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The Effect of Parent–Child Function on Physical Activity and Television Viewing among Adolescents with and without Special Healthcare Needs

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Using the 2007 National Survey of Children's Health, the association between parent–child function and physical activity and television viewing was investigated among a national sample of adolescents in the United States. Parent–child function was measured using the National Survey of Children's Health "Family Function" survey items and confirmatory factor analysis. Multivariable regression described the influence of parent–child function and having a special healthcare need (SHCN) on physical activity and television viewing, and described the differential influence of parent–child function on type of SHCN. Higher parent–child function was associated with more frequent physical activity (relative risk = 1.18, 95% confidence interval: 1.1, 1.3) and less frequent television viewing (relative risk = 0.91, 95% confidence interval: 0.86, 0.96). Controlling for parent–child function, having any SHCN was not associated with physical activity or television viewing. Controlling for type of SHCN, higher parent–child function influenced physical activity for adolescents with autism ($p = 0.007$) or a functional limitation ($p = 0.001$). Policy and programmatic efforts to bolster organised parent–child physical activities and reduce caregiver burden might ameliorate disparities in physical activity.

Keywords: adolescents; children with special healthcare needs; confirmatory factor analysis; functional limitations; National Survey of Children's Health; parent–child function; physical activity; television viewing

Introduction

Increasing regular physical activity and reducing hours of television watched by adolescents is a national priority in the United States (American Academy of Pediatrics, 2001; Centers for Disease Control and Prevention, 2008). Despite the current recommendation (Centers for Disease Control and Prevention, 2008) that children participate in 20 minutes of vigorous physical activity daily, fewer than one in three high school students engage in this frequency and intensity (Centers for Disease Control and Prevention, 2007). While experts recommend that adolescents watch no more than one to two hours of television per day (American Academy of Pediatrics, 2001), more than one in four adolescents engage in more than four hours of daily television viewing (Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998) and nearly

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10% of adolescents watch more than four hours of television on a school day (Data Resource Center for Child and Adolescent Health, 2003). Marked social disparities in patterns of physical activity and television viewing exist that disproportionately affect racial and ethnic-minority adolescents, especially boys, and those from lowest-income families (Andersen et al., 1998; Singh, Kogan, Siahpush, & van Dyck, 2008). Moreover, adolescents with special healthcare needs (SHCN) are a particularly vulnerable population. Children with SHCN are those who, when compared with children generally, require more medical or therapeutic services, take a greater than expected number of medications, have a functional limitation, or present with a developmental delay or behavioural problem, any of which is due to a condition that will persist longer than a year (Bethell et al., 2002). Indeed, adolescents with SHCN are a heterogeneous group with varying risk for not engaging in optimal patterns of physical activity. For example, adolescents with SHCN, particularly those with physical disabilities, are substantially more likely to engage in sedentary activities than their typically developing peers (King et al., 2006), which is troublesome given their propensity for social isolation, obesity, and secondary cardiovascular and orthopaedic complications (American Academy of Pediatrics, 2002).

Determinants of physical activity stem from social, environmental and cultural attributes of individuals and their environments (Ferreira et al., 2006; Gauvin, 2003). To this end, individual attributes that promote more frequent physical activity among adolescents include greater socio-economic resources such as income and parental education (Gauvin, 2003). Additionally, parental role-models and family attitudes to encourage exercise and supervised television viewing beget more optimal patterns of physical activity (King et al., 2006). Beyond attributes of individuals and families, neighbourhood characteristics influence physical activity. Individuals living in communities with greater social capital—safe and supportive neighbourhoods—are more likely to exercise regularly than their counterparts living in more socially disadvantaged areas (Singh et al., 2008). Particularly germane to adolescents is the role of school policy and the intersection between school mandates and family involvement. In this vein, school-based physical education policy, particularly in conjunction with family physical activity routines, is influential in promoting optimal physical activity patterns for children (van Sluijs, McMinn, & Griffin, 2007). In addition to the aforementioned socio-economic and political considerations to physical activity, adolescents with SHCN often face further impediments to physical activity promotion. For example, King et al. (2006) describe barriers to physical activity unique to families of children with SHCN, in particular those with physical disabilities. These include time and financial burdens and unsupportive social and attitudinal environments, including lack of transportation and limited extracurricular programming for children with disabilities. The majority of the extant literature has focused on children and adolescents with physical disabilities (e.g., cerebral palsy). However, it is plausible that adolescents with diverse SHCN may experience barriers to optimal patterns of physical activity.

