Health Survey. Canadian Journal of Public Health 1996;87(5):354–358.

American Academy of Pediatrics . Family pediatrics: Report of the task force on the family. Pediatrics 2003;111(6):1541–1571. [PubMed: 12777595]

Barnes GM, Reifman AS, Farrell MP, Dintcheff BA. The effects of parenting on the development of adolescent alcohol misuse: A six-wave latent growth model. Journal of Marriage and the Family 2000;62(1):175–186.

Bartko WT, Eccles JS. Adolescent participation in structured and unstructured activities: A person-oriented analysis. Journal of Youth and Adolescence 2003;32(4):233–241.

Ben-Arieh A, Ofir A. Time for (more) time-use studies: studying the daily activities of children. Childhood 2002;9(2):225–248.

Bentler PM. Comparative fit indices in structural models. Psychological Bulletin 1990;107:238–246. [PubMed: 2320703]

Bijleveld, C.; van der Kamp, L. Longitudinal data analysis: Designs, models and methods. London, UK: Sage; 1998.

Bouffard SM, Wimer C, Caronongan P, Little PMD, Dearing E, Simpkins SD. Demographic differences in patterns of youth out-of-school time activity partcipation. Journal of Youth Development 2006;1 (1)

Bronfenbrenner, U. The ecology of human development. Cambridge, MA: Harvard University Press; 1979.

Bronfenbrenner, U. Making human beings human: Bioecological perspectives on human development. Thousand Oaks, CA: Sage; 2005.

Bronfenbrenner, U.; Morris, PA. The bioecological model of human development. In: Lerner, RM., editor. Theoretical models of human development. 6. Vol. 1. Hoboken, NJ: Wiley; 2006. Handbook of Child Psychology

Brown M, Gordon WA. Impact of impairment on activity patterns of children. Archives of Physical Medicine and Rehabilitation 1987;68:828–832. [PubMed: 2962558]

Chan D, Ramey S, Ramey C, Schmitt N. Modeling intraindividual changes in children's social skills at home and at school: A multivariate latent growth approach to undertanding between-settings differences in children's social skill development. Multivariate Behavioral Research 2000;35(3): 365–396.

DiLorenzo TM, Stucky-Ropp RC, Vander Wal JS, Gotham HJ. Determinants of exercise among children. II. A longitudinal analysis. Preventative Medicine 1998;27:470–477.

Duncan SC, Duncan TE. Modeling incomplete longitudinal substance use data using latent variable growth curve methodology. Multivariate Behavioral Research 1994;29(4):313–338.

Dunn, LM.; Dunn, LM. Peabody Picture Vocabulary Test-Third Edition (PPVT-III). Circle Pines, MN: American Guidance Service, Inc; 1997.

Feldman AF, Matjasko JL. The role of school-based extracurricular activities in adolescent development: A comprehensive review and future directions. Review of Educational Research 2005;75(2):159–210.

Feldman AF, Matjasko JL. Profiles and portfolios of adolescent school-based extracurricular activity participation. Journal of Adolescence 2007;30(2):313–332. [PubMed: 16678248]

Finch, N.; Lawton, D.; Williams, J.; Sloper, P. Disability Survey 2000: Young people with a disability and sport. London: Sport England; 2001.

Göncü, A., editor. Children's engagement in the world: Sociocultural perspectives. New York: Cambridge University Press; 1999.

Goodman R. The Strengths and Difficulties Questionnaire: A research note. Journal of Child Psychology and Psychiatry 1997;38(5):581–586. [PubMed: 9255702]

Goodman R. Psychometric properties of the Strengths and Difficulties Questionnaire. Journal of the American Academy of Child and Adolescent Psychiatry 2001;40(11):1337–1345. [PubMed: 11699809]

Hansen WE, McNeal RB. The law of maximum expected potential effect: Constraints placed on program effectiveness by mediator relationships. Health, Education Research, Theory and Practice 1996;11:501–507.

Harter, S. Social Support Scale for Children. Denver CO: Department of Psychology, University of Denver; 1985.

