

Association of Active Play-Related Parenting Behaviors, Orientations, and Practices With Preschool Sedentary Behavior

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Background: Parents' behaviors, practices, beliefs, and attitudes greatly influence children's active play behavior; however, little research has examined these parental influences on preschool children's sedentary behavior (SB). **Purpose:** The purpose of this study was to examine the association between parental influences on preschool SB. **Methods:** One hundred eighty-six parents of preschoolers completed an online survey that examined the parents' own physical activity behaviors, parental practices, parental dimensions, and parental orientations. Hierarchical linear regression analysis was used to examine the association between active play-related parenting behavior, orientations, and practices with preschool SB during the week and weekend. **Results:** During the weekday ($\beta = -0.46, P < .001$) and weekend ($\beta = -0.48, P < .001$), parental control was inversely associated with preschool screen time among boys. **Discussion:** The results of this study suggest that parental control is an independent predictor of screen time during the week and weekend for preschool boys. Future research should include sedentary-specific parenting practices and a qualitative methodology component. **Translation to Health Education Practice:** If our findings are confirmed by future research, health educators should teach parents how to implement monitoring and control-related parenting practices to minimize preschool SB.

BACKGROUND

Regular participation in physical activity is critical in the prevention of chronic disease.¹ Physical activity may help

prevent various chronic diseases, such as cardiovascular disease and diabetes, through a variety of mechanisms, including physical activity-induced regulation of systemic inflammation,^{2,3} glycemic control,⁴ and endothelial function.⁵ And among those with chronic disease (e.g., diabetes), adoption and maintenance of physical activity may help attenuate the progression of the disease along with delaying the onset of other chronic diseases.³ Given these beneficial effects of physical activity, increasing physical activity and minimizing prolonged sedentary behavior is critical, and

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doing so early in childhood is important as physical inactivity and cardiovascular disease risk factors (e.g., adiposity, C-reactive protein, and lipids) track from childhood to adulthood.⁶⁻¹⁰

Recent studies indicate that time spent in sedentary activities is an independent predictor of health (i.e., independent of physical activity).¹¹ Because of this emerging evidence, a new line of inquiry, named *sedentary physiology*, has emerged, which can be conceptualized as being on the opposite end of the movement continuum from *exercise physiology*.¹² In adolescents, Mark and Janssen¹³ showed that, independent of physical activity, the odds of having metabolic syndrome was 3 times higher among those who spent ≥ 5 hours per day sitting in front of a screen (i.e., “screen time”; e.g., television, computer, and video games), a commonly used proxy measure of sedentary behavior, compared to those with ≤ 1 hour of television viewing. The mechanism through which sedentary behavior may influence cardiovascular disease risk factors may, for example, be through increases in the enzyme lipoprotein lipase, which favors increased accumulation of triglycerides and decreased high-density lipoprotein cholesterol.^{12,14} Not only may excessive accumulation of sedentary activity influence cardiometabolic health among children, but studies indicate that early excessive exposure to television viewing may negatively influence attention,¹⁵ language,¹⁶ and cognitive development.¹⁷ During the school-age years, too much television exposure may influence violence and aggressive behavior,^{18,19} sexual behavior,²⁰ academic achievement,²¹ self-image,²² obesity,²³ and substance use.¹⁸ Moreover, television commercials directed toward children tend to promote unhealthy food choices and encourage sedentary behaviors.²⁴

Like physical activity and active play behavior,²⁵ sedentary behavior may track over time,²⁶ underscoring the importance of developing sedentary-reducing interventions during early childhood. This is particularly important because, in addition to sedentary behavior being associated with cardiovascular disease risk factors in childhood, sedentary behavior is associated with numerous chronic diseases in adulthood. For example, excessive television viewing in adulthood has been associated with an increased risk of type 2 diabetes,²⁷ colon cancer for men and women and endometrial cancer for women,^{28,29} and mental disease.³⁰