The purpose of this article is to focus on the role of family, specifically parent–child function, on physical activity and television viewing among adolescents. Family is one of the most important contexts for adolescent development. The dynamic and interdependent relationships and actions among family members shape behaviour, norms, and attitudes for the family unit (Bubolz, 2001), substantially influence developmental outcomes (Sameroff & Fiese, 2000), and are of increasing concern to paediatricians (Wertlieb, 2003). Positive family environments are characterised by warmth, cohesion,

and adaptability, whereas negative family environments are characterised by criticism, hostility, and over-control (Kim Park, Garber, Ciesla, & Ellis, 2008). While the detrimental influence of negative family environments on children's emotional well-being has been well established (Rutter, 1990), there is growing evidence to suggest that family psychosocial processes may contribute to disparities in adolescents' physical health as well (Wen, 2008). Several studies (Barr-Anderson et al., 2007; Ferreira et al., 2006; McGuire, Hanna, Neumark-Sztainer, Cossrow, & Story, 2002; Ward et al., 2006) highlight the importance of positive family environments—family cohesion, supportive parental role-models, and parental encouragement—for promoting physical activity in diverse populations of adolescents. While these data suggest the importance of parent–child function, its influence on physical activity and television viewing in a nationally representative sample of US adolescents with and without SHCN appears not to have been previously investigated.

Contemporary theoretical models of child development (Sameroff & Fiese, 2000) suggest a dynamic interplay between child and parental attributes on the manifestation of developmental delays. To this end, Newacheck, Rising, and Kim (2006) posit that families of adolescents with SHCN are particularly vulnerable to the influence of negative family function. Indeed, families of children and adolescents with SHCN disproportionately experience time and financial burdens (Kuhlthau, Smith, Yucci, & Perrin, 2005), unmet need for services (Warfield & Gulley, 2006), and care-giving demands that outweigh coping resources (Perry, 2004; Raina et al., 2004). The interplay between having an adolescent with SHCN and experiencing family dysfunction may result in caregiver burden that exceeds parents' emotional, financial, or time resources to promote healthy patterns of physical activity or to foster appropriate supervision for television viewing. Indeed, the nature of the SHCN (e.g., time-intensive versus financially intensive) influences manifestation of caregiver burden (Gould, 2004). That is, children with SHCN are a heterogeneous population with regard to severity of impairments, health and developmental service needs (Warfield & Gulley, 2006), and presumably, the influence of a SHCN on family well-being varies considerably by type of SHCN. For example, average effects of having SHCN on physical activity and television viewing may mask larger effects for children with more complex needs. Indeed, maladaptive coping, financial strain, parental stress, and unmet need are particularly prevalent among families of children with autism (Altiere & von Kluge, 2009), functional limitations (Stein & Silver, 2005), special education needs (Sices, Harman, & Kelleher, 2007), and asthma (Duplantier, 2008).

The aims of the study were to examine the relationship between parent–child function and adolescent physical activity and television viewing frequency, and to determine whether parent–child function is particularly important to the frequency of physical activity and television viewing of adolescents with SHCN. It was hypothesised that higher parent-child function will be positively associated with physical activity and negatively associated with television viewing frequency and that lower parent-child function would exacerbate the influence of having a SHCN on frequency of physical activity and television viewing. Understanding family correlates of physical activity and television viewing is consistent with US paediatric (Wertlieb, 2003) and public health priorities (American Academy of Pediatrics, 2001; Centers for Disease Control and Prevention, 2008) and has the potential for improving the physical and emotional health of US adolescents generally, and of adolescents with SHCN in particular.