Henry AD. Development of a measure of adolescent leisure interests. The American Journal of Occupational Therapy 1998;52(7):531–539. [PubMed: 9693697]

Holloway, S.; Valentine, G., editors. Children's geographies: Playing, living, learning. London: Routledge; 2000.

Hu LT, Bentler PM. Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modelling 1999;6:1–55.

Imms C. Review of the Children's Assessment of Participation and Enjoyment and the Preferences for Activity of Children. Physical & Occupational Therapy in Pediatrics 2008;28(4):389–404. [PubMed: 19042479]

King G, Law M, Hanna S, King S, Hurley P, Rosenbaum P, et al. Predictors of the leisure and recreation participation of children with physical disabilities: A structural equation modeling analysis. Children's Health Care 2006;35(3):209–234.

King G, Law M, Hurley P, Petrenchik T, Schwellnus H. A developmental comparison of the out-of-school recreation and leisure activity participation of boys and girls with and without physical disabilities. 2008 Manuscript submitted for publication.

King, G.; Law, M.; King, S.; Hurley, P.; Rosenbaum, P.; Hanna, S., et al. Children's Assessment of Participation and Enjoyment (CAPE) and Preferences for Activities of Children (PAC). San Antonio, TX: Harcourt Assessment; 2004.

King G, Law M, King S, Rosenbaum P, Kertoy M. A model of the factors affecting the participation of children with disabilities. Developmental Medicine & Child Neurology 2003;45(Supp 94):52–52.

King G, Law M, King S, Rosenbaum P, Kertoy M, Young NL. A conceptual model of the factors affecting the recreation and leisure participation of children with disabilities. Physical & Occupational Therapy in Pediatrics 2003;23(1):63–90. [PubMed: 12703385]

King G, McDougall J, DeWit D, Hong S, Miller L, Offord D, et al. Pathways to children's academic performance and prosocial behaviour: Roles of physical health status, environmental, family, and child factors. International Journal of Disability, Development and Education 2005;52(4):313–344.

King GA, Law M, King S, Hurley P, Hanna S, Kertoy M, et al. Measuring children's participation in recreation and leisure activities: construct validation of the CAPE and PAC. Child: Care, Health and Development 2006;33(1):28–39.

Kraemer HC, Stice E, Kazdin A, Offord D, Kupfer D. How do risk factors work together? Mediators, moderators, and independent, overlapping and proxy risk factors. American Journal of Psychiatry 2001;158:848–856. [PubMed: 11384888]

Landgraf, JM.; Abetz, L.; Ware, JE. Child Health Questionnaire (CHQ): A user's manual. Boston MA: The Health Institute, New England Medical Center; 1996.

Larson R, Richards MH. Daily companionship in late childhood and early adolescence: Changing developmental contexts. Child Development 1991;62:284–300. [PubMed: 2055123]

Larson RW, Verma S. How children and adolescents spend time across the world: Work, play and developmental opportunities. Psychological Bulletin 1999;125:701–736. [PubMed: 10589300]

Lavigne JV, Faier-Routman J. Psychological adjustment to pediatric physical disorders: A meta-analytic review. Journal of Pediatric Psychology 1992;17(2):133–157. [PubMed: 1534367]

Law M, Finkelman S, Hurley P, Rosenbaum P, King S, King G, et al. Participation of children with physical disabilities: Relationships with diagnosis, physical function, and demographic variables. Scandinavian Journal of Occupational Therapy 2004;11(4):156–162.

Law M, King G, King S, Kertoy M, Hurley P, Rosenbaum P, et al. Patterns of participation in recreational and leisure activities among children with complex physical disabilities. Developmental Medicine and Child Neurology 2006;48:337–342. [PubMed: 16608540]

Longmuir PE, Bar-Or O. Factors influencing the physical activity levels of youths with physical and sensory disabilities. Adapted Physical Activity Quarterly 2000;17(1):40–53.

Mactavish J, Schleien S, Tabourne C. Patterns of family recreation in families that include children with a developmental disability. Journal of Leisure Research 1997;29(1):21–46.

