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Parent–Child Attitude Congruence on Type and Intensity of Physical Activity: Testing Multiple Mediators of Sedentary Behavior in Older Children

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Objective: This study examined parent–child attitudes on value of specific types and intensities of physical activity, which may explain gender differences in child activity, and evaluated physical activity as a mechanism to reduce time spent in sedentary behaviors. ***Design:*** A community sample of 681 parents and 433 children (mean age 9.9 years) reported attitudes on importance of vigorous and moderate intensity team and individually performed sports/activities, as well as household chores. Separate structural models (LISREL 8.7) for girls and boys tested whether parental attitudes were related to child TV and computer via child attitudes, sport team participation, and physical activity, controlling for demographic factors. ***Main Outcome Measures:*** Child 7-day physical activity, sport teams, weekly TV, computer. ***Results:*** Parent–child attitude congruence was more prevalent among boys, and attitudes varied by ethnicity, parent education, and number of children. Positive parent–child attitudes for vigorous team sports were related to increased team participation and physical activity, as well as reduced TV and computer in boys and girls. Value of moderate intensity household chores, such as cleaning house and doing laundry, was related to decreased team participation and increased TV in boys. Only organized team sports, not general physical activity, was related to reduced TV and computer. ***Conclusion:*** Results support parents' role in socializing children's achievement task values, affecting child activity by transferring specific attitudes. Value of vigorous intensity sports provided the most benefits to activity and reduction of sedentary behavior, while valuing household chores had unexpected negative effects.

Keywords: parental influence, gender, motivation, activity displacement, task value

Population-wide declines in physical activity and the stability of sedentary behavior patterns begun in adolescence, or even earlier in childhood, have been identified as behavioral factors in the rise of obesity among children and adolescents over the past two decades (Gordon-Larsen, Nelson, & Popkin, 2004). Physicians and health professionals have been urged to encourage parents to increase children's physical activity and limit sedentary activities, such as TV viewing, as target behaviors in the effort of obesity prevention (Barlow, 2007), however, the relationship between physical activity and sedentary behavior remains unclear (Marshall, Biddle, Gorely, Cameron, & Murdey, 2004). Moreover, the mechanisms by which these relationships operate and are established in youth remain unknown. It is unclear if physical activity may act as a protective mechanism to reduce sedentary behavior, what types of physical activity might lead to such decreases, how parental and child attitudes may be involved, and whether ethnicity and other demographic variables may impact these mediating processes. Understanding the mediating mechanisms of behaviors has become an important focus of research on obesity prevention to provide critical information that can be used to design more effective interventions (Baranowski, Anderson, & Carmack, 1998).

Process Models of Parent Socialization

Parents act as gatekeepers of behavior, especially in young children, but even more importantly, parents indirectly affect child behavior by influencing the attitudes and cognitions that children develop (Eccles et al., 1983; Mead, 1934). Some theories related to children's achievement motivation and behavior have specifically emphasized parental influence and understanding the processes through which parents promote and sustain children's participation in activities, both in and out of school. Eccles et al.'s expectancy-value model of achievement motivation (Eccles et al., 1983), which guided the current study, has been the most influential framework in describing the relations between parents' beliefs and behaviors regarding specific activities, child beliefs, and children's activity choices and performance. In this model, the two most important predictors of choice behaviors are an individual's expectations for success, which stem from one's self-concept of

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ability (i.e., competence), and subjective task value. Parents are posited to influence child behavior through their effects on child perceptions of ability and task value beliefs. Empirical studies have supported the model in multiple ages of children across a variety of domains, including academic subjects, out-of-school activities, and sports (Eccles & Harold, 1991; Fredericks & Eccles, 2005; Simpkins, Davis-Kean, & Eccles, 2005).

Although expectancy-value theorists have long argued that people are likely to do tasks they highly value and avoid tasks that they consider are of little value (Atkinson, 1957; Eccles et al., 1983; Feather, 1982), it has been the empirical work of Eccles and colleagues that has made the most substantial contribution to the measurement of achievement task value, its relation to task choice among children, and how parental influence may affect the child value-behavior relationship (Wigfield & Eccles, 1992). Research is still quite limited, however, on parent–child attitude transfer on the value of particular behaviors in the area of physical activity and how this relates to child behavior. There is evidence to support a relation between child participation in organized and free-time physical activity and parental beliefs on the importance of general physical activity for their child (Heitzler, Martin, Duke, & Huhman, 2006). Positive correlations have also been found between parents' value of general sports for their child and children's value beliefs of sports ($r = .22 - .35$), and in turn, child value beliefs of sports and participation in sports (organized or with neighborhood friends, $r = .42 - .53$) (Fredericks & Eccles, 2005). However, no previous studies have explored the direct transfer of task value between parent and child regarding specific types and intensities of physical activities and the extent to which such children's beliefs mediate the relation between parental beliefs and child behavior. The current study seeks to fill this gap by testing such mediating relationships.

Influence of Child Gender and Other Demographic Factors on Parental Beliefs

Despite the fact that parents' gender-biased views in areas of achievement among children are well established (Eccles, Freedman-Doan, Frome, Jacobs, & Yoon, 2000; Frome & Eccles, 1998), previous studies have not explored how the transfer of specific beliefs related to type and intensity of physical activity may differentially impact activity and sedentary behavior in girls and boys. Understanding the origins of gender differences may help explain the lower levels of physical activity among girls, as well as important gender differences in sedentary behavior (Jago, Anderson, Baranowski, & Watson, 2005).