Methods

Participants

The sample was derived from the 2007 National Survey of Children's Health (NSCH) (Data Resource Center for Child and Adolescent Health, 2007), conducted by the National Center for Health Statistics. This is a large, nationally representative survey designed to calculate national and state-specific prevalence estimates of physical, emotional, and behavioural indicators of children (ages birth to 17 years). The overall response rate was 66%, which resulted in a national sample of 91,642 children (Blumberg et al., 2009). The sample was restricted to adolescents (ages 10–17 years). Adolescents for whom the primary respondent was someone other than the biological, step, or adoptive mother or father (5.8%, n = 4865) were excluded from the analyses since the survey does not have information on physical activity of other primary caregivers and because caregiver physical activity was a covariate of interest.

Outcome Measures

Frequency of physical activity, collected by parent proxy, was defined as days during the past week that included exercise, playing sports, or participating in physical activity for at least 20 minutes and was categorised as daily or not based upon recommendations from the Centers for Disease Control and Prevention (2008). Frequency of television viewing, collected by parent proxy, was measured in hours per typical day, and categorised as zero, less than or equal to one hour, greater than one hour but less than four hours, and four or more hours per day.

Child Characteristics

Information was used about the child's age in years, race and ethnicity—grouped as white, non-Hispanic; black, non-Hispanic; Hispanic; and Other (including Asian, non-Hispanic, and multi-racial families). Presence of a SHCN was defined using the National Survey of Children with SHCN Screener (Bethell et al., 2002; Carle, Blumberg, & Poblenz, 2011). Adolescents were identified as having SHCN if their parents reported that at least one of the following criteria resulted from a medical condition and had lasted or would last at least 12 months: requires routine medication for healthcare need; functional limitations; developmental, behavioural, or emotional problems; requires physical, occupational, or speech therapy services; or requires more medical, educational or mental health services than peers. Body mass index was categorised as underweight (less than fifth percentile), healthy weight (between fifth and 84th percentile), overweight (between 85th and 94th percentile) and obese (greater than 95th percentile). Lastly parent-reported current or previous diagnosis of autism, asthma, or functional limitation, or that the child has a developmental or health problem, condition, or disability for which the child has a special education plan (i.e., child receives special education services) was included.

Caregiver and Family Characteristics

Primary caregiver's education was categorised as less than high school, high school, and more than high school. Primary caregiver's physical health was grouped as excellent/very good, good, or fair/poor. Family structure was categorised as single-parent

family or two-parent family (biological or step parents). Frequency of caregiver exercise was categorised as zero, one to two days, three to five days, and six or more days per week of at least 20 minutes of vigorous physical activity. Family income was measured in US dollars and converted to percentages relative to the Federal Poverty Level based upon the Department of Health and Human Services guidelines for income and family size. Missing data on household poverty status were multiply imputed by the National Center for Health Statistics. One multiply imputed dataset was chosen at random for these analyses (Pedlow, Luke, & Blumberg, 2007). The presence of someone to provide parenting emotional support to the caregiver (yes/no) was included.

Parent–Child Functioning

Confirmatory factor analysis (CFA) for ordered categorical measures using Mplus was conducted (Muthen & Muthen, 2007) using the five survey items from the Family Function section of the NSCH (coping with daily parenting tasks, difficulty of caring for the child, how often child behaviours bother the parent, how often parent is angry with child, and sharing ideas and talking about things that matter). Specifically, CFA was used to estimate a factor score that measured parent–child functioning for each child. First, "family function" survey responses were standardised and reverse-coded prior to CFA. Then, factor scores were derived from a weighted summary of each survey item and its factor loading (i.e., the association between the survey item and the underlying construct of parent–child function). Moreover, the CFA procedures, including calculation of the factor scores, accounted for the complex survey design and sampling weights of the NSCH. Higher factor scores (Mean = 0 and Standard Deviation = 1) indicate more optimal parent–child function, and in the multivariable models we present (described below) can be interpreted as the association between a one-standard-deviation change in parent–child function and the outcome of interest (i.e., physical activity or television viewing). Using CFA, an internally consistent parent–child function score was generated based on responses to these questions, while simultaneously partialling out random measurement error. Although the National Center for Health Statistics labels this section of the survey "family functioning", and other authors (e.g., Kim, Viner-Brown, & Garcia, 2007) have called scales created from these questions "family functioning", the questions on this section of the survey only address the relationship between the respondent (in this case, a parent) and the child. Thus, this measure was labelled parent–child functioning rather than family functioning.

