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The association between parents and children meeting physical activity guidelines

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Abstract

Purpose: To examine the association between parents and children meeting physical activity (PA) guidelines, by gender, among 8–12 year old children with BMI ≥75th percentile

Design and methods: This was a secondary analysis of baseline data from a school-based healthy weight management intervention in Minnesota for 8–12 year old children. Survey data about PA participation were collected from 2014 through 2018. Analyses entailed descriptive statistics and multivariate logistic regression controlling for child age, race/ethnicity, BMIz, child's perception of parent support for activity, and number of sports played.

Results: Children's (n = 132) mean age was 9.32 ± 0.89 years, 49% were female, 63% were members of racial/ethnic minority groups, and 33% met PA Guidelines (≥60 minutes daily). Parents' (n = 132) mean age was 39.11 ± 7.05 years, mean BMI of 30.90 ± 8.44, 94% were female, 42% were members of racial/ethnic minority groups, and 57% met PA Guidelines for Americans (≥150 minutes moderate or >75 minutes vigorous PA weekly). There was no association between parents and children meeting PA guidelines for the total sample (OR = 1.43, 95% CI = 0.63–3.24, p = 0.39) or girls (OR = 0.65, 95% CI = 0.18–2.33, p = 0.51). Boys whose parents met PA guidelines had 3.84 times greater odds of meeting PA guidelines (95% CI = 1.28–13.4, p = 0.04).

Conclusions: PA interventions for boys may benefit from focus on parents' PA. Further research should investigate correlates of girls' PA.

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CRediT authorship contribution statement

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Declarations of competing interest

None.

Practice implications: Pediatric nurses working with children to increase PA should encourage parents' PA. For parents of boys, this may increase the child's PA. Considered broadly, nurses should be aware of gender influences on children's engagement in PA.

Keywords

Physical activity; Parent; Child; Pre-adolescent

Introduction

In 2015–2016, 18.5% of children and adolescents had obesity (Hales, Fryar, Carroll, Freedman, & Ogden, 2018). Due to obesity's association with increased risk for chronic cardiometabolic disorders (e.g., diabetes, hypertension, ischemic heart disease, stroke) and negative psychosocial outcomes (e.g., body dissatisfaction, depression, bullying), health interventions aimed at reducing the prevalence of childhood obesity are necessary (Flynn et al., 2006; Gibson et al., 2017; Rankin et al., 2016; Reilly et al., 2003; Reilly & Kelly, 2011). Childhood and adolescence are ideal times for obesity interventions and nursing care focused on weight management, because healthy habits formed at this time can decrease risk for adult obesity (Ash, Agaronov, Aftosmes-Tobio, & Davison, 2017; Dangardt et al., 2019; Hampson, Goldberg, Vogt, & Dubanoski, 2007; Jones, Hinkley, Okely, & Salmon, 2013; Shephard & Trudeau, 2000; Simmonds, Llewellyn, Owen, & Woolacott, 2016; Tammelin et al., 2014).

Moderate and vigorous physical activity (MVPA) is associated with a decreased risk of obesity, thus nurses interested in helping children and adolescents reach, as well as maintain, a healthy body weight should encourage MVPA (Kelishadi & Azizi-Soleiman, 2014; Kelly, Turner, Speroni, McLaughlin, & Guzzetta, 2013; Reilly et al., 2003; Reilly & Kelly, 2011; Sothern, Loftin, Suskind, Udall, & Blecker, 1999). Current Physical Activity (PA) Guidelines for Americans recommend 60 minutes or more of MVPA per day for children and adolescents (U.S. Department of Health and Human Services, 2018), but nationally only 24% of 6–19 year olds meet these guidelines (Katzmarzyk et al., 2018). In addition, PA decreases during adolescence, with 42.5% of 6–11 year olds but only 5.1% of 16–19 year olds meeting activity guidelines (Katzmarzyk et al., 2018). Children and adolescents with overweight and obesity are less likely to meet physical activity guidelines (Ball et al., 2008; Kunin-Batson et al., 2015; Laurson et al., 2008). Nursing interventions to increase PA are needed, especially among groups at risk for obesity such as children and adolescents with elevated BMI.