Magnusson, D.; Stattin, H. The person in the environment: Towards a general model for scientific inquiry. In: Lerner, RM., editor. Theoretical models of human development. Volume 1 of Handbook of Child Psychology. 6. Hoboken, NJ: Wiley; 2006.

Mancini MC, Coster WJ, Trombly CA, Heeren TC. Predicting elementary school participation in children with disabilities. Archives of Physical Medicine and Rehabilitation 2000;81:339–347. [PubMed: 10724080]

Margalit M. Leisure activities of cerebral palsied children. Israel Journal of Psychiatry and Relational Science 1981;18(3):209–214.

Masten AS, Coatsworth JD. The development of competence in favorable and unfavorable environments: Lessons from research on successful children. American Psychologist 1998;53(2):205–220. [PubMed: 9491748]

McArdle, JJ. Structural modeling experiments using multiple growth functions. In: Ackerman, P.; Kanfer, R.; Cudeck, R., editors. Learning and individual differences: Abilities, motivation, and methodology. Hillsdale, NJ: Erlbaum; 1989. p. 71-117.

McHorney CA, Ware JE, Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Medical Care 1993;31(3):247–263. [PubMed: 8450681]

Medrich, EA.; Roizen, J.; Rubin, V.; Buckley, S. The serious business of growing up: A study of children's lives outside school. Berkeley, CA: University of California Press; 1982.

Moos, RH.; Moos, BS. Family Environment Scale manual. 3. Palo Alto, CA: Consulting Psychologists Press, Inc; 1994.

Muthén, BO.; Muthén, LK. Mplus (version 4.0). Los Angeles: Muthén & Muthén; 2006.

Pless, IB.; Pinkerton, P. Chronic childhood disorder: Promoting patterns of adjustment. Chicago: Yearbook Medical Publishers; 1975.

Posner JK, Vandell DL. After-school activities and the development of low-income urban children: A longitudinal study. Developmental Psychology 1999;35(3):868–879. [PubMed: 10380876]

Rogosa DR, Brandt D, Zimowski M. A growth curve approach to the measurement of change. Psychological Bulletin 1982;90:726–748.

Sandler, IN.; Ayers, TS.; Suter, JC.; Schultz, A.; Twohey-Jacobs, J. Adversities, strengths, and public policy. In: Maton, KI.; Schellenbach, CJ.; Leadbeater, BJ.; Solarz, AL., editors. Investing in children, youth, families, and communities: Strengths-based research and policy. Washington, DC: American Psychological Association; 2004. p. 31-49.

Shanahan MJ, Flaherty BP. Dynamic patterns of time use in adolescence. Child Development 2001;72 (2):385–401. [PubMed: 11333073]

Simpkins SD, Ripke M, Huston AC, Eccles JS. Predicting participation and outcomes in out-of-school activities: Similarities and differences across social ecologies. New Directions for Youth Development 2005;105:51–69. [PubMed: 15945137]

Sparrow, SS.; Balla, DA.; Cicchetti, DV. Vineland Adaptive Behavior Scales. Circle Pines, MN: American Guidance Service, Inc; 1984.

Statistics Canada. Median family income in constant dollars (2000) for all census families for Canada, provinces and territories. Ottawa ON: Statistics Canada; 2001.

Steiger JH. Structural model evaluation and modification: An interval estimation approach. Multivariate Behavioral Research 1990;25:173–180.

Stein REK, Riessman CK. The development of an Impact on Family Scale: Preliminary findings. Medical Care 1980;18(4):465–472. [PubMed: 7401703]

Stevenson CJ, Pharoah POD, Stevenson R. Cerebral palsy - the transition from youth to adulthood. Developmental Medicine and Child Neurology 1997;39:336–342. [PubMed: 9236701]

Stokols D. Establishing and maintaining health environments: Toward a social ecology of health promotion. American Psychologist 1992;47:6–22. [PubMed: 1539925]

Taylor WC, Baranowski T, Young DR. Physical activity interventions in low-income, ethnic minority, and populations with disability. American Journal of Preventive Medicine 1998;15(4):334–343. [PubMed: 9838976]

Thompson, B. Ten commandments of structural equation modeling. In: Grimm, LG.; Yarnold, PR., editors. Reading and understanding more multivariate statistics. Washington, DC: American Psychological Association; 2000. p. 261-283.