Before effective sedentary-reducing interventions can be developed, implemented, and evaluated, an important prerequisite is to understand factors that influence sedentary behaviors among young children. Unfortunately, we have a limited understanding of the determinants of sedentary behaviors among preschool children. Providing some insight into this, Hinkley et al.³¹ recently reviewed the literature and concluded that nearly all evaluated studies have been published in the last 10 years, television viewing was the most commonly used measure of sedentary behavior, and it was not possible to draw a strong

conclusion regarding the association between environmental determinants and preschool sedentary behavior because too few studies had been conducted. With regard to potential environmental determinants of preschool sedentary behavior, Hinkley et al.³¹ noted that 8 studies examined this topic. Among these studies, correlate variables included presence of siblings, television time rules, parental limiting of television advertising exposure, parental encouragement/discouragement for physical activity, parental perceptions of television, parental role modeling of physical activity, parental time with child, teacher-related physical activity training and education, and preschool teacher education (e.g., college education). Among these correlate variables, television time rules were associated with 4 sedentary-related behavioral outcomes, including television viewing, DVD/videos, electronic games, and computer use. To further delineate the mechanisms through which sedentary behavior is influenced in preschool children, we are in need of additional studies examining determinants of preschool sedentary behavior.

Most recently, Schary et al.³² showed that parents may influence their preschool children’s sedentary behavior by utilizing an appropriate parenting style, often characterized by the broad parental milieu of displays of warmth (e.g., affection and responsiveness) and control (e.g., demandingness). This study showed that preschool children whose parents employed a permissive parenting style (i.e., high levels of warmth and low levels of control) watched more television than preschool children whose parents employed other parenting styles. Although this study provides evidence for an association between parenting style and preschool sedentary behavior, the individual associations between the parental dimensions (i.e., warmth and control) that constitute parenting style were not examined in the study by Schary et al.³² These authors indicated that future studies should examine the influence of these specific parental dimensions on preschool sedentary behavior, because other studies have demonstrated a link between these parenting style dimensions (i.e., warmth and control) and other health behaviors.³³

Our recent work³² showing an association between parenting style and preschool sedentary behavior supports other studies showing that parents play an important role in shaping and developing other child health behaviors, such as physical activity and active play.³⁴⁻⁴⁰ For example, Loprinzi and colleagues⁴⁰ showed that preschool children are more likely to be active if their parents employ activity-facilitating parenting practices, such as parental support for child activity, with these findings also supported by other studies.³⁸ Given this, along with other studies showing that parenting style may influence child sedentary behavior^{41,42} and activity behavior,⁴² it is plausible that active play-related parenting practices (e.g., parental support for active play) may also be associated (i.e., inversely related) with young children’s sedentary behavior. This assertion has

been supported by Leatherdale and Wong,⁴³ who showed that adolescents were 12% less likely to watch greater than 2 hours of television if their parents were very supportive of their physical activity behavior.

PURPOSE

Although we view sedentary behavior and active play behavior as distinct constructs, at this point we have a limited understanding as to whether parental influences differently affect active play and sedentary behavior or positively influence both of these behaviors. To provide some insight into this, along with increasing our knowledge base regarding parental influences on preschool sedentary behavior, we examined the influence of parenting behaviors (e.g., parent physical activity), orientations (e.g., parental confidence in providing active play support), and practices (e.g., parental support for active play) known to be associated with child activity on the sedentary behaviors of preschool children.^{38,42,44-50} This investigation is an extension of our previous work⁴⁰ that examined the influences of these parental variables on preschool active play behavior (but not sedentary behavior). More specifically, we previously demonstrated that parents who perceived physical activity to be important for their child, had confidence in providing support for their child's physical activity, had good physical activity experiences as a child, and had high perceptions of their child's physical ability were more likely to employ parenting practices and behaviors that were associated with their preschool child's physical activity behavior. Here, we examine the influence of these same (and other) parental-related parameters on preschool sedentary behavior. As noted previously, among adults, sedentary behavior may be an independent risk factor in the development of various chronic health conditions,^{11,51} many of which can be traced back to behavioral patterns exhibited during early childhood.¹⁰

Given that sedentary behaviors may be different between weekdays and weekends⁵² and that television viewing may only provide a partial picture of children's overall sedentary behaviors,^{31,53} we aimed to examine the association between parental influences on preschool sedentary behavior during weekdays and weekends, as well as other indices of preschool sedentary behavior, such as engaging in quiet play (e.g., reading and playing puzzles), playing on the computer, and video games.