We also need to know much more about how culture or ethnic origin influences parents as socializers of children's task perceptions. Few studies have examined ethnic differences in achievement values in relation to motivation among children and adolescents. There has been some research on achievement values among African-American youth related to school and academic achievement (Graham, Taylor, & Hudley, 1998), but information is lacking on other ethnic groups, on specific task values, such as those related to physical activity, and on how cultural differences in parental attitudes may shape domain-specific motivation and behavior in children. Similarly, although parent ethnicity, socioeconomic status, Body Mass Index (BMI), and family structure (e.g., number of children in the family) have been related to child physical activity, as well as TV (Bagley, Salmon, & Crawford, 2006; Sallis, Prochaska, & Taylor, 2000), there have been no studies that have addressed how these key demographic factors may impact parental attitudes on the value of specific types and intensities of physical activity in concert with child physical activity and sedentary behavior. The current study attempted to better understand the role of these demographic factors by testing their relationships with parent value ratings in attitude-behavior models.

Physical Activity and Sedentary Behavior

Time spent in sedentary behavior, such as TV viewing, has been associated with obesity in adults (Hu, Li, Colditz, Willett, & Manson, 2003) and more recently in children (Danner, 2008; Delva, Johnston, & P'Malley, 2007; O'Brien et al., 2008). Children who have watched more TV have also been less physically active in many studies, and it has been widely hypothesized that TV displaces other leisure activities (Mutz, Roberts, & van Vuuren, 1993), such as physical activity, as a possible effect mechanism for obesity. Much controversy, however, surrounds the relationship between physical activity and media use in children and adolescents. Previous reviews of correlates of physical activity among youth have found TV viewing generally unrelated to activity levels or there have been inconsistent results (Sallis et al., 2000). A recent meta-analysis of 39 independent samples of cross-sectional data from children and youth (Marshall et al., 2004) concluded that the relationship between physical activity and TV was quite small (corrected effect size, $r = -.13$), as was the relationship between physical activity and video/computer game use (corrected effect size, $r = -.14$, based on 10 samples). Moderator analyses from Marshal et al. suggested that the physical activity-TV relationship may differ by physical activity intensity (larger inverse relationships were found for vigorous), but more research is needed to better understand if and how types and intensities of physical activity may be related to TV watching or computer use. The current study addressed this gap by testing moderate-to-vigorous physical activity (MVPA) and organized team sport participation as mediators of attitudes on types and intensities of activities and TV watching, as well as computer use. The methodology of structural equation modeling used allows a more effective and comprehensive test of displacement mechanisms, which has been lacking in previous investigations.

Present Research

The current study examined the process in which parental beliefs about specific types and intensities of physical activity may influence children's activity and sedentary behavior. We focused on the intergenerational transmission of activity value and tested a model that posited that parental beliefs on activity value have indirect effects on child behavior through concordant child beliefs. Our study sample is representative of middle to late childhood when children are still highly influenced by parents, and there are major cognitive advances that facilitate their ability to report their attitudes and behavior (Harter, 1999). Using structural equation modeling to test the distinct contributions of multiple mediators, it was hypothesized that placing high value on the six physical activities specified, especially vigorous activities, would be positively related to leisure-time physical activity and participation in

organized team sports, which in turn, would be inversely related to child TV watching and computer use. Our study is among the first to examine the notion that parents transfer attitudes not only on the types of physical activities that children should perform, but also on the intensity level of these activities. Examining parent–child congruence on the type and intensity of activities, including household chores, and relationships to activity and sedentary behavior, controlling for relevant demographic factors, have not been explored.

Method

Participants

Participants were 433 children in 4th and 5th grade and one or both parents ($n = 681$) recruited from 12 elementary schools in Houston, TX. Study procedures were approved by school district and Baylor College of Medicine's institutional review boards. Children obtained signed parental consent. Participation rates of eligible children were 50% to 87%, and participation of both mother and father averaged 73%. Sample characteristics are presented in Table 1.

Procedure

Data were collected from students by research staff during school. Parents received packets brought home by children, which were returned to the schools. Children were given a $5 movie ticket and parents were mailed a gift card ($10 for one parent, $25 for both parents).

Table 1
Sample Characteristics

Parents	
Female, male	$n = 429$ (63.0%), $n = 252$ (37.0%)
Age in years, mean (*SD*)	40.6 (7.1)
Hispanic	26.2%
Non-Hispanic	71.3%
White	55.8%
Asian	9.9%
African-American	10.9%
Other or missing	23.4%
High school, technical school, or less	29.5%
Some college	8.7%
College degree	30.4%
Postgraduate degree	29.9%
Overweight or obese (BMI ≥25)	46.8%
Stage of exercise behavior	
Action/maintenance (currently exercise)	45.1%
Preparation (not regular)	35.4%
Contemplation (thinking about)	15.3%
Precontemplation (no intention)	4.2%
Previous competitive sport participation	61.1%
Children	
Female, male	$n = 232$ (53.6%), $n = 201$ (46.4%)
Age in years, mean (*SD*)	9.9 (0.7)
In Grade 4, 5	54.3%, 45.7%
At risk or overweight (≥85th percentile)	38.2%
Sport participation (≥1 organized team in last year)	71.9%

Measures

Child physical activity. Children completed the Physical Activity Questionnaire for Older Children (PAQ-C) (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997) for moderate to vigorous physical activity during the previous 7 days. Nine items (each scored on 1–5 scale) are averaged to yield an overall physical activity score ranging from 1 to 5, resulting in a more normal distribution of physical activity scores than is found among most measures. The PAQ-C is one of few questionnaires specifically designed and validated for use in children in Grades 4 to 8. One-week test–retest reliability has ranged from .75 to .82 (Crocker et al., 1997), and Cronbach alphas have ranged from .72 to .76 in children 11 years old (Janz, Lutuchy, Wenthe, & Levy, 2008). It has been related to Seven-Day Recall ($r = .46$), the Caltrac accelerometer ($r = .39$), and a step test of fitness ($r = .28$) (Kowalski et al., 1997). In our own validity assessment ($n = 58$ children), associations with the MTI accelerometer worn 4 days (Thursday−Sunday) were $r = .45$ for MVPA, .12 for light activity, and −.45 for inactive minutes during waking hours. Students also indicated the number of organized competitive teams they participated on over the past year, in- or outside of school.