Children's health behavior, including PA, is influenced by parents (Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2010; Lindsay, Sussner, Kim, & Gortmaker, 2006; Pugliese & Tinsley, 2007). Parent modeling of healthy behaviors may increase healthy behaviors in their children. However, nationally only 53% of adults engage in the recommended 150 minutes of moderate or 75 minutes of vigorous PA per week (U.S. Department of Health and Human Services, 2018; National Center for Health Statistics, 2019) which suggests that parents may not model optimal physical activity behaviors. To date, studies examining the relationship between parent PA and children's PA have demonstrated mixed results

(Anderssen, Wold, & Torsheim, 2006; Biddle, Atkin, Cavill, & Foster, 2011; Gustafson & Rhodes, 2006; Sterdt, Liersch, & Walter, 2014; Yao & Rhodes, 2015). Longitudinal studies have shown no relationship (Anderssen et al., 2006) and reviews have shown weak effects or mixed associations (Gustafson & Rhodes, 2006; Yao & Rhodes, 2015). Potential gender differences have been noted, with fathers having a greater influence on their sons' PA and mothers having a greater influence on their daughters' PA (Fuemmeler, Anderson, & Mâsse, 2011; Gustafson & Rhodes, 2006; Schoeppe, Röbl, Liersch, Krauth, & Walter, 2016; Yao & Rhodes, 2015). Overall, there is ambiguity from previous studies as to whether there is an association between parents and children engaging in recommended amounts of PA. Patterns of association in high risk subgroups, such as children with elevated BMI percentile, are particularly poorly understood, as are associations in racial/ethnic minority populations. Overall, a better understanding of the relationship between parent's and children's PA will better inform nursing care and family-based PA interventions.

Purpose

The purpose of this study was to examine the association of parents and children meeting PA guidelines, by gender, in a racially/ethnically diverse sample of children with body mass index (BMI) ≥75th percentile. Children with a BMI at the top quarter of the growth chart are at increased risk for excess weight gain, making this population of particular importance for research and nursing interventions (Datar, Shier, & Sturm, 2011; Nader et al., 2006; Skelton & Beech, 2011).

Methods

Design

This was a secondary analysis of baseline data from the Students, Nurses, and Parents Seeking Healthy Options Together (SNAPSHOT) study, a two-group randomized controlled trial of a school-based healthy weight management intervention conducted in two metropolitan Minnesota public school districts (Kubik et al., 2018). The intervention was delivered across four one-year cohorts from 2014 to 2018 and targeted 8–12 year old children with BMI ≥ 75th percentile for age and sex, a population at increased risk for excess weight gain and at a key developmental stage for promoting a healthy body weight (Datar et al., 2011; Nader et al., 2006; Skelton & Beech, 2011). Additional inclusion criteria were English literacy, child living with the participating parent for most of the time, and no plans to move outside the school district within the next 12 months. Exclusion criteria were food allergies, physical or medical conditions limiting PA, and emotional conditions limiting engagement with other children in group activities. Participants were recruited from two large school districts, one urban and one suburban, using flyers, website announcements, in-person presentations, and mailings. The SNAPSHOT study was approved by the Institutional Review Boards of Temple University and University of Minnesota and written informed parent consent and child assent was completed prior to data collection.

Measures

Parents self-reported demographic measures for themselves and their children, including child/parent age in years, child/parent gender, and child/parent race/ethnicity. Trained research staff collected child/parent height and weight using standard procedures (Lohman, Roche, & Martorell, 1988). BMI was calculated for adults by dividing weight (kilograms) by body surface area (meters squared). Child BMI was calculated using age- and sex-specific growth charts provided by the Centers for Disease Control and Prevention (Lohman et al., 1988).