The CFA model fit well: Root Mean Square Error of Approximation (RMSEA) = 0.027 (values less than 0.05 indicate excellent fit) (Hu & Bentler, 1999) and Comparative Fit Index (CFI) = 0.96 and Tucker Lewis Index (TLI) = 0.96 (for both, values greater than 0.95 indicate excellent fit). Additional psychometric analysis supporting the reliability and validity of the parent–child function scale is available from the authors upon request.

Analytic Plan

Multivariable ordinal regression models (O'Connell, 2006) were used to estimate the cumulative probability of more frequent television viewing. Logistic regression models were used to estimate the likelihood of meeting the US recommendation of 20 minutes of vigorous daily physical activity. For each outcome (i.e., television viewing and physical activity), the influence of parent–child function score and the presence of SHCN

were estimated, conditional on adolescent and caregiver socio-economic and health characteristics. Thus these two sets of models estimated the independent influences of parent–child function and *any* SHCN on the cumulative likelihood of engaging in more television viewing and the likelihood of meeting US recommendations for regular physical activity, respectively.

In the third set of models, the interaction between parent–child function and the presence of SHCN was examined, focusing on four specific types of SHCN: autism, functional limitations, asthma, and special education. That is, these final models tested the differential influence of parent–child function while controlling for type of SHCN. Regression analyses were conducted in SAS v9.2 (SAS Institute Inc, Cary, NC, USA) using PROC SURVEY to account for the complex sampling scheme and design weights. The ordinal and logistic regression models included a complementary log–log function (Penman & Johnson, 2009; Schmidt & Kohlmann, 2008) to estimate cumulative hazard ratios and rate ratios, respectively. These effect estimates (i.e., hazard ratio and rate ratio) can be interpreted as relative risks (RRs), a more appropriate estimate than odds ratios given the prevalence of the selected health behaviours (Chowhan & Stewart, 2007). The scale of the factor scores (Mean = 0, Standard Deviation = 1) allows for the interpretation that a unit increase in parent–child function is associated with a change in the cumulative hazard rate ratio (for ordinal regression models) or RR (for binary regression models) of the outcome.

This research was deemed exempt from Institutional Review Board approval.

Results

The overall survey sample included 91,642 children. Of these, 86,770 had complete information on all covariates of interest, of which 43,337 were between 10 and 17 years of age. Of the total sample, 11.1% (n = 9714) had SHCN. Table 1 presents the characteristics of the study sample and distribution of the outcome variables.

Higher parent–child function (Table 2) was associated with 18% increased likelihood of meeting US physical activity recommendations (RR = 1.18, 95% confidence interval [CI]: 1.06, 1.31), and a 9% decreased likelihood for more frequent television viewing (RR = 0.91, 95% CI: 0.86, 0.96), conditional on family socio-economic, social support, and health characteristics. Controlling for parent–child function, having any type of SHCN (Table 2) was not associated with differences in physical activity or television viewing.