METHODS

Sample and Recruitment

The sample along with the recruitment strategy for the present study is the same as our previous study examining

the association between parental influences on preschool physical activity. For additional description of the sample and recruitment strategy, the reader is referred to our previous study⁴⁰; however, this information is also provided in the narrative that follows. Participants were recruited from direct solicitation, social networking (i.e., Facebook) and through family- and center-based child care facilities using the Oregon Child Care Resource and Referral Network. Directors of these facilities were sent an e-mail with a link to the online survey (SurveyMonkey.com) and were asked to distribute the link to parents of at least 18 years of age who had a preschool-aged child (2-5 years). It was not possible to determine how many parents received the e-mail from the child care director and, of these, how many completed the survey. Similarly, and with respect to recruitment through Facebook, we were not able to determine the percentage of parents who saw the link and, of these, which ones participated in the survey. Consequently, it is not possible to ascertain response rates for the present study.⁴⁰ Out of 217 participants who completed items on the questionnaire, 186 participants were included in the present analyses. Exclusion criteria included not providing sufficient data on the evaluated variables. If less than half of the items were missing for a variable, mean substitution was employed. Mean substitution was employed for 3 missing data points on the parental support variable, 3 for the parental warmth variable, 6 for the parental control variable, 4 for the parental irritable variable, and 24 for the parental perceived competence variable.

Use of online surveys is acceptable, because online surveys have demonstrated evidence of construct reliability, test-retest reliability, and higher completion rates than mailed questionnaires.⁵⁴ The university's Institutional Review Board approved this study, and parents provided informed consent prior to completing the online survey.

Parent Influence Measures

Data were self-reported using online measures of all study variables, including sociodemographic information and the parental influence variables, with respondents' proxy reporting their children's sedentary behavior. Parental body mass index was calculated from self-reported weight and height (i.e., weight in kilograms divided by the square of height in meters). All evaluated parental influence variables have demonstrated evidence of reliability and/or validity,^{38,40,42,44-50,55} with details also reported elsewhere.⁴⁰

Parenting behavior

Parenting behavior was operationalized as the parent's own physical activity behavior.

Parental physical activity. Parental physical activity was assessed using the International Physical Activity Questionnaire (IPAQ) short form.⁵⁵ Parents reported the number of days and total amount of time in a typical week they “walked continuously for at least 10 minutes at a time”; “did vigorous physical activities which make you breathe much harder than normal”; and “did moderate physical activities.” This instrument has been shown to be a valid and reliable tool for measuring physical activity in adults. Across 12 different countries among adults, and with regard to test–retest reliability, the Spearman correlation coefficient ranged from 0.46 to 0.96 (depending on the IPAQ question), with most around 0.8. Regarding criterion-related validity, the pooled Spearman correlation coefficient between the IPAQ items and activity counts from a Computer Science Application (CSA) accelerometer was 0.30, which is similar to other validation studies.⁵⁵

Parenting practices

Parenting practices were operationalized as specific strategies that parents employ, either knowingly or unknowingly, to influence their child’s active play behavior.

Parental support for child activity. Weekly frequency of parental support for child activity was assessed using the parental support scale described by Loprinzi and Trost⁴⁸ and developed by Sallis et al.⁵⁶ Parents responded to the following questions for which they: “encouraged their child to do physical activity or sport”; “played outside or did physical activity/sport with their child”; “provided transportation to a place where their child could do physical activity or play sport”; “watched their child participate in sport, physical activities or outdoor games”; and “told their child that sport or physical activity is good for their health.” Responses were recorded on a 6-point scale with endpoints ranging from *never* to *daily*. Items were summed with higher values indicating greater parental support for child activity. Within this sample, the internal consistency of this scale, as measured by Cronbach’s alpha, was .74.