Child sedentary behavior. TV watching and computer use were based on an item from the adolescent version of the Modifiable Activity Questionnaire (Aaron et al., 1995). Students were asked, "In a typical week, I watch TV in my free time___" and "In a typical week, I play TV/computer games or am on the computer Internet for fun ___" with the 5-point response scale for each question of "never," "almost never," "sometimes," "often," and "almost all of my time." A similar measure of TV in 9 to 11 year-old children (Economos et al., 2008) found 68% to 100% agreement on test-retest over 2 hours. In our own substudy ($n = 58$ children) alpha reliability for the TV and computer items was .73. The association of the TV item with self-reported 30-min blocks of TV from the PDPAR diary (Anderson, Hagströmer, & Yngve, 2005) over 4 days (Thursday−Sunday) was .33, and of the computer item with self-reported computer blocks from the diary was .27. Also in our substudy, parent–child agreement was .45 on the TV item and was .49 on the computer item.

Beliefs on activity type. Parents were asked, "How important is it to you for your child to participate in the following physical activities? (a) Vigorous team activity (hard to very hard effort, involves running without stopping very much, e.g., basketball, soccer), (b) moderate team activity (light to moderate effort, involves moving and stopping, e.g., baseball/softball, volleyball, football), (c) vigorous individual activity (hard to very hard effort, e.g., running, intense cycling, swimming, skating), (d) moderate individual activity (light to moderate effort, e.g., walking for exercise, bicycling around the neighborhood, golf), (d) vigorous household chores (hard to very hard effort, e.g., heavy yard work such as mowing or digging, moving or lifting furniture/boxes), and (e) moderate household chores (light to moderate effort, e.g., laundry, cleaning house/room, raking leaves, weeding, carrying groceries)." Response options ranged from 1 ("not important at all") to 5 ("very important"). Children were asked the same ques-

tions with "for your child" removed. Alpha reliabilities for the six items were .73 for adults and .63 for children. A 4-factor measurement model (using LISREL 8.7) consisting of parent and child sports/physical activity attitudes (2 latent factors w/4 items loading on each factor) and parent and child chore attitudes (2 latent factors w/2 items loading on each factor) supported the theoretical distinction of sports/PA and chores, with low to moderate correlations between sports/PA and chores in both boys and parents (boys: $r = .26$, parents of boys $r = .41$; 4-factor model RMSEA = .095) and girls and parents (girls: $r = .64$, parents of girls $r = .44$; 4-factor model RMSEA = .094).

BMI. Child height (nearest 0.1 cm) and weight (nearest 0.1 kg.) were measured twice by staff, shoes removed, using a Seca #214 Road Rod Portable Stadiometer (Seca Corp., Hanover, MD) and a Befour PS6600 Digital Scale (Befour, Inc., Saukville, WI), and averaged. BMI was calculated ($kg \cdot m^{-2}$), and BMI-for-age percentiles, at risk (85th percentile $\leq$ x $<$ 95th percentile) and overweight ($\geq$95th percentile) were defined using the Centers for Disease Control and Prevention criteria (Kuczmarski et al., 2002). Parents self-reported height and weight. Overweight (BMI of 25.0 to 29.9) and obese (BMI $\geq$30.0) were defined according to WHO criteria (World Health Organization Expert Committee, 1995).

Analysis Plan

Path analysis using structural equation modeling in LISREL 8.7 (Jöreskog & Sörbom, 2004) was used to test the hypothesized models. Structural equation modeling enables the evaluation of multivariate path models, allowing the simultaneous evaluation of the direct, indirect, and total effects of a set of predictor variables on multiple mediators and multiple outcome variables. Three mediation models (team sports, individual sports/activity outside of a team, household chores) were evaluated for each gender. Each model was composed of two attitude variables (e.g., parent attitudes on vigorous, moderate intensity team sports), four mediating variables (e.g., child attitudes on vigorous, moderate intensity team sports, child team participation, and child physical activity), and two outcome variables (time watching TV, time on computer). Parent race/ethnicity, education, overweight status, and number of children living at home were included as exogenous, control variables on parental attitudes in all models (see Figure 1).

Covariances were estimated in each model between each of the two intensity variables for parents, between the two child intensity variables, between child team participation and physical activity, as well as between child TV and computer, because, theoretically, they should be correlated. The robust maximum likelihood (RML) estimation method was used to generate the standardized parameter estimates for the models, because the data were not multivariate normal. PRELIS estimated the asymptotic covariance matrix of the sample variances and covariances that the RML method requires. Model fit was evaluated using the Satorra-Bentler (S-B) scaled chi-square statistic (Satorra & Bentler, 1988) to correct for nonnormality. A chi-square that is not significant ($p > .05$) indicates a good fit, as the model does not differ significantly from the observed data. Because significant chi-squares that reject the model can occur even when the model fit is relatively good, other fit indices were also used. These included the comparative fit index (CFI), non-normed fit index (NNFI), standardized root mean squared residual (SRMR), and the root mean square error of approximation (RMSEA). As recommended by Hu and Bentler (Hu & Bentler, 1999), RMSEA values of 0.06 or less, SRMR values of less than .08, and CFI and NNFI values of .95 or higher were used to indicate well-fitting models. Chi-square difference tests were used to compare the hypothesized models with alternative models in which direct paths were added, because the hypothesized and alternative models were nested.