Table 3 tests the interaction between parent–child function and each of four specific SHCN on patterns of physical activity and television viewing. At the mean parent–child function score, adolescents with autism were 43% (RR = 0.57, 95% CI: 0.37, 0.87) less likely to meet physical activity recommendations than their peers without autism. Moreover, a unit increase in parent–child function score was associated with a 39% (RR = 0.61, 95% CI: 0.46, 0.81) lower likelihood of engaging in recommended frequency of physical activity for children with autism compared with their peers without autism. At the mean parent–child function score, adolescents with functional limitations were 46% (RR = 0.54, 95% CI: 0.36, 0.81) less likely to meet physical activity recommendations than their counterparts without functional limitations. Moreover, a unit increase in parent–child function score was associated with a 49% (RR = 0.51, 95% CI: 0.31, 0.76) lower likelihood of engaging in recommended frequency of physical activity for adolescents with functional limitations compared with their peers without functional limitations.

Table 1. Socio-demographic, health, and physical activity characteristics of a national US sample (n = 43,337) of adolescents (ages 10–17).

Characteristic	Weighted % (standard error)
Race and ethnicity	
White, non-Hispanic	58.9 (0.64)
Black, non-Hispanic	14.4 (0.42)
Hispanic	17.5 (0.62)
Other (includes Asian, non-Hispanic and multi-race)	7.6 (0.34)
Health of primary caregiver	
Excellent/very good	50.4 (0.64)
Good	25.6 (0.56)
Fair/poor	24.2 (0.55)
Education of primary caregiver	
Less than high school degree	11.4 (0.50)
High school degree	25.6 (0.56)
More than high school degree	63.1 (0.64)
Source of emotional support for parenting	
Yes	87.2 (0.48)
No	12.8 (0.48)
Family structure	
Two-parent, biological, adoptive, or step parents	79.8 (0.49)
Single parent	19.6 (0.49)
Child's body mass index	
Underweight (<5th percentile)	5.2 (0.29)
Healthy (5th to 84th percentile)	63.5 (0.62)
Overweight (85th to 94th percentile)	15.3 (0.46)
Obese (>95th percentile)	16.1 (0.49)
Federal poverty level	
0–99%	15.6 (0.48)
100–199%	19.8 (0.53)
200–399%	33.2 (0.60)
400% or more	31.4 (0.54)
Relation of primary caregiver	
Mother (biological, adoptive, or step)	80.4 (0.49)
Father (biological, adoptive, step)	19.6 (0.47)
Child has any special healthcare need[a]	11.1 (0.11)
Child has a functional limitation	
Yes	5.1 (0.10)
No	94.9 (0.10)
Child has current or previous diagnosis of autism	
Yes	1.5 (0.10)
No	98.5 (0.10)
Child has current or previous diagnosis of asthma	
Yes	13.5 (0.29)
No	86.5 (0.29)
Child has special education needs	
Yes	8.6 (0.23)
No	91.4 (0.23)
Days that child exercised vigorously in week	
0	12.0 (0.43)
1–3	27.7 (0.56)
4–6	35.4 (0.57)
Every day	24.9 (0.53)

(*Continued*)

Table 1. (*Continued*).

Characteristic	Weighted % (standard error)
Days that child's primary caregiver exercised vigorously per week	
0	22.9 (0.55)
1–2	23.4 (0.53)
3–5	38.8 (0.59)
6+	14.9 (0.50)
Hours of television viewing per day	
0	5.9 (0.28)
<1	42.5 (0.62)
1 to <4	39.7 (0.61)
4+	11.9 (0.40)
Age of the child	13.8 (2.3), 10 to 17[b]
Parent–child function	0 (1), –0.2 to 0.1[b]

Notes: [a]Children with SHCN are those who, when compared with other children, generally, require more medical or therapeutic services, take a greater than expected number of medications, have a functional limitation, or present with a developmental delay or behavioural problem, any of which is due to a condition that will persist longer than a year (Bethell et al., 2002). [b]Mean (Standard Deviation), range.

Table 2. Adjusted[a] RR (95% CI) from regression models of physical activity and television viewing for parent–child function score and presence of SHCN, among US adolescents (ages 10–17; n = 43,337).