Restrictive play rules. To determine whether parents enforced a list of rules for outdoor and indoor play, items developed by Sallis et al.⁴⁵ were used. A total of 6 items were assessed, including “stay close to or within sight of the house/parent,” “do not go into the street,” “do not fight or play rough games,” “do not climb walls, trees, or fences,” “no balls in the house,” and “do not run inside the house.” Possible responses were *no*, *sometimes*, and *yes*. Items were summed with higher values indicating the use of more restrictive play rules. Using similar items, the 2-week test–retest reliabilities in the McKenzie et al.⁵⁷ sample ranged from 0.64 to 0.73. Internal consistency in the Sallis et al.⁴⁵ sample ranged from 0.65 to 0.68. The internal consistency in

the present sample was 0.55, which suggests that this construct is not unidimensional.

Parental monitoring of child physical activity. Parental monitoring of child activity was assessed using the question developed by Arredondo et al.⁴⁷ Parents were asked “How much do you keep track of the amount of physical activity/active play/sport your child is getting?” Possible responses included, *not at all*, *not very much*, *quite a bit*, and *very much*.

Parenting orientations

Parental orientations were operationalized as beliefs and attitudes toward child activity or toward their parenting practices.

Perceived competence. Perceived competence was assessed using the modified Perceived Competence Scale developed by Southall et al.⁵⁸ Parents responded to 15 questions comparing the level of coordination of their child with other children of the same age. Sample items for the scale include the following: compared to other children of the same age, my child “does well at games or activities that involve kicking balls,” and “would rather play games and sports rather than watch them.” Responses were recorded on a 4-point scale with endpoints ranging from *strongly disagree* to *strongly agree*. Items were summed with higher values indicating greater parental perceived competence. Within this sample, the internal consistency of this scale, as measured by Cronbach’s alpha, was .89.

Perceived importance of child activity. Perceived importance of child activity was assessed using the perceived importance item described by Loprinzi and Trost.⁴⁸ Parents indicated their importance of child activity using the following question format: “How important is it to you that your child is good at sports and physical activities/active play?” Responses were recorded on a 5-point scale with endpoints ranging from *very unimportant* to *very important*.

Perceived confidence in providing support (parental self-efficacy). Parental confidence in providing support for their child’s activity behavior was assessed using the 5-item questionnaire developed by Adkins et al.⁴⁹ On the measure, parents were asked how hard it would be for them to provide each of the different above-mentioned types of parental support, with responses ranging from *not hard at all* to *very hard*. The Cronbach’s alpha reported by Adkins et al.⁴⁹ was .83. Adkins et al.⁴⁹ provided evidence of construct validity of the parental self-efficacy among 8- to 10-year-old girls, as indicated by a positive and significant association between parental self-efficacy and child physical activity ($r = 0.45$, $P < .001$). The present study used a modified version of the questionnaire by asking parents the following single item,

“How confident are you in your ability to provide support for your child’s physical activity/active play/sport?” Possible responses included *not confident*, *neutral*, *somewhat confident*, and *very confident*.

Parents physical activity experiences as a child.

Parents were asked to report their physical activity experiences during their childhood years (6-11 years) and during their adolescent years (12-18 years). They were asked whether they “had good experiences during physical activity or sports” for these two time periods. Responses for the two time periods were combined, with responses ranging from *never* to *all the time*. The correlation coefficient for these two time periods was $r = 0.68$.