Trost SG, Pate RR, Saunders R, Ward DS, Dowda M, Felton G. A prospective study of the determinants of physical activity in rural fifth-grade children. Preventative Medicine 1997;26:257–263.

Tucker LR, Lewis C. The reliability coefficient for maximum likelihood factor analysis. Psychometrika 1973;38:1–10.

Wallander JL, Varni JW. Effects of pediatric chronic physical disorders on child and family adjustment. Journal of Child Psychology and Psychiatry 1998;39(1):29–46. [PubMed: 9534085]

Ware JE, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36): I. Conceptual framework and item selection. Medical Care 1992;30(6):473–483. [PubMed: 1593914]

Ware, JE.; Snow, KK.; Kosinski, M.; Gandek, B. SF-36 Health Survey: Manual and interpretation guide. Boston, MA: The Health Institute, New England Medical Center; 1993.

Whiteneck GG, Harrison-Felix CL, Mellick DC, Brooks CA, Charlifue SB, Gerhart KA. Quantifying environmental factors: A measure of physical, attitudinal, service, productivity, and policy barriers. Archives of Physical Medicine and Rehabilitation 2004;85(8):1324–1335. [PubMed: 15295760]

Wickrama KAS, Lorenz FO, Conger RD, Elder GH Jr. Marital quality and physical illness: A latent growth curve analysis. Journal of Marriage and the Family 1997;59(1):143–155.

Young NL, Williams JI, Yoshida KK, Wright JG. Measurement properties of the Activities Scale for Kids. Journal of Clinical Epidemiology 2000;53:125–137. [PubMed: 10729684]