A direct effects model that contained all direct and indirect paths from parent and child attitudes to mediators and behavioral outcomes was estimated in addition to the hypothesized mediation model of only indirect effects to examine directs effects. Tests of mediation for specific mediators (e.g., child attitude as a mediator of parental attitude and child team participation), controlling for all other variables in the model, followed the procedure of Baron and Kenny (Baron & Kenny, 1986). Mediation was inferred when (a) the direct effect between the independent variable and the mediator was significant, (b) the direct effect between the mediator and the outcome variable was significant, and (c) the direct effect of the independent on the outcome variable, with the mediator in the model, was significantly reduced as determined by the Aroian version of the Sobel test (Baron & Kenny, 1986; Sobel, 1982) using the unstandardized coefficients and standard errors from the all-paths model (i.e., $z \geq 1.96$).

Data from mothers and fathers were grouped together to predict child attitudes by gender of child. Previous work by Eccles and colleagues has found substantial correlations of mother-father beliefs, and they have found that parents demonstrate the same child-gender biases (e.g., that boys have more math ability than girls). To empirically justify grouping the parent data together to predict child outcomes in the current data, a MANOVA was performed to determine if there were significant mother-father mean differences on the six parent attitudes.

Results

Preliminary Analyses

Means and standard deviations for the study variables are shown in Table 2. The MANOVA to evaluate mother-father and child-gender differences in parental attitudes indicated no parent-gender $\times$ child-gender interaction, but there was a small, but significant multivariate main effect for parent gender (Wilks Λ = .98, $F(6) = 2.27$, $p = .04$). Follow-up ANOVAs indicated a parent-gender difference on one variable, vigorous chores, but the mean difference was very small (father $M = 2.7$, mother $M = 2.5$). Both mothers and fathers rated vigorous chores as the least important of the six activities. As expected, there was a significant multivariate main effect for child gender (Wilks $\Lambda = .92$, $F(6) = 8.62$, $p < .0001$). Follow-up ANOVAs indicated that both mothers and fathers rated vigorous team sports, moderate team sports, and vigorous household chores as more important for boys (see Table 2). Because of the high overall agreement of parent attitudes from these preliminary analyses, the parent data were grouped together as planned for use in the hypothesized child-gender models.

In evaluating girl-boy differences in child attitudes, a MANOVA indicated a significant multivariate main effect for child gender (Wilks $\Lambda = .90$, $F(6) = 11.95$, $p < .0001$). Follow-up ANOVAs indicated that there were significant child-gender differences on four of the six variables. Boys rated vigorous team

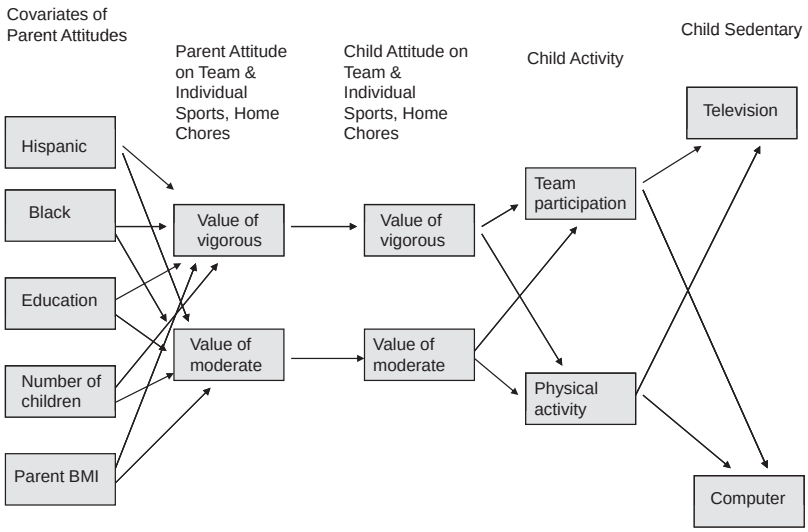


Figure 1. Hypothesized model of parent-child attitudes on task value and child behavior.

activities and vigorous chores as more important than did girls. Girls rated moderate individual activities and moderate household chores as more important than did boys (see Table 2). These results supported the planned separate structural equation models for boys and girls.

Path Analysis for Team Activities

Demographic control variables for parental attitudes were coded for Hispanic (1 = yes, 0 = no), African-American (1 = yes, 0 = no), parent education (1 = high school or less, 2 = tech school or some college, 3 = college or graduate degree), parent BMI group (1 = BMI $<$ 25, 2 = BMI $\geq$25), and number of children living at home (1 = one, 2 = two or three, 3 = four or more). LISREL regression coefficients for the covariates in each model are shown in Table 3. In the two models for team sports, significant effects (*t* values $\geq$1.96) for Hispanic and parent education were found for boys, and effects for number of children were found for girls. Being Hispanic was associated with more positive parental attitudes for vigorous team sports for boys, and more parental education was associated with more positive attitudes for both vigorous and moderate team sports for boys. More children in the family was significantly related to more positive parental attitudes for vigorous and moderate team sports for girls. Modification indices indicated the addition of two paths to the boy model (parent educ $\rightarrow$ child team sports, Black $\rightarrow$ child TV). These paths were added one at a time with model evaluation at each step (total $\Delta\, df = 2$, $\Delta\, \chi^2 = 30.95$, $p < .001$). Higher parental education was associated with greater participation in team sports among boys, and being African-American was related to more TV watching. Modification indices indicated the addition of three paths to the girl model (Hispanic $\rightarrow$ child VTeam, Hispanic $\rightarrow$ child team sports participation, Black $\rightarrow$ child TV; total $\Delta\, df = 3$, $\Delta\, \chi^2 = 28.66$, $p < .001$). Being Hispanic was associated with more negative parental views for vigorous team sports for daughters and less participation in team sports. Being African-American was related to more TV watching in girls.