Three parenting dimensions

Parental dimensions. Parents self-rated their parenting dimensions using 3 continuous parental dimensions from the Child Rearing Questionnaire,⁵⁹ which is described by Wake et al.⁶⁰ The 3 parental dimensions assessed from this single scale included *warmth* (6 items), *control* (5 items), and *irritability* (4 items). An example item of parental warmth is “How often do you have warm, close times together with your child?” An example item of parental control is “When you discipline your child, how often does he/she ignore the punishment (reverse scored)?” An example item of irritability is “How often are you angry when you punish your child?” For all 3 constructs, the responses were recorded on a 5-point Likert scale ranging from *never/almost never* to *all the time*. These 3 parental dimensions have demonstrated evidence of construct validity. In a previous sample of preschool children, internal consistency, as measured by Cronbach’s alpha, was .83, .73, and .61, respectively, for warmth, control, and irritability.⁶⁰ Providing some evidence of construct validity, Wake et al.⁶⁰ showed that paternal parenting style using this scale was associated with weight status in preschool-aged children. In the present sample, Cronbach’s alpha was .87, .75, and .66 for warmth, control, and irritability, respectively.

Sedentary behavior

Electronic media use and time spent in quiet play.

Electronic media use and time spent in quiet play was evaluated using the Physical Activity and Exercise Questionnaire for Children.⁶¹ Parents were asked to report the average number of hours their child spends sitting still when watching television, videos, or playing on the computer for both weekdays and weekends. Additionally, they were asked to report the average amount of time their child was involved in quiet play, such as playing with dolls or toys or doing puzzles or reading for both weekdays and weekends. Responses ranged from *1 hour or less* to *10 or more hours*. These sedentary behavior questions (i.e., electronic media use and quiet play) were validated by assessing the association between physical activity (using

accelerometry) and the number of weekday and weekend hours in sedentary behavior and the percentage of time spent in sedentary behavior.⁶¹ The correlation coefficients were $r = -0.26$ ($P = .09$) and $r = -0.28$ ($P = .07$), respectively. Serving as a covariate, child active play was also measured using the Physical Activity and Exercise Questionnaire for Children, which asked parents to report the number of hours their child spends in active play (e.g., running, jumping, and climbing).

Data Analysis

Hierarchical linear regression analysis was used to examine the association between active play-related parenting behaviors, orientations, and practices (independent variables) with preschool sedentary behavior (dependent variable) during the week and weekend. Models were computed separately for boys and girls given established gender-related differences in active play and sedentary behavior. The first block included parental physical activity behavior; block 2 included parenting practices (i.e., parental support, restrictive play rules, and parenting monitoring); block 3 include parental orientation variables (i.e., perceived competence, perceived importance, parental self-efficacy, and parental physical activity experiences as a child); and block 4 included parental dimensions (i.e., warmth, control, and irritable). All models controlled for parental education, parental body mass index, and child active play. Statistical significance was set at an a priori nominal alpha level of .05.

RESULTS

Descriptive characteristics of the analyzed sample are shown in Table 1. The mean age of the parents was 35 years

TABLE 1
Demographic Characteristics of the Analyzed Sample ($N = 186$)

<i>Parent</i>	
% (SE) Live in Oregon	74.0 (3.2)
% (SE) Female	84.9 (2.6)
Age, mean (SD)	34.9 (6.0)
% White	88.6 (2.3)
Education	
% (SE) High school diploma	2.6 (1.1)
% (SE) Some college	17.7 (2.8)
% (SE) Bachelor’s degree	44.0 (3.6)
% (SE) Graduate degree	35.4 (3.5)
Mean (SD) body mass index (kg/m^2)	25.5 (5.8)
<i>Child</i>	
% Boys	49.1 (3.6)
Mean age (SD)	3.9 (1.2)

and the majority of parents who completed the questionnaire were female (85%), non-Hispanic white (89%), and had at least a bachelor's degree (80%). Further, the majority of the parent-child dyads were from Oregon (approximately 74%), and 49% of the children were boys. The remainder of the parent-child dyads came from other regions in the United States, including the Midwest, Northeast, and South. When comparing the participants from Oregon to those in other regions of the United States, there were no differences with respect to the demographic or study variables with the exception of parent age ($M = 34.9$ vs. 33.2 , respectively; $P = .03$) and parental self-efficacy ($M = 3.6$ vs. 3.5 , respectively; $P = .04$). With the exception of quiet play during the weekend (boys vs. girls: 2.4 vs. 2.9 hours, $P = .03$), there were no child gender differences for quiet play during the week, TV viewing during the week, or TV viewing during the weekend ($P > .05$ for all).