Parent and child PA data were collected using a self-reported paper and pencil survey, adapted from the reliable and valid Leisure Time Exercise Questionnaire (Godin & Shephard, 1985; McGuire, Neumark-Sztainer, & Story, 2002). Variables used in this study included moderate and vigorous PA. Vigorous PA was assessed by asking: "In a usual week, how many hours do you spend doing strenuous exercise?" with given examples such as biking fast or running. Moderate PA was assessed by asking "In a usual week, how many hours do you spend doing moderate exercise?" with given examples such as walking quickly and easy bicycling. Response options for moderate and vigorous PA ranged from none to >6 hours per week. PA Guidelines for Americans were used to create a dichotomous variable indicating whether or not the child and parent met guidelines (at least 60 minutes of MVPA per day for children and 150 minutes of moderate or 75 minutes of vigorous PA per week for adults) (U.S. Department of Health and Human Services, 2018).

The child survey also included a question about how many sports the child participated in during the past year, with response options of "0", "1", "2", "3", or "4 or more". To assess the child's perception of parental support for PA, the child survey included a nine item scale (adapted from reliable tools, score range of 9–27, higher score indicating greater support, $\alpha = 0.73$) (Story et al., 2003; Trost et al., 2003). The scale questions included "How often do your parents do the following things" related to various activities and behaviors supportive of PA, such as trying a new physical activity with the child or encouraging the child to play outside, with response options of "almost never," "sometimes," or "almost always."

Statistical analysis

Descriptive statistics were calculated for the demographics and variables of interest. PA levels for both children and parents were dichotomized as meeting or not meeting PA Guidelines for Americans (U.S. Department of Health and Human Services, 2018). Multivariate logistic regression was used to examine the association between parent meeting PA guidelines (independent variable, dichotomous yes/no) and child meeting PA guidelines (dependent variable, dichotomous yes/no). Additional model covariates included child age in years (continuous), child race/ethnicity (racial/ethnic minority yes/no, with racial/ethnic minority defined as Black or African American, Asian or Pacific Islander, American Indian or Alaskan Native, more than one race, or Hispanic/Latinx), number of sports played by child (categorical 0 to ≥4), and child perception of parental support for PA (continuous). Covariates were selected according to prior research demonstrating factors associated with children's PA (Biddle et al., 2011). Analyses were stratified by child gender. Of note: Study sample size was determined by power to detect an intervention effect in the parent RCT - not

for this study or for gender subgroup analyses. However, gender subgroup analyses were executed given extensive evidence for known differences in PA behaviors and modification by gender (Cooper et al., 2015; Craggs, Corder, Van Sluijs, & Griffin, 2011; Fuemmeler et al., 2011; Hallal et al., 2012; Jago, Fox, Page, Brockman, & Thompson, 2010; Telford, Telford, Olive, Cochrane, & Davey, 2016; Verloigne et al., 2012). Statistical significance was set at $p < 0.05$ and model fit was confirmed using the Hosmer-Lemeshow test (Allison, 2014; Hosmer, Hosmer, Le Cessie, & Lemeshow, 1997; Lemeshow & Hosmer, 1982). All analyses were conducted using SAS version 9.4 (SAS, 2013).

Results

Descriptive statistics for the sample ($n = 132$ dyads) are presented in Tables 1a and 1b. Children had a mean age of 9.32 ± 0.89 and mean BMIz score of 1.62 ± 0.67. Approximately half (49%) of children were female and 63% were members of racial/ethnic minority groups. One third (33%) of children met PA guidelines. Boys reported more perceived parent support for PA than girls and more sports participation than girls, though these differences were not statistically significant. Parents had a mean age of 39.11 ± 7.05 and a mean BMI of 30.90 ± 8.44. The majority (94%) of parents were female, 42% were members of racial/ethnic minority groups, and 57% met PA guidelines. Multivariate logistic regression results, stratified by gender, are presented in Table 2. No association was found between parents and children meeting PA guidelines for the total sample (OR = 1.43, 95% CI = 0.63–3.24, $p = 0.39$) or girls (OR = 0.65, 95% CI = 0.18–2.33, $p = 0.51$). However, boys whose parents met PA guidelines had 3.8 times greater odds of meeting PA guidelines ($p = 0.04$ 95% CI 1.28–13.41).