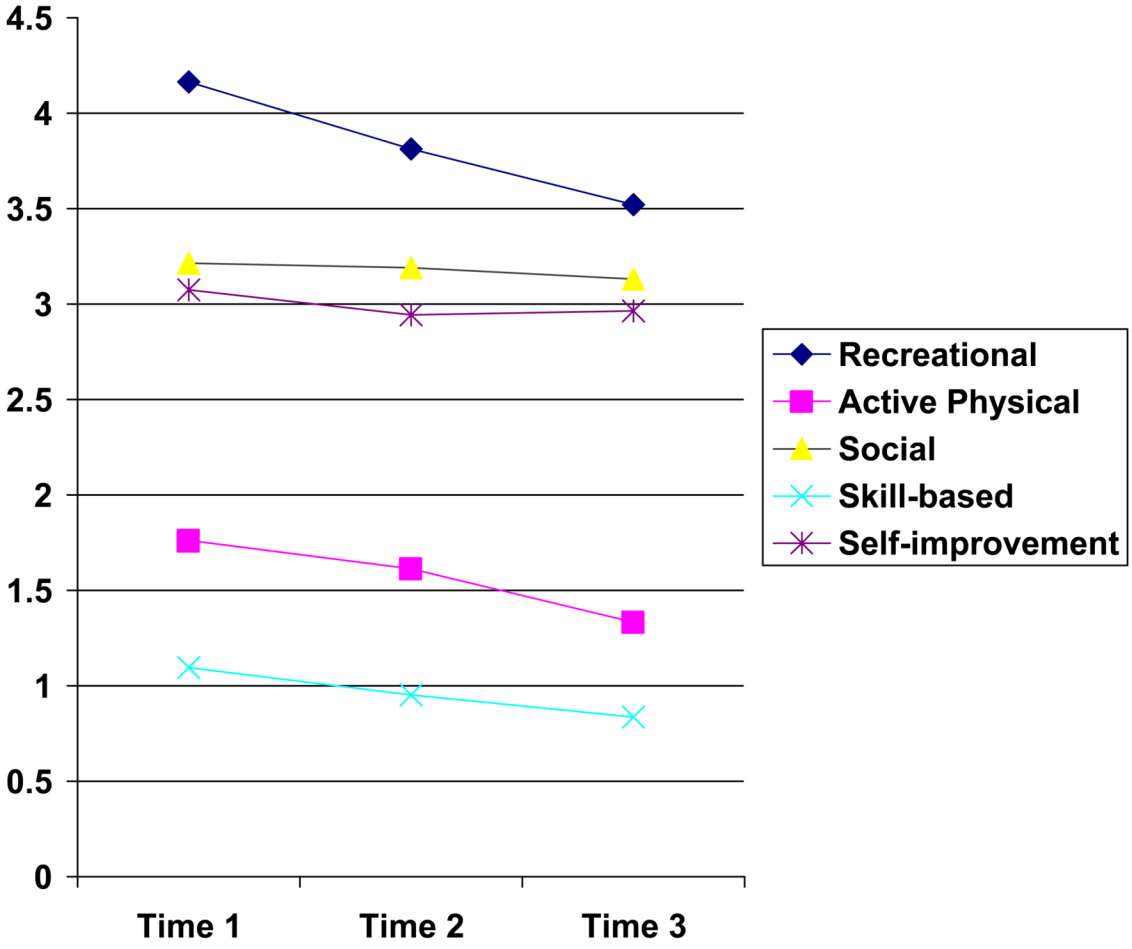

Figure 1.
Change over time in the intensity of children's activity participation.

Table 1

Child, Parent, and Family Characteristics at Time 1 (N= 427)

Characteristic	Frequency	Valid %
Child's Sex		
Male	229	53.6
Female	198	46.4
Child's Age (M= 10.37, SD= 2.37, range= 6 to 15 years)		
6 – 10 years	225	52.7
11 – 15 years	202	47.3
Child's Primary Health and Development Problem		
Central nervous system (CNS) disorders	340	79.6
Musculoskeletal disorders	87	20.4
Family Type		
Two-parent	348	81.5
Single-parent	67	15.7
Missing	12	2.8
Ethnic Background		
Caucasian	345	80.8
Non Caucasian	79	18.5
Missing	3	.7
Respondent Age		
20 – 29	19	4.5
30 – 39	154	36.2
40 – 49	218	51.2
50 – 59	35	8.2
Missing	1	NA
Respondent Sex		
Male	48	11.3
Female	375	88.7
Missing	4	NA
Educational Attainment of Respondent		
Completed elementary, some high school	47	11.0
Completed high school, some college/technical training	137	32.1
Completed college/technical training, some university	139	32.6
Completed university	104	24.4
Total Family Income (Can $)		
< 30,000	68	16.1
30,000 – 44,999	79	18.7
45,000 – 59,999	74	17.5
60,000 – 89,999	114	27.0
> 90,000	87	20.6
Missing	5	NA

Table 2

Study Measures and Variables

Measure	Variables
	Predictors
Demographic questionnaire	Child's age
	Child's sex
	Parent/caregiver's ethnicity
	Household income
	Major life changes in past four months
Strengths and Difficulties Questionnaire (SDQ)	Child emotional functioning (Emotional Problems scale)
	Child behavioral functioning (Conduct Problems scale)
	Child hyperactivity
	Child peer problems
	Child prosocial behavior
Activities Scale for Kids (ASK)	Child physical functioning
Vineland Adaptive Behavior Scales (VABS)	Child communicative functioning (Overall Communications standard score)
Preferences for Activities of Children (PAC)	Child preferences for recreational, active physical, and social activities
SF-36	Parent/caregiver's physical functioning (Physical Functioning scale)
	Parent/caregiver's mental functioning (Mental Health scale)
Family Environment Scale (FES)	Family cohesion
	Family active-recreational orientation
	Family intellectual-cultural orientation
Craig Hospital Inventory of Environmental Factors (CHIEF)	Policies environment
	Physical/Structural environment
	Work/School environment
	Attitudes/Support environment
	Services/Assistance environment
	Outcomes
Children's Assessment of Participation and Enjoyment (CAPE)	Child intensity of participation in recreational activities
	Child intensity of participation in active physical activities
	Child intensity of participation in social activities
	Child intensity of participation in skill-based activities
	Child intensity of participation in self- improvement activities