Characteristic	Physical activity[b]	Television viewing[c]
Parent–child function score[d]	1.18 (1.06, 1.31)	0.91 (0.86, 0.96)
Child has a SHCN		
Yes	1.0 (0.84, 1.8)	1.02 (0.98, 1.06)
No	Reference	Reference

Notes: [a]Adjusted for child's age, race and ethnicity, source of emotional support, education of primary caregiver, health of primary caregiver, poverty level, child's body mass index, family structure, and caregiver exercise. [b]Physical activity was modelled as a dichotomous variable: whether the child met the US national recommendations for daily physical activity (i.e., at least 20 minutes of vigorous physical activity six to seven days a week). [c]Television viewing was modelled as an ordinal variable (i.e., zero, less than one, one to four, and four or more hours per day). [d]Parent–child function scores (Mean = 0, Standard Deviation = 1) were calculated from CFA of the five survey items from the Family Function section of the NSCH (coping with daily parenting tasks, difficulty of caring for the child, how often child behaviours bother the parent, how often parent is angry with child, and sharing ideas and talking about things that matter). Higher scores indicate better parent–child function.

There were no significant differential influences of parent–child function on physical activity for adolescents with asthma (p = 0.31) or special education needs (p = 0.06).

Similar analyses for television viewing showed no significant interaction between parent–child function and each specific type of SHCN (results not shown).

Discussion

In this study, lower parent–child function was associated with less frequent physical activity and more frequent television viewing among adolescents. Moreover, adolescents with autism and functional limitations were particularly vulnerable to the influence of parent–child function on physical activity.

The findings of the current study were consistent with previous studies (Barr-Anderson et al., 2007; Chowhan & Stewart, 2007; Henggeler & Cohen, 1991;

Table 3. Adjusted[a] RR (95% CI) from binary regression models of meeting national recommendations[b] for physical activity by differential influence of parent–child function controlling for type of SHCN, among US adolescents (ages 10–17; n = 43,337).

Characteristic	Autism	Functional limitations	Asthma	Special education
Parent–child function score[c]	0.70 (0.53, 0.93)	1.16 (1.03, 1.31)	1.09 (0.95, 1.25)	1.17 (1.03, 1.33)
Child SHCN sub-group[d]				
Yes	0.57 (0.37, 0.87)	0.54 (0.36, 0.81)	1.08 (0.91, 1.28)	1.0 (0.81, 1.22)
No	Reference	Reference	Reference	Reference
Child SHCN×parent–child function score[e]				
Child SHCN×parent–child function score	0.61 (0.46, 0.81)	0.51 (0.31, 0.76)	1.14 (0.88, 1.47)	0.76 (0.56, 1.02)
Non-child SHCN×parent–child function score	Reference	Reference	Reference	Reference

Notes: [a]Adjusted for child's age, race and ethnicity, source of emotional support, education of primary caregiver, health of primary caregiver, poverty level, child's body mass index, family structure, and caregiver exercise. [b]Centers for Disease Control and Prevention recommendations for physical activity for children include 20 minutes of daily vigorous physical activity (yes/no). [c]Parent–child function scores (Mean = 0, Standard Deviation = 1) were calculated from confirmatory factor analysis of the five survey items from the Family Function section of the NSCH (coping with daily parenting tasks, difficulty of caring for the child, how often child behaviours bother the parent, how often parent is angry with child, and sharing ideas and talking about things that matter). Higher scores indicate better parent–child function. [d]Interpreted as the relative risk of engaging in recommended physical activity for children with SHCN sub-group versus adolescent without SHCN at the mean parent–child function score. [e]Interpreted as the change in relative risk of meeting national physical activity recommendations for a unit-change in parent–child function for children with SHCN sub-type relative to children without the sub-type of SHCN.

McGuire et al., 2002; Ward et al., 2006) where low family function predicted more frequent television viewing and less frequent physical activity. Positive family environment fostered self-control, social competence, healthy attitudes and behaviours, and was characterised by optimal parental support and supervision (Kim Park et al., 2008). Thus, families characterised by conflict, over-control or under-control/supervision, and poor communication demonstrated fewer positive health attitudes and behaviours and might have watched excessive television because they lacked the emotional resources (Pearlin, 1959) necessary to restrict television viewing and engage in alternative pro-social activities (e.g., physical exercise or extracurricular activities).