Table 2
Descriptive Statistics for Primary Study Variables

		Parents of boys		Parents of girls		Boy children		Girl children	
	Range	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Vigorous team sports	1–5	3.76****	(1.15)	3.32****	(1.24)	3.94***	(1.19)	3.61***	(1.29)
Moderate team sports	1–5	3.75**	(1.05)	3.55**	(1.13)	3.19	(1.32)	3.15	(1.30)
Vigorous individual sports	1–5	3.66	(1.08)	3.54	(1.12)	3.61	(1.29)	3.76	(1.27)
Moderate individual sports	1–5	4.06	(0.94)	3.95	(0.94)	2.92***	(1.31)	3.30***	(1.24)
Vigorous household chores	1–5	2.79****	(1.33)	2.32****	(1.13)	2.77*	(1.36)	2.53*	(1.40)
Moderate household chores	1–5	3.79	(1.17)	3.86	(1.10)	2.65****	(1.44)	3.19****	(1.45)
PAQ-C	1–5	—	—	—	—	3.06**	(0.69)	2.91**	(0.69)
Sports teams in last year	0–10	—	—	—	—	2.00**	(1.82)	1.62**	(1.71)
Television	1–5	—	—	—	—	3.33	(1.05)	3.31	(0.98)
Computer	1–5	—	—	—	—	3.33****	(1.19)	2.79****	(1.08)

Note. *SD* = standard deviation. Child gender differences.
* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

Table 3
Maximum Likelihood Parameter Estimates for Demographic Covariates

Path	Effects–boys		Effects–girls	
	B	b (*SE*)	B	b (*SE*)
Covariates of parental attitudes				
Hispanic → VTeam	.23**	.78 (.26)	.10	.36 (.21)
Black → VTeam	.03	.09 (.26)	.03	.13 (.21)
Parent education → VTeam	.21*	.30 (.12)	.09	.14 (.10)
Number of children → VTeam	.05	.10 (.15)	.21***	.45 (.12)
Parent BMI group → VTeam	.04	.10 (.15)	.02	.04 (.14)
Hispanic → MTeam	.09	.28 (.25)	.08	.24 (.19)
Black → MTeam	−.08	−.25 (.26)	.01	.03 (.20)
Parent education → MTeam	.19*	.24 (.11)	−.02	−.03 (.09)
Number of children → MTeam	.00	.00 (.14)	.15*	.29 (.12)
Parent BMI group → MTeam	−.07	−.15 (.13)	−.03	−.06 (.13)
Hispanic → VIndiv	.16*	.50 (.25)	.05	.15 (.19)
Black → VIndiv	−.02	−.06 (.22)	.00	.00 (.19)
Parent education → VIndiv	.12	.15 (.10)	.03	.04 (.09)
Number of children → VIndiv	.00	.00 (.13)	.11*	.22 (.11)
Parent BMI group → VIndiv	.05	.10 (.13)	.02	.05 (.13)
Hispanic → MIndiv	.06	.16 (.23)	.01	.03 (.18)
Black → MIndiv	.00	−.01 (.20)	−.04	−.09 (.15)
Parent education → MIndiv	.27**	.30 (.10)	−.01	−.01 (.08)
Number of children → MIndiv	−.01	−.03 (.12)	.01	.01 (.08)
Parent BMI Group → MIndiv	−.05	−.10 (.12)	−.11	−.20 (.11)
Hispanic → VChore	−.11	−.43 (.30)	−.17*	−.53 (.22)
Black → VChore	−.08	−.32 (.31)	.01	.03 (.23)
Parent education → VChore	−.11	−.17 (.13)	−.15*	−.22 (.10)
Number of children → VChore	.17**	.44 (.17)	.17**	.34 (.11)
Parent BMI group → VChore	.03	.08 (.17)	.01	.02 (.13)
Hispanic → MChore	−.03	−.09 (.29)	.02	.07 (.22)
Black → MChore	.04	.15 (.24)	.10	.35 (.18)
Parent education → MChore	.06	.08 (.11)	−.08	−.12 (.10)
Number of children → MChore	.16*	.36 (.15)	.17**	.32 (.10)
Parent BMI group → MChore	−.03	−.08 (.15)	.00	.00 (.13)
Added paths to child attitude				
Hispanic → child VTeam	—		−.20**	−.75 (.23)
Hispanic → child VIndiv	—		−.16**	−.58 (.22)
Black → child MIndiv	—		−.16**	−.64 (.23)
Parent education → child MChore	−.21**	−.36 (.11)	−.20**	−.36 (.10)
Added paths to child behavior				
Hispanic → child team sports (models for team, individual, chores)	—	—	−.19***	−.91 (.20)
			−.20***	−.95 (.19)
			−.21***	−.98 (.19)
Parent education → child team sports (models for team, individual, chores)	.30***	.66 (.12)	—	—
	.32***	.70 (.12)		
	.29***	.63 (.11)		
Black → child TV (models for team, individual, chores)	.20***	.60 (.17)	.16*	.46 (.18)
	.20***	.60 (.17)	.17*	.49 (.18)
	.20***	.60 (.17)	.17*	.49 (.18)

Note. B is standardized and b is unstandardized parameter with *SE*.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Controlling for the five demographic variables, results of the path analysis for team sports are shown in Table 4. The hypothesized mediation model had a better fit to the data in boys, S-B $\chi^2(42, N = 242) = 52.95$, $p = .12$, RMSEA = .033 (0.000 − .058), NNFI = .96, CFI = .98, SRMR = .054, than in girls, S-B $\chi^2(41, N = 288) = 77.08$, $p = .00$, RMSEA = .056 (0.036 − .075), NNFI = .86, CFI = .92, SRMR = .058. Modification indices and the direct effects model indicated that the direct effect of parental attitude for vigorous team sports to child participation in team sports was still significant in boys and girls, so this path was added to the model for boys (total $\Delta df = 1$, $\Delta \chi^2 = 5.45$, $p < .02$; resulting boy model fit of S-B $\chi^2(41, N = 242) = 47.50$, $p = .22$, RMSEA = .018 (0.000 − .049), NNFI = .99, CFI = .99, SRMR = .048) and for girls ($\Delta df = 1$, $\Delta \chi^2 = 14.65$, $p < .001$; resulting girl model fit of S-B $\chi^2(40, N = 288) = 62.43$, $p = .01$, RMSEA = .045 (0.021 − .065), NNFI = .91, CFI = .95,