Table 3

CAPE Activities in the Activity Type Groupings

Recreational	Active Physical	Social	Skill-based	Self-Improvement
Collecting things	Bicycling, in-line skating or skateboarding	Going on a full day outing	Dancing	Attending church, temple or a religious activity
Crafts, drawing or coloring	Doing a paid job	Going to a live event	Doing gymnastics	Doing a chore
Pretend or imaginary play	Martial arts	Going to a movie	Horseback riding	Doing homework
Doing puzzles	Team sports	Going to a party	Learning to dance	Doing volunteer work
Going for a walk or hike	Water sports	Hanging out	Learning to sing	Getting tutored for schoolwork
Playing board or card games	Snow sports	Listening to music	Participating in community organizations	Going to the public library
Playing computer or video games	Playing games	Making food	Playing a musical instrument	Reading
Playing on playground equipment	Racing, track or field	Talking on the phone	Swimming	Shopping
Playing with pets	School club participation	Visiting with others	Taking art lessons	Writing a story
Playing with things or toys				Writing letters
Taking care of a pet				
Watching TV or a video				

Table 4

Initial Tests for Growth in Types of Activities

Type of Activity	Mean Time 1	Mean Time 2	Mean Time 3	Mean Slope	Variance	Tests of Model Fit
Recreational	4.16	3.80	3.51	−0.33***	0.13***	CFI=1.00 TLI=1.00 RMSEA=0.04
Active Physical	1.76	1.60	1.32	−0.22***	0.09*	CFI=1.00 TLI=1.00 RMSEA=0.03
Social	3.21	3.18	3.12	−0.05*	0.05*	CFI=1.00 TLI=1.00 RMSEA=0.00
Skill-based	1.09	0.95	0.83	−0.13***	0.01	CFI=1.00 TLI=1.04 RMSEA=0.00
Self-improvement	3.07	2.94	2.95	−0.06**	0.05	CFI=0.99 TLI=0.98 RMSEA=0.02

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$

Table 5

Latent Growth Curve Model Predictors of Intensity of Recreational Activities

Predictors	Intercept	Slope
Child Factors (Demographics, Personal Preferences, and Resources)		
Child's age (years)	−0.342***	−0.139
Child's sex (male)	−0.013	0.059
Child preferences for recreational activities	0.414***	−0.144
Child communicative functioning	−0.063**	0.054
Child physical functioning	0.242***	−0.116
Child emotional functioning	−0.020	0.089
Child behavioral functioning	0.072	−0.076
Child hyperactivity	−0.015	0.028
Child peer problems	−0.015	0.074
Child prosocial behavior	0.039	−0.016
Parent/Family Factors (Socio-demographics, Personal Resources, and Family Environment)		
Parent/caregiver's ethnicity (non Caucasian)	−0.221***	0.071
Household income	−0.037	−0.126*
Parent/caregiver's physical functioning	−0.076	0.149*
Parent/caregiver's mental functioning	0.077	−0.020
Family cohesion	−0.002	0.059
Family recreational orientation	0.052	0.063
Family intellectual orientation	0.023	−0.014
Major life changes in past four months	−0.017	−0.003
Community Environment		
Policies environment	0.086*	−0.053
Physical environment	0.030	−0.135*
Work/school environment	−0.038	−0.074
Attitudinal environment	0.055	−0.112
Services environment	−0.022	0.240***
R Square	.538	.141
CFI = .993		
TLI = .980		
RMSEA = .023		