Discussion

In this study of 8–12 year old children with BMI ≥75th percentile and their parent, parents meeting PA guidelines was associated with boys but not girls meeting PA guidelines. Thus, PA interventions and clinical care for boys with elevated BMI may benefit from a focus on parent's PA. While this study was an exploratory secondary analysis, the results are consistent with existing literature reporting differences between boys and girls in both PA behaviors and influences on PA (Cooper et al., 2015; Craggs et al., 2011; Fuemmeler et al., 2011; Hallal et al., 2012; Jago et al., 2010; Telford et al., 2016; Verloigne et al., 2012). Findings add new knowledge related to gender differences in associations between parents and children meeting activity guidelines. Further, this study highlights how these associations manifest in a priority population at risk of excess weight gain, children with BMI ≥75th percentile, and approaching a developmental stage (adolescence) during which activity levels decline. It raises questions for future research that can build the evidence-base for interventions and pediatric nursing care focused on physical activity and obesity prevention.

Associations between parent and child PA are difficult to disentangle because parent influence on child PA is multi-faceted and may occur through direct and indirect pathways. The complexity of these associations aligns with theories such as Social Cognitive Theory (Bandura, 1986) that recognize multifaceted interpersonal influences on behavior

(Anderssen et al., 2006; Welk, Wood, & Morss, 2003). Parent role modeling of PA, such as by engaging in enough PA to meet guidelines, is one key influencing factor. It is possible that parent role modeling may influence child PA directly or indirectly, with child perception of parent support and parental bonding serving as mediating factors (Beets, Cardinal, & Alderman, 2010; Dzewaltowski, Ryan, & Rosenkranz, 2008; Wilk, Clark, Maltby, Tucker, & Gilliland, 2018). Another key interpersonal influence is parent support for PA, which is associated with increased child PA (Biddle et al., 2011; Sterdt et al., 2014) (and was controlled for in this study's multivariate analyses). Parent encouragement (e.g., suggesting that their child be active) and facilitating (e.g., bringing their child to the park to play) may also influence child's PA (Anderssen et al., 2006; Welk et al., 2003), with encouragement being a particularly important factor (Wilk et al., 2018). Future studies can attempt to disentangle the direct and indirect pathways by which parents influence their children's PA, in order to inform family-level interventions and clinical care.

When working with children and families, nurses should be sensitive to parents' barriers to supporting their child's PA (Bassett-Gunter, Rhodes, Sweet, Tristani, & Soltani, 2017). Barriers such as lack of energy, guilt for overscheduling, safety concerns, and inclement weather limit parents' ability to provide support for PA (Bassett-Gunter et al., 2017). Future research should test targeted strategies for addressing common barriers to parental support and motivation for PA. Previous research has illuminated effective strategies for family-based PA interventions despite barriers, such as using goal-setting and reinforcement strategies (Bassett-Gunter et al., 2017; Brown et al., 2016). For children with overweight or obesity, multicomponent family interventions that include both PA counseling and additional components (such as dietary counseling, sedentary activity counseling, behavioral counseling, family counseling, and parent training) are recommended (Association, 2006). Despite existing recommendations, there remains a lack of evidence on interventions and clinical care for children with elevated BMI. In addition, there remains a need for research to inform culturally-relevant multi-component family-based PA interventions, as well as explore if and how to tailor family-focused interventions based upon child gender (Ash et al., 2017; Brown et al., 2016).

Parent characteristics, such as gender, may influence the association between parent and child PA. The majority (93%) of parents in this sample were female, similar to other studies on relationships between parent and child PA (Jago et al., 2010). Previous studies have reported differing associations between father's, mother's, and children's PA (Beets et al., 2010; Fuemmeler et al., 2011; Gustafson & Rhodes, 2006; Peterson, Lawman, Wilson, Fairchild, & Van Horn, 2013; Telford et al., 2016; Welk et al., 2003), indicating potential variation in modeling behavior and support for PA between parents. Studies that included both mothers and fathers suggest the strongest association is for fathers with sons and mothers with daughters (Fuemmeler et al., 2011; Gustafson & Rhodes, 2006). It is possible that this study's association of parent and child meeting PA guidelines may have differed if the sample included more fathers. Further, it is possible that other parent characteristics (besides gender) may be relevant to understanding the association between parent and child PA; however sample size and data limitations precluded exploring parent characteristics in the current study. Future studies may benefit from exploring the how parent characteristics, including but not limited to gender, influence the association between parent and child PA.