Table 4
Parameter Estimates for Path Models of Types of Activity

Path	Boys			Girls		
	B	b	*SE*	B	b	*SE*
Model 1 – Team sports						
Parent value VTeam → child value VTeam	.28***	.28	.06	.26***	.27	.06
Parent value MTeam → child value MTeam	.26***	.33	.08	.21***	.24	.07
Parent value VTeam → child teams (added)	.19**	.30	.10	.21***	.29	.07
Child value VTeam → child teams	.14**	.22	.08	.24***	.31	.06
Child value MTeam → child teams	.13*	.19	.09	.11	.14	.09
Child value VTeam → child PA	.25**	.15	.05	.26***	.13	.03
Child value MTeam → child PA	.19**	.11	.04	.03	.01	.03
Child teams → child TV	−.12*	−.06	.03	−.15**	−.09	.03
Child teams → child computer	−.11	−.07	.04	−.21***	−.13	.03
Child PA → child TV	.01	.02	.11	.03	.05	.09
Child PA → child computer	.02	.03	.12	.04	.06	.10
Model 2 – Individual sports						
Parent value VIndiv → child value VIndiv	.18*	.21	.08	.13*	.15	.07
Parent value MIndiv → child value MIndiv	.21***	.29	.08	.05	.07	.08
Child value VIndiv → child teams	.11*	.16	.08	.16**	.21	.08
Child value MIndiv → child teams	.00	.00	.08	.06	.09	.08
Child value VIndiv →child PA	.35***	.19	.03	.19**	.10	.03
Child value MIndiv → child PA	.15**	.08	.03	.21***	.11	.03
Child teams → child TV	−.12*	−.06	.03	−.15**	−.09	.03
Child teams → child computer	−.11	−.07	.04	−.21***	−.13	.03
Child PA → child TV	.01	.02	.11	.03	.05	.09
Child PA → child computer	.02	.03	.13	.04	.06	.10
Model 3 – Household Chores						
Parent value VChores → child value VChores	.17**	.18	.06	.04	.05	.07
Parent value MChores → child value MChores	.18**	.21	.07	.11	.13	.07
Child value VChores → child teams	.20***	.27	.08	.11	.13	.07
Child value MChores → child teams	−.14*	−.18	.09	−.07	−.08	.07
Child value VChores → child PA	.10	.05	.04	.23***	.11	.03
Child value MChores → child PA	.05	.02	.04	−.06	−.03	.03
Child teams → child TV	−.12*	−.06	.03	−.15**	−.09	.03
Child teams → child computer	−.11	−.07	.04	−.21***	−.13	.03
Child PA → child TV	.01	.02	.11	.03	.05	.09
Child PA → child computer	.02	.03	.12	.04	.06	.10

Note. Effects are controlled for the demographic variables Hispanic, Black, parent education, number of children, and parent BMI. B is standardized and b is unstandardized parameter with standard error.
* $p < .05$. ** $p < .01$. *** $p < .001$.

SRMR = .051). As hypothesized, parental attitudes for vigorous and moderate team sports were significantly related to boy and girl attitudes. In turn, boys' value of vigorous and moderate team sports were significantly related to team participation and overall physical activity, but in girls, only value of vigorous team sports was related to team participation and physical activity. Regarding activity displacement effects, in both boys and girls, only team participation, not general physical activity, was negatively related to sedentary behavior. In boys it was related to reduced TV (B = −.12, $p < .05$), and in girls to both reduced TV (B = −.15, $p < .01$) and computer use (B = −.21, $p < .001$).

Mediation tests for paths that met the criteria for mediation are shown in Table 5. The hypothesized mechanism of parental influence on activity through child attitude (Model 1) was significant for value of vigorous team sports in boys and girls, and for moderate team sports in boys. In addition, parents' value of vigorous team sports also directly influenced team participation in both boys and girls, producing substantial total effects (boys B = .23, $p < .001$, girls B = .28, $p < .001$). Activity displacement effects (Model 2) were significant only in girls.

Path Analysis for Individual Activities

For the control variables, significant effects for Hispanic and parent education were found for boys, and effects for number of children were found for girls (see Table 3). Being Hispanic was associated with more positive parental attitudes on vigorous individual sports for boys, and more parental education was associated with more positive attitudes on moderate individual sports. More children in the family was significantly related to more positive parental attitudes on vigorous individual sports for girls. As in the team model, two paths were added to the boy model (parent education → child team sports, Black → child TV). Four paths were added to the girl model (Hispanic → child VIndiv, Black → child MIndiv, Hispanic → child team sports, Black → child TV). Being Hispanic was associated with more negative views for vigorous individual sports among girls and less participation in team sports. Being African-American was related to more negative attitudes for the value of moderate individual sports and more TV watching.

Controlling for the five demographic variables, results of the path analysis for individual activities are shown in Table 4. The

Table 5
Mediation Tests for Specific Indirect Effects of Parent and Child Attitudes