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$

Note: Model controls for responding parent/caregiver's age and sex

Table 6

Latent Growth Curve Model Predictors of Intensity of Active Physical Activities

Predictors	Intercept	Slope
Child Factors (Demographics, Personal Preferences, and Resources)		
Child's age (years)	−0.061	−0.367***
Child's sex (male)	0.143**	−0.060
Child preferences for physical activities	0.301***	−0.185*
Child communicative functioning	0.053	0.107*
Child physical functioning	0.371***	−0.154
Child emotional functioning	0.035	−0.005
Child behavioral functioning	0.091	0.036
Child hyperactivity	−0.049	0.044
Child peer problems	−0.074	0.074
Child prosocial behavior	0.064	−0.085
Parent/Family Factors (Socio-demographics, Personal Resources, and Family Environment)		
Parent/caregiver's ethnicity (non Caucasian)	−0.202***	0.182***
Household income	0.119**	0.018
Parent/caregiver's physical functioning	−0.002	0.117
Parent/caregiver's mental functioning	0.024	−0.078
Family cohesion	−0.009	−0.031
Family recreational orientation	0.206***	0.143
Family intellectual orientation	−0.017	−0.067
Major life changes in past four months	−0.015	0.126
Community Environment		
Policies environment	0.073	−0.136
Physical environment	−0.057	−0.153
Work/school environment	−0.049	0.57
Attitudinal environment	0.066	−0.051
Services environment	0.026	−0.032
R Square	.487	.303
CFI = .978		
TLI = .933		
RMSEA = .038		

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$

Note: Model controls for responding parent/caregiver's age and sex

Table 7

Latent Growth Curve Model Predictors of Intensity of Social Activities

Predictors	Intercept	Slope
Child Factors (Demographics, Personal Preferences, and Resources		
Child's age (years)	0.163**	−0.122
Child's sex (male)	−0.077	0.034
Child preferences for social activities	0.290***	−0.032
Child communicative functioning	0.036	0.160
Child physical functioning	0.363***	0.037
Child emotional functioning	0.022	0.059
Child behavioral functioning	0.055	0.101
Child hyperactivity	−0.083	−0.068
Child peer problems	−0.296***	0.156
Child prosocial behavior	0.078	0.075
Parent/Family Factors (Socio-demographics, Personal Resources, and Family Environment)		
Parent/caregiver's ethnicity (non Caucasian)	−0.112	0.071
Household income	0.091**	0.050
Parent/caregiver's physical functioning	−0.095*	0.098
Parent/caregiver's mental functioning	0.045	−0.012
Family cohesion	−0.029	−0.034
Family recreational orientation	0.246**	0.004
Family intellectual orientation	−0.114	−0.019
Major life changes in past four months	0.080	0.030
Community Environment		
Policies environment	0.020	−0.013
Physical environment	0.050	−0.012
Work/school environment	−0.027	0.106
Attitudinal environment	0.040	−0.061
Services environment	0.009	0.024
R Square	.516	.137
CFI = 1.00		
TLI = 1.00		
RMSEA = .000		

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$

Note: Model controls for responding parent/caregiver's age and sex

Table 8

Multisample Analyses for Activities (Predictors of Slope) by Sex

Type of Activity	Boys	Girls	χ^2 difference	df
Recreational Activities				
Family cohesion	−0.082	0.276**	5.23*	1
Policies environment	−0.197	0.246**	7.25**	1
Child emotional functioning	−0.038	0.329***	4.08*	1
Child prosocial behavior	−0.106	0.267*	6.04*	1
Physical Activities				
Parent/caregiver's ethnicity (non Caucasian)	0.371***	0.063	4.17*	1
Household income	0.247	−0.175**	7.03**	1
Policies environment	−0.389**	0.092	5.70*	1
Physical environment	0.053	−0.365**	4.04*	1
Social Activities				
Policies environment	−0.137	0.286**	5.14*	1

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$

Table 9

Multisample Analyses for Activities (Predictors of Slope) by Age

Type of Activity	6 to 10	11 to 15	χ^2 difference	df
Recreational Activities				
Household income	0.034	−0.334**	4.99*	1
Parent/caregiver's physical functioning	0.057	0.226**	9.45**	1
Physical Activities				
Parent/caregiver's ethnicity (non Caucasian)	−0.001	0.345***	5.17*	1
Policies environment	−0.436*	0.031	5.70*	1
Child behavioral functioning	0.420*	−0.149	6.16*	
Social Activities				
Household income	0.282*	−0.256	6.58*	1

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$