Programmatic policy implications of this research indicate that improving parent–child function should translate into more frequent physical activity for families. Several studies (O'Connor, Jago, & Barnowski, 2009; Task Force on Community Prevention Services, 2002; van Sluijs et al., 2007) have investigated the effect of improving family support for physical activity. The results suggested limited positive effects compared with school-based interventions. However, potentially effective practices include a family component to school-based programming (van Sluijs et al., 2007), family involvement in organised, exercise-based activities (O'Connor et al., 2009) and parent support and education around increasing television monitoring at home (Jordan & Robinson, 2008). Owing to the limited number of studies, low study quality, and heterogeneity of interventions, expert panels concluded that, although family function is an important predictor of physical activity, there was insufficient evidence to recommend implementing family-based physical activity interventions exclusively (O'Connor et al., 2009; Task Force on Community Prevention Services, 2002; van Sluijs et al., 2007). Rather, the findings of this study add to the evidence base suggesting potential efficacy of improving physical activity by incorporating parent–child function, and suggest the importance of the role of families (especially given the significant association between caregiver and adolescent exercise) in health behaviour research. Whereas previous work has suggested that successful interventions to improve physical activity have largely benefited the most advantaged (Gauvin, 2003), applying a parent–child function lens to population health interventions to improve physical activity and reduce television viewing may shed light on reducing social disparities in physical inactivity.

The results of this study also found that, at every level of parent–child function, having autism or a functional limitation was associated with less frequent exercise. Previous research has suggested that children with disabilities engage in fewer pro-social activities (e.g., clubs, after-school programmes) and more sedentary behaviours (e.g., television viewing) (King et al., 2006). This is particularly problematic for a population that is at risk for secondary complications such as obesity, contractures, and social isolation (American Academy of Pediatrics, 2002; Simeonsson, McMillan, & Huntington, 2002). Consistent with a previous theoretical model (Newacheck et al., 2006), this study found that this varies by parent–child function. However, it appears this is the first study to empirically test this in the context of physical activity. One explanation for the differing patterns of physical activity in families of children with SHCN is that caregiving experiences alter family cohesion, adaptability, and coping strategies (Jones & Passey, 2005), and impose different community and socio-political barriers on adolescents with SHCN (Gnanasekaran et al., 2008), all of which constrain physical activity.

While it was hypothesised that having a SHCN would have an independent effect on physical activity, there was no evidence of this. That is, the results suggested that having *any* SHCN was not associated with differences in the likelihood that an adolescent would engage in the recommended amount of daily, vigorous physical activity.

This finding was not consistent with the research of Law et al. (2006), which suggested that children with disabilities engaged in less physical and more leisure activities. However, previous research (e.g., King et al., 2006; Law et al., 2006) focused on children with cerebral palsy. Indeed, in this study adolescents with SHCN were a diverse group with varying types of need. Thus, differences in patterns of physical activity among adolescents with SHCN might have been masked when differences in sub-type of SHCN were not considered.

Moreover, it was hypothesised that having a SHCN would not only have an independent effect on television viewing, but also be differentially influenced by parent–child function; however, the results did not support this. Previous research (Henggler & Cohen, 1991; Pearlin, 1959) suggested that the influence of low parent–child function on television viewing stems from inappropriate supervision and limited emotional resources, which presumably, due to caregiver burden, would have been stronger for families of adolescents with SHCN. *Post-hoc* analyses (data not shown) revealed an independent association between parent–child function and having a television in the child's room, rules about television programming, time that the adolescent spends unsupervised, and frequency of extracurricular activities. Moreover, with the exception of extracurricular activities, no differences were found in these patterns for adolescents with SHCN. Thus, adolescents with SHCN living in families with low parent–child function appeared to engage in fewer extracurricular activities, but did not differ in television-related supervision. Thus, despite exercising less and engaging in fewer extracurricular activities, adolescents with SHCN did not seem to be compensating with excessive television viewing. However, future research should employ detailed time-use data to further explore this.