Path	Z[a]	*p*-value
Team sports – boys		
1. Parent VTeam → child VTeam → team participation	2.33	.020
Parent VTeam → child VTeam → overall PA	2.48	.013
Parent MTeam → child MTeam → team participation	1.84	.066 ns
Parent MTeam → child MTeam → overall PA	2.24	.025
2. Child VTeam → child team participation → child TV	−1.55	.121 ns
Child MTeam → child team participation → child TV	−1.37	.170 ns
Team sports – girls		
1. Parent VTeam → child VTeam → team participation	3.36	.001
Parent VTeam → child VTeam → overall PA	3.08	.002
2. Child VTeam → child team participation → child TV	−2.59	.011
Child VTeam → child team participation → child computer	−3.28	.001
Individual sports – boys		
1. Parent VIndiv → child VIndiv → team participation	1.52	.128 ns
Parent VIndiv → child VIndiv → overall PA	2.40	.016
Parent MIndiv → child Mindiv → overall PA	2.10	.036
2. Child VIndiv → child team participation → child TV	−1.33	.182 ns
Individual sports – girls		
1. Parent VIndiv → child VIndiv → team participation	1.59	.111 ns
Parent VIndiv → child VIndiv → overall PA	1.75	.081 ns
2. Child VIndiv → child team participation → child TV	−1.92	.055 ns
Child VIndiv → child team participation → child computer	−2.20	.028
Household chores – boys		
1. Parent VChore → child VChore → team participation	2.19	.029
Parent MChore → child MChore → team participation	−1.60	.109 ns
2. Child VChore → team participation → child TV	−1.67	.095 ns
Child MChore → team participation → child TV	1.33	.182 ns

[a] z-value for Aroian version of the Sobel test; ns = not significant at $p < .05$.

hypothesized mediation model revealed a good fit of the model to the data in boys, S-B $\chi^2(42, N = 242) = 49.49$, $p = .20$, RMSEA = .027 (0.000 − .054), NNFI = .96, CFI = .98, SRMR = .043, and in girls, S-B $\chi^2(40, N = 288) = 50.66$, $p = .12$, RMSEA = .031 (0.000 − .054), NNFI = .94, CFI = .97, SRMR = .045. As hypothesized, parental attitudes on vigorous individual sports were significantly related to boy and girl attitudes on vigorous, but parent–child congruence on moderate intensity individual activities were significant only in boys. Post hoc tests indicated that girls felt these moderate intensity activities to be less important for them than did their parents. In turn, both boys' and girls' value of vigorous individual sports was significantly related to both increased team participation and overall physical activity. Both boys' and girls' value of moderate individual activity was significantly related to increased overall physical activity, but it was not related to team participation.

Mediation tests for child activity (Table 5, Model 1) indicated that the hypothesized parental influence through child attitude on value of vigorous and moderate individual sports was significant only in boys. Activity displacement effects (Model 2) were significant only in girls for reduction of computer time.

Path Analysis for Household Chores

Among the control variables, significant effects for number of children were found for boys, and effects for Hispanic, parent education, and number of children were found for girls (see Table 3). More children in the family was significantly related to more positive parental attitudes regarding the importance of vigorous and moderate intensity household chores for boys and girls. Being Hispanic and higher parent education were related to more negative parental attitudes on vigorous household chores for girls. Modification indices indicated the addition of three paths to the boy model (parent education → child MChore, parent education → child team sports participation, Black → child TV). Higher parental education was associated with more negative views on the child's value of moderate intensity household chores for boys and greater participation in team sports. Being African-American was related to more TV watching. Modification indices indicated the addition of three paths to the girl model (parent education → child MChore, Hispanic → child team sports, Black → child TV). As in boys, higher parent education was associated with more negative views by girls on the value of moderate intensity household chores. As in previous models, being Hispanic was associated with less participation in team sports in girls, and being African-American was related to more TV watching.

Controlling for the demographic variables, the path analysis for household chores revealed a good fit of the model to the data in both boys, S-B $\chi^2(41, N = 242) = 61.36$, $p = .02$, RMSEA = .046 (0.018 − .069), NNFI = .91, CFI = .95, SRMR = .053, and girls, S-B $\chi^2(41, N = 288) = 55.58$, $p = .06$, RMSEA = .036 (0.000 − .057), NNFI = .90, CFI = .95, SRMR = .047. Parent–child

attitude congruence on both vigorous and moderate chores was found for boys, but not for girls, although parent–girl attitudes on value of moderate household chores were almost significant ($t = 1.95$). For vigorous chores, post hoc tests indicated that 31% of girls rated vigorous chores as more important than did parents, 28% rated them less important, and 41% shared their parents view. In turn, child value of vigorous household chores, such as mowing the yard or moving furniture, was significantly related to increased team participation in boys, and overall physical activity in girls (see Table 4). Child value of moderate household chores, such as laundry or cleaning, however, had significant negative effects on team participation in boys ($B = -.14$, $p < .05$), but it was not significantly related to overall physical activity in boys or girls.

Mediation tests for child activity (Table 5, Model 1) indicated that the hypothesized parental influence through child attitude on value of chores was significant for vigorous intensity chores in boys. The mediation test for the negative effect of parent–child attitudes for value of moderate intensity chores on team participation in boys was not significant, indicating that although parental value of moderate chores for boys was negatively related to their team participation via boys' attitude, this indirect effect was relatively weak. No activity displacement effects were significant (Model 2), indicating that although child attitudes on household chores had opposite effects on TV in boys depending on the intensity level of the chores (TV reduction effects for vigorous, TV increase for moderate), the effects through team participation were relatively weak.

Discussion

As the problem of child overweight continues to become more widespread, an emphasis on early intervention has become a priority to reduce children's risk for adult disease. The current study examined mechanisms by which the value of specific types and intensities of physical activity may influence children's active and sedentary behaviors. We found that specific parental attitudes on value are largely shared by children. Some of these attitudes were positively associated with child activity and protective against sedentary behavior, whereas others were not. Moreover, the effects of activity value found were over and above important ethnic and demographic factors.