Summary statistics for the study variables are displayed in Table 2. With regard to child sedentary behavior, children engaged in 2.4 ($SD = 1.3$) and 2.6 ($SD = 1.4$) hours per day

of quiet play, respectively, during the week and weekend. Children engaged in 1.5 ($SD = 0.7$) and 1.9 ($SD = 1.0$) hours per day of screen time, respectively, during the week and weekend. From the hierarchical linear regression analyses, none of the parental influences were associated with quiet play; thus, these results are not shown. Similarly, no parental influences were associated with the preschool sedentary behavior for the girls; thus, these results are also not shown.

Table 3 shows the hierarchical regression analyses examining the association between parental influences on preschool sedentary behavior for the boys for weekdays. Parental control was inversely associated with preschool screen time among boys ($\beta = -0.46$, $P < .001$), with block 4, which included all independent predictors in the final model, explaining 33% of the variance. Table 4 shows the hierarchical regression analyses examining the association for boys for the weekend. Similarly, parental control emerged as the only independent predictor ($\beta = -0.48$, $P < .001$), with the final block including all predictors explaining 49% of the variance.

TABLE 2
Descriptive Statistics for the Study Variables ($N = 186$)^a

Variable	
Parental body mass index (kg/m^2), mean (SD)	25.5 (5.8)
Parenting behavior	
Parental physical activity	
MVPA MET/min/week, mean (SD)	2320.8 (2991.9)
Parenting practices, mean (SD)	
Parental support for child PA (possible range: 0-35)	18.8 (4.8)
Restrictive play rules (possible range: 6-18)	14.0 (2.0)
Parent monitoring of child PA (possible range: 1-4)	2.3 (0.7)
Parenting orientation, mean (SD)	
Perceived child competence in PA (possible range: 15-60)	44.7 (6.2)
Perceived importance that child participants in PA (possible range: 1-5)	4.6 (0.8)
Perceived confidence in providing support (possible range: 1-4)	3.6 (0.6)
Parent's physical activity experiences as a child/adolescent (possible range: 1-5)	3.6 (1.0)
Parental dimensions, mean (SD)	
Warmth (possible range: 5-30)	27.3 (3.0)
Control (possible range: 5-25)	20.5 (2.8)
Irritability (possible range: 5-20)	9.3 (2.1)
Child sedentary behavior (possible range: 1-10)	
Quiet play during week, mean (SD) hours per day	2.4 (1.3)
Quiet play during weekend, mean (SD) hours per day	2.6 (1.4)
Screen time during the week, mean (SD) hours per day	1.5 (0.7)
Screen time during the weekend, mean (SD) hours per day	1.9 (1.0)

^aMVPA indicates moderate-to-vigorous physical activity; MET, metabolic equivalent; PA, physical activity.

DISCUSSION

Our previous work demonstrates that these evaluated parental influences are associated with child active play behavior⁴⁰ but, to our knowledge, no study has systematically examined these active play-related parental influences on preschool sedentary behavior. In addition to employing a cross-sectional study design and using a subjective measure of sedentary behavior, a limitation of the present study was not examining sedentary-specific parenting practices, such as television limit setting and rule enforcement. Another limitation is the participant homogeneity with regard to education. That is, our results may not be generalizable to other parent-child dyads of lower socioeconomic status given that the majority of parents in this study were well-educated (i.e., possessed a baccalaureate degree or higher). Lastly, the restrictive play variable demonstrated poor internal consistency, suggesting that this measure may need further refinement. Should such work be pursued, readers are reminded that low internal consistency may be due to a number of factors that are beyond the scope of this study (e.g., use of a homogeneous sample, a limited number of questions, the potential for this construct being multidimensional).⁶² That said, that the measure's reliability was less than ideal and that this variable contributed to the hierarchical regression model speaks to its robustness as a construct.