Interventions to promote physical activity in children and adolescents with disabilities have focused mostly on children and adolescents with cerebral palsy and the interventions have largely been individual (e.g., individual strength training or cardiovascular programme) with a growing recognition of the need for community-based programming. The results (Fragala-Pinkham, Haley, & Goodgold, 2006; Verschuren, Ketelaar, Takken, Helders, & Gorter, 2008) suggested that partnering with a community-based fitness organisation can be an effective means to improve physical activity in children and adolescents with cerebral palsy. However, less attention has been given, in intervention studies, to parent–child function or other populations of children with SHCN. Future research should include a parent–child function component to physical activity interventions since assistance with family psychosocial processes (i.e., family supports and parent–child function) is often overlooked, when considering a child's medical and developmental needs, by parents of children with developmental disabilities and perhaps even clinicians (Palisano et al., 2009).

Limitations to this study should be acknowledged. First, the cross-sectional data precluded our ability to make inferences about causal relationships. Second, no agreed-upon framework existed for measuring family function using the NSCH. Although our research supported the validity of using these five questions, CFA, and the resulting parent–child function scores, the five questions only measured parent–child function. They did not fully address the broader family functioning spectrum and no questions existed on the survey to measure family (as opposed to parent–child) function. Thus, it remained unclear, the extent to which the broader concept of family function relates to physical activity and television viewing.

Third, our outcome measures were parent-reported, which may have introduced reporting bias. To our knowledge, the validity of parent-reported physical activity and television viewing has not been studied. Parental mental health may have affected parent

reports of physical activity, television viewing, and parent–child function. However, parental mental health measures were not included in this study because previous literature has suggested that it correlated highly with parent–child function.

Fourth, additional contributors to children's behaviour—peer influences and parental time and emotional resources (e.g., employment patterns, work hours and satisfaction)—should be acknowledged. The nature of this dataset did not allow an examination of these questions, but future research should address these determinants of adolescent behaviour.

Lastly, our measurement of television viewing was limited to quantity and we acknowledge that quality of programming can vary substantially. Certainly viewing an educational programme together as a family would be quite different from an adolescent watching a violent or inappropriate programme without supervision.

Despite these limitations, this study had several strengths. First, it appears that this was the first population-based study to explore the association between parent–child function and adolescents' frequency of physical activity and television viewing. Previous epidemiologic studies (e.g., Ferreira et al., 2006) have investigated race, ethnicity, socioeconomic characteristics, and attitudes and behaviours of families, but not family process factors. Secondly, two important health-related behaviours—physical activity and television viewing—were investigated. Rates of chronic disease in children and adolescents have increased substantially in the last two decades, largely due to epidemic increases in obesity and emotional problems (Perrin, 2010). Understanding correlates of obesity (i.e., physical activity and television viewing) as well as emotional health (i.e., parent–child function) at the national level could contribute positively to programmatic efforts and health policy to improve the physical and emotional health of children and adolescents. Lastly, significant differences with regard to the influence of parent–child function on physical activity for children with and without SHCN were discovered. Given the physical inactivity crisis in the United States, the vulnerability of children with SHCN to not participating in family, school, and community-based activities, and the growing recognition of the importance of caregiver burden, this research could offer a timely positive contribution to current policy and programmatic efforts.

This study found that lower parent–child function was associated with less frequent participation in physical activity and more frequent television viewing among adolescents. Moreover, lower parent–child function was particularly detrimental for adolescents with autism and functional limitations. Policy and programmatic efforts to bolster organised parent–child physical activities, reduce caregiver burden, engage paediatric clinicians and educators in family psychosocial processes, and increase community-based partnerships with physical fitness centres might ameliorate disparities in physical activity.

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