The current work focused on three types of child activity (team, individual, household chores) and two intensity levels (vigorous and moderate). The analyses allowed us to address two important questions about the mechanisms of physical activity behavior: (a) Do parents and children have similar attitudes on the value of specific physical activities, and if we assume parents to be the driving force of parent–child attitude similarities, are parental attitudes about physical activity instrumental to children's activity behaviors? (b) Are there specific child attitudes regarding activity that may lead to child activity that may displace sedentary behaviors? First, we found that parental beliefs regarding the importance of vigorous intensity team sports had the strongest positive relationships with child activity, both participation in team sports and overall physical activity, and this effect was seen in girls and boys. Although previous studies have shown relationships between parents' and children's value of sports and sports participation in both boys and girls (Eccles & Harold, 1991; Fredericks & Eccles, 2005), our results extend this research by showing the distinct effects of value for specific activities. Of interest was the direct path found from parental attitudes on vigorous team sports to team sport participation in girls and boys. Although child attitudes served to significantly mediate parental views, parents also appeared to directly affect child behavior. Although speculative, the direct path suggests that the parents may enroll children in community team sports, so that children receive both direct and indirect benefits of parental attitude. Parental value of moderate-intensity sports, vigorous individually performed sports, and vigorous household chores were also instrumental to child activity, but only in boys. This appeared to be because parent and girl values were not as strongly shared as they were in boys, and because girls' value of moderate-intensity activity was not as strongly related to activity as it was in boys.

Second, only team sports participation, not overall physical activity, was related to reduced sedentary behavior, and this was found in girls and boys. Our results reflect those of Marshall et al., who found little relation between TV and physical activity, except when intensity level was considered (Marshall et al., 2004). In our data, only child attitudes for value of vigorous team sports and value of vigorous individual sports seemed to be instrumental to this displacement effect. Similarly, only parental value of vigorous team sports appeared instrumental to a reduction of sedentary behavior. Thus, while our results support team sport participation, rather than general physical activity, as an activity that may displace both TV and computer use, we found a possible cognitive mechanism for this effect only in girls, and it involved valuing vigorous intensity sports by the child and the parents. Our results extend Sirard's findings in middle school girls (Sirard, Pfeiffer, Dowda, & Pate, 2008) by adding a cognitive mechanism to drive the behavioral relationships: that of vigorous activity value in parent and child.

Perhaps the most interesting findings involved the attitudes on household chores. Among parents, the two types of chores we explored represented the ends of the spectrum on task importance: moderate intensity chores were rated as the most important of all six physical activities and vigorous chores were rated as the least. Given previous research on parents' child–gender biases, it was not particularly surprising that boys shared parental attitudes on the importance of vigorous chores, while girls did not (Eccles et al., 2000; Frome & Eccles, 1998). Importantly, however, despite parent child-gender bias on this type of task, child value of vigorous chores was related to increased activity in both boys and girls. For the most important type of task rated by parents, moderate intensity household chores, the effects found for boys were quite unexpected. Value of chores such as cleaning house and doing laundry was negatively related to boys' sport team participation and positively related to TV watching, although the strength of the two causal pathways tested was weak. Our data do not allow an explanation, and future research should explore these relationships. Placing high importance on domestic-type chores for boys may place them at risk for increased TV by keeping them in and around the house where these devices are located, or parents may stress moderate chores for boys because they are already watching TV and can do something constructive. Because others have found that active boys spend less time inside and more time with friends than sedentary boys (Gorely, Marshall, & Biddle, 2007), staying in the house may be a crucial factor.

Our findings also reveal important effects related to race/ethnicity, parent education, and family structure that to our knowledge have not been previously reported. Being Hispanic was associated with positive attitudes toward vigorous sports for boys (team and individual), but negative attitudes regarding these activities for girls. Interestingly, the negative effects for girls were found among the girls themselves, not their parents. Similarly, African-American girls placed less value on performing moderate intensity activities such as bicycling or walking. More parental education was associated with higher value by parents of both vigorous and moderate intensity sports for boys, regardless if they were performed in a team or individually, but somewhat surprisingly, not for girls (i.e., parental child-gender biases are still present, even among highly educated parents). The only demographic variable that was significantly positively related to parental attitudes on sports and physical activity for girls was the number of children in the family. This is supportive of recent findings from Australia where girls without siblings were less active than those with a sibling (Bagley et al., 2006). Attitudes on chores reflected culture (Hispanics valued vigorous chores less, especially for girls) and family status. Families with more children valued chores more, and families with more education, with possibly more money to allow individuals outside the family to take care of the housekeeping and yard maintenance, valued them less. Finally, we found no effects of parent weight on their activity importance attitudes for children in this age group, and, controlling for all other demographic variables, being African-American was directly associated with more TV in boys and girls, a finding consistent in the literature (Lowry, Weschsler, Galuska, Fulton, & Kann, 2002).

The strengths of this study include a large demographically diverse sample of parents, a focus on transfer of parent–child attitudes not previously studied, inclusion of active and sedentary child behavior, the use of structural equation modeling, and the inclusion of relevant, demographic variables in the analyses. The study is limited by its location in one area of the Southwest and by issues of measurement. Child behavior was self-reported, and the measures of TV and computer, as well as the attitude measures, were single items, which were assumed to be measured without error (multiple-indicator measures would be preferred for future studies, enabling better measurement of constructs). In addition, attitudes on value of sedentary behavior were not measured, which future studies should consider. Lastly, despite the feasibility of the models, our cross-sectional data does not allow specific conclusions regarding the direction of the causal relationships that were modeled.

Our findings have implications for physical activity interventions. First, because the issue of intensity is becoming increasingly important to guidelines for physical activity in children and adolescents, the results may be useful in efforts to increase vigorous activity. It will be important to communicate to parents how they influence child attitudes about vigorous activities, and how they can directly and indirectly affect child behavior. Addressing and reducing parent child–gender biases regarding vigorous activity should also be encouraged. Second, our results support views that physical activity and sedentary behavior should be targeted separately (Marshall et al., 2004), as overall physical activity was not related to TV or computer. However, our findings do support organized team sports as a viable strategy to decrease media use in boys and girls. In summary, children appear to largely share parental attitudes on the importance of specific types and intensities of physical activities. Positive attitudes for vigorous intensity team and individual sports had the greatest association with increased activity and reduced sedentary behavior in both boys and girls.

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