Although active play and sedentary behavior are distinct behaviors, it is plausible that active play-related parental influences may also be linked with sedentary behavior given that participation in active play may displace time spent in sedentary behavior, which is supported by some

TABLE 3
Hierarchical Linear Regression Results Examining the Association Between Active Play-Related Parental Influences and Child Sedentary Behavior for Boys During the Weekday ($N = 81$)^a

<i>Block 1</i>	<i>Block 1, β (P value)</i>	<i>Block 2, β (P value)</i>	<i>Block 3, β (P value)</i>	<i>Block 4, β (P value)</i>
Parenting behavior				
Parental physical activity	-0.22 (.05)	-0.19 (.09)	-0.18 (.15)	-0.19 (.09)
Block 2				
Parenting practices, mean (SD)				
Parental support for child PA		-0.08 (.54)	-0.03 (.82)	0.15 (.30)
Restrictive play rules		0.07 (.48)	0.08 (.48)	0.09 (.37)
Parent monitoring of child PA		-0.09 (.48)	-0.11 (.48)	-0.19 (.15)
Block 3				
Parenting orientation, mean (SD)				
Perceived child competence in PA			-0.01 (.94)	0.03 (.77)
Perceived importance that child participates in PA			0.06 (.58)	-0.07 (.54)
Perceived confidence in providing support			-0.15 (.28)	-0.11 (.40)
Parent's physical activity experiences as a child/adolescent			-0.02 (.84)	-0.07 (.54)
Block 4				
Parental dimensions, mean (SD)				
Warmth				-0.05 (.70)
Control				-0.46 (<.001)
Irritability				0.02 (.87)
	$R^2 = 0.09$	$R^2 = 0.12$	$R^2 = 0.15$	$R^2 = 0.33$
		Change in $R^2 = 0.028$	Change in $R^2 = 0.024$	Change in $R^2 = 0.18^*$

*Significant change in R^2 ($P < .05$). Bold indicates statistical significant beta coefficient ($P < .05$).

^aPA indicates physical activity. All models controlled for parental education, parental body mass index, and child active play.

TABLE 4
Hierarchical Linear Results Examining the Association Between Active Play-Related Parental Influences and Child Sedentary Behavior for Boys During the Weekend ($N = 81$)

<i>Block 1</i>	<i>Block 1, β (P value)</i>	<i>Block 2, β (P value)</i>	<i>Block 3, β (P value)</i>	<i>Block 4, β (P value)</i>
Parenting behavior				
Parental physical activity	-0.21 (.05)	-0.15 (.16)	-0.18 (.10)	-0.20 (.05)
Block 2				
Parenting practices, mean (SD)				
Parental support for child PA		-0.26 (.05)	-0.19 (.17)	0.01 (.98)
Restrictive play rules		0.01 (.89)	0.05 (.61)	0.06 (.46)
Parent monitoring of child PA		0.01 (.93)	-0.01 (.93)	-0.10 (.38)
Block 3				
Parenting orientation, mean (SD)				
Perceived child competence in PA			-0.03 (.78)	0.01 (.89)
Perceived importance that child participates in PA			0.18 (.10)	0.02 (.79)
Perceived confidence in providing support			-0.25 (.05)	-0.20 (.08)
Parent's physical activity experiences as a child/adolescent			0.18 (.15)	0.13 (.21)
Block 4				
Parental dimensions, mean (SD)				
Warmth				-0.04 (.72)
Control				-0.48 (<.001)
Irritability				0.10 (.34)
	$R^2 = 0.15$	$R^2 = 0.21$	$R^2 = 0.28$	$R^2 = 0.49$
		Change in $R^2 = 0.054$	Change in $R^2 = 0.068$	Change in $R^2 = 0.21^*$

PA indicates physical activity. All models controlled for parental education, parental body mass index, and child active play.