Implications for nursing

While this study was an exploratory secondary analysis, the findings have implications for pediatric nursing. Considering this study's findings alongside theory and existing literature, it is clear that pediatric nurses should consider gender differences in PA behaviors and influences when engaging in family education related to PA (Fuemmeler et al., 2011; Gustafson & Rhodes, 2006; Schoeppe et al., 2016; Yao & Rhodes, 2015). Education can be supplemented by encouraging increased parent PA and support for their child's PA, in order to increase PA among boys. Given the complexity of the relationship among parent and child PA, nurses can encourage parents to take multi-faceted approaches to supporting their child's PA (e.g., encouragement and role modeling) (Anderssen et al., 2006; Bandura, 1986; Biddle et al., 2011; Sterdt et al., 2014; Welk et al., 2003; Wilk et al., 2018). Additionally, nurses should discuss PA with girls and consider what factors may promote increased PA, with attention to the potential for girls having less parent support for PA (Beets et al., 2010; Fuemmeler et al., 2011; Gustafson & Rhodes, 2006; Telford et al., 2016; Welk et al., 2003).

Limitations

Limitations include small sample size, cross-sectional design, and focus on child characteristics only. In addition, this study was a secondary analysis of data from a randomized controlled trial, thus the data were not collected specifically for nor powered based upon testing this study's hypothesis; a study designed to primarily address the research question may have led to different results. This study was conducted using self-report of PA, which may have resulted in less accurate measure of PA compared to objective measure using tools such as actigraph. In addition, participants were volunteers for a healthy weight intervention program located in one Midwestern metropolitan area and may differ from the general population.

Conclusions

In this study of the association between parents and children meeting PA guidelines, boys whose parents met PA guidelines had greater odds of meeting PA guidelines. This suggests the need for PA interventions for boys with overweight or obesity to be family-centered, and the need for further research on PA correlates for girls. With attention to the association between parents and children's PA, nursing interventions can be implemented to promote physical activity, reduce obesity, and promote health for all children.

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Table 1a

Demographics of children in study sample (n = 132).[a]

Characteristic	Total sample n = 132	Boys n = 67	Girls n = 65	*P*-value for difference by gender
Child gender				
Male	65 (49.24%)			
Female	67 (50.76%)			
Child age in years (mean ± SD)	9.32 ± 0.89	9.18 ± 0.86	9.46 ± 0.91	0.07
Child BMIz (mean ± SD)	1.62 ± 0.67	1.61 ± 0.63	1.64 ± 0.71	0.80
Child race/ethnicity (n [%])[b]				
American Indian/Alaskan Native	2 (1.52)	1 (1.49)	1 (1.54)	0.63
Asian or Pacific Islander	9 (6.82)	4 (5.97)	5 (7.69)	
Black/African American	30 (22.73)	13 (19.40)	17 (26.15)	
White/Caucasian	66 (50.00)	34 (50.75)	32 (49.23)	
More than one race	16 (12.12)	8 (11.94)	8 (12.31)	
Other	9 (6.82)	7 (10.45)	2 (3.08)	
Hispanic/Latinx	30 (22.73)	18 (26.87)	12 (18.46)	0.25
Not Hispanic/Latinx	102 (77.27)	49 (73.13)	53 (81.54)	
Racial/ethnic minority group	83 (62.88)			
Meets PA guidelines for Americans (n [%])[b]				
Yes	44 (33.33)	19 (29.23)	25 (37.31)	0.32
No	88 (66.67)	46 (70.77)	42 (62.69)	
Perception of parent support for PA (mean ± SD)	20.00 ± 3.47	20.22 ± 3.05	19.11 ± 3.80	0.07
Number of sports played (n [%])				
0	27 (20.45)	13 (19.40)	14 (21.54)	0.35
1	27 (20.45)	10 (14.93)	17 (26.15)	
2	33 (25.00)	17 (25.37)	16 (24.62)	
3	16 (12.12)	11 (16.42)	5 (7.69)	
4 or more	29 (21.97)	16 (23.88)	13 (20.00)	

[a]BMI=Body Mass Index, PA = Physical activity.