*Significant change in R^2 ($P < .05$). Bold indicates statistical significant beta coefficient ($P < .05$).

studies.^{23,63,64} With the ultimate goal of creating a supportive, healthy home environment, parents who employ active play-related parenting behaviors, orientations, and practices may also be more likely to employ sedentary-specific parenting practices, such as establishing sedentary rules and monitoring the amount of time their children spend in sedentary activities. This is in support of the results of Jago et al.,⁶⁵ who showed that, in addition to parenting style, children watched less television if their parents employed television-specific restriction practices.

Of the parental influences, parental control emerged as an independent predictor of screen time during the week and weekend for preschool boys. Although speculative, this finding may have been influenced by the fact that the majority of parents in this study were educated, because previous research also demonstrates an association between socioeconomic status and youth sedentary behaviors.⁶⁶ Again, although parental monitoring or restriction of screen time was not assessed, it is possible that parents who employed higher levels of parental control were more likely to monitor and restrict the amount of time their preschool child engaged in screen time. This assertion is in support of the findings by Schary et al.³² In a sample of 201 preschool children, Schary et al.³² showed that preschool children of authoritative parents (i.e., displaying high levels of warmth and control) engaged in the least amount of screen time compared to preschool children whose parents employed other parenting typologies. Although these studies found a link between parenting style and screen time, it is uncertain from their findings whether parental control or parental warmth was the most influencing dimension. Our findings indicate that parental control may be more important than parental warmth in influencing preschool screen time viewing.

Parental monitoring of child screen time behavior appears to be an effective method of minimizing excessive screen-based behaviors.³² In school-aged children, Ni Mhurchu and colleagues⁶⁷ examined the preliminary efficacy of a 6-week home-based electronic time monitoring intervention on children's television viewing. Participants who watched more than 20 hours of television per week were randomized into either the intervention group, which included the use of an electronic television time monitor along with advice to restrict television watching, or a control group, which included verbal advice to restrict television viewing. Both groups reported decreases in total screen time, suggesting that intervening with parents by encouraging them to monitor and restrict their child's screen time may be an effective strategy to reduce screen time behavior. Providing support to this, Barradas and colleagues⁶⁸ showed that parental limits on the frequency of children's television viewing were associated with child television viewing. Of importance, restricting the frequency of meals eaten while watching television may promote reduced television viewing among children.⁶⁹ If future

studies confirm our assertion that parental control is linked with more specific parenting practices related to children's screen viewing, such as parental monitoring and restriction of screen time, then identifying a parent's typology may be an important step in determining which families may be in need of intervention.

In conclusion, parental control influenced screen time during the weekday as well as on the weekend for boys (but not girls). Future research should further investigate factors influencing preschool girls' sedentary behavior to help explain the gender differences observed in the present study. Further study should include sedentary-specific parenting practices including rule enforcement and television/screen time limit setting. The use of qualitative methodology, including observation of preschool children's sedentary behavior and parental focus groups, may assist researchers in identifying factors influencing childhood sedentary behavior. Finally, increasing the sample size and using a heterogeneous sample (particularly with respect to parental education) will ensure that findings can be generalized.

TRANSLATION TO HEALTH EDUCATION PRACTICE

If our findings are confirmed by future research, health educators are encouraged to teach parents how to implement monitoring and control-related parenting practices aimed at minimizing preschool children's sedentary behavior. Strategies may include minimizing "screen days" to select days during the week/weekend, keeping track of the amount of time the child engages in screen-based behaviors, purchasing a device that locks and turns the television off after a predetermined limit has been reached, and other emerging technologies such as devices that link the television's power supply to children's physical activity engagement. Health education researchers are encouraged to examine the efficacy and sustainability of these and other strategies.

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