[b]At least 60 min of MVPA per day for children and 150 min of moderate or 75 min of vigorous PA per week for adults.

Table 1b

Demographics of parents in study sample (n = 132).[a]

Characteristic	
Parent gender (n [%])	
Male	8 (6.06%)
Female	124 (93.94%)
Parent age in years, (mean ± SD)	39.11 ± 7.05
Parent BMI in kg/m^2 (mean ± SD)	30.90 ± 8.44
Parent race/ethnicity (n [%])	
American Indian/Alaskan Native	2 (1.52)
Asian or Pacific Islander	9 (6.82)
Black/African American	26 (19.70)
White/Caucasian	86 (65.15)
More than one race	2 (1.52)
Other	7 (5.30)
Hispanic/Latinx	17 (12.88)
Not Hispanic/Latinx	115 (87.12)
Racial/ethnic minority group	56 (42.42%)
Meets PA guidelines for Americans (n [%])[b]	
Yes	75 (56.82)
No	57 (43.18)

[a]BMI=Body Mass Index, PA = Physical activity.

[b]At least 60 min of MVPA per day for children and 150 min of moderate or 75 min of vigorous PA per week for adults.

Table 2

Multivariate logistic regression analysis of the association between parent meeting PA guidelines and child meeting PA guidelines for Americans (n = 132).[a,b]

	Total sample N = 132		Boys N = 67		Girls N = 65	
	Child meets guidelines[b]					
	Odds ratio (95% CI)	P-value	Odds ratio (95% CI)	P-value	Odds ratio (95% CI)	P-value
Parent meets guidelines[b]		0.39		0.04		0.51
Yes	1.43 (0.63, 3.24)		3.84 (1.08, 13.71)		0.65 (0.18, 2.33)	
No	Ref		Ref		Ref	
Child age in years	1.06 (0.67, 1.67)	0.80	1.36 (0.66, 2.80)	0.40	1.09 (0.54, 2.18)	0.81
Child BMI z-score	0.90 (0.50, 1.63)	0.73	0.53 (0.20, 1.36)	0.19	1.29 (0.53, 3.15)	0.58
Child race/ethnicity[c]						
Minority group	0.51 (0.23, 1.17)	0.11	0.60 (0.19, 1.93)	0.39	0.64 (0.18, 2.34)	0.50
Not minority group	Ref		Ref		Ref	
Parent support for PA	1.13 (1.00, 1.28)	0.05	1.05 (0.85, 1.28)	0.67	1.19 (1.00, 1.43)	0.06
Child number of sports						
Child in 0 sports	0.34 (0.09, 1.33)	0.16	0.43 (0.06, 3.45)	0.51	0.32 (0.05, 2.29)	0.50
Child in 1 sport	0.65 (0.20, 2.16)		2.06 (0.33, 12.81)		0.47 (0.08, 2.87)	
Child in 2 sports	1.47 (0.50, 4.30)		2.23 (0.48, 10.49)		1.44 (0.27, 7.70)	
Child in 3 sports	1.68 (0.47, 6.06)		1.92 (0.34, 10.89)		1.44 (0.15, 14.04)	
Child in ≥4 sports	Ref		Ref		Ref	

[a]BMI=Body Mass Index, PA = Physical activity.

[b]At least 60 min of MVPA per day for children and 150 min of moderate or 75 min of vigorous PA per week for adults.

[c]Children of Black/African American, Asian or Pacific Islander, American Indian/Alaskan Native race or Hispanic/Latinx ethnicity were considered to be members of racial/ethnic minority group.