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## Parents' Activity-Related Parenting Practices Predict Girls' Physical Activity

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### Abstract

**Purpose**—Using a sample of 180 9-yr-old girls and their parents, this study examined (a) parents' activity-related parenting strategies and similarities and differences in such strategies for mothers and fathers, and (b) links between activity-related parenting strategies and girls' physical activity patterns.

**Methods**—Measures of girls' physical activity included the Children's Physical Activity scale, participation in organized sports, and physical fitness. We developed a questionnaire to assess ways in which parents promote physical activity among their children.

**Results**—Exploratory and confirmatory factor analyses identified two factors for each parent including logistic support of girls' activity (i.e., enrolling girls in sports and driving them to events) and parents' explicit modeling (i.e., the extent to which parents used their own behavior to encourage their daughters to be active). Mothers reported significantly higher levels of logistic support than fathers, whereas fathers reported higher levels of explicit modeling than mothers. Although mothers and fathers tended to report different methods of support, both methods were associated with higher physical activity among girls. Finally, girls reported significantly higher levels of physical activity when at least one parent reported high levels of overall support in comparison to no parents; no significant differences were identified for support from one versus two parents.

**Conclusion**—Results from this study indicate the positive contribution that parents can have on activity practices of their young daughters.

### Keywords

GIRLS; PHYSICAL ACTIVITY; PARENTS; PARENTING PRACTICES; ENCOURAGEMENT; SUPPORT

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The majority of children and adolescents in the United States do not meet recommendations for physical activity, particularly for vigorous activity. Only 36% of children met the Healthy People 2000 goal for vigorous activity (29), and current figures using objective measures of physical activity indicate that fewer than 3% of youth meet Healthy People 2010 objectives for vigorous physical activity (15). In addition, data from multiple national surveys indicate that 14% of youth do not participate in any activity (27). The failure to meet activity recommendations is problematic because low levels of physical activity have been linked to higher rates of Type II diabetes mellitus, hypertension, colon cancer, depression, osteoporosis,

and obesity (16,24). Levels of physical activity, or lack of activity, are not uniform among youth. Girls exhibit lower levels of physical activity and fitness than boys (22,27). In addition, physical activity declines as girls and boys approach puberty (27), and this decline is greater for girls than boys (22). Given that girls' involvement in physical activity appears to decline with the onset of puberty, it is important to determine factors contributing to girls' sport and activity participation before this point in their development. Such factors are potential targets for intervention efforts to promote physical activity among girls as they transition through adolescence.

Parents are important teachers and social referents for children throughout childhood and adolescence (7). In addition to serving as role models for physical activity, parents are also central in organizing and funding children's involvement in physical activities. Not surprisingly, therefore, parental participation in physical activity (24,28), encouragement of activity (2,19), and provision of transportation to sporting events (23) have been linked to higher levels of activity among children and adolescents. Parental involvement may be particularly relevant for girls because parent activity and encouragement have been shown to influence activity patterns of girls to a greater extent than boys (4,13,25). Although research indicates that parental influence is important, ways in which mothers and fathers differ in their activity-related parenting practices and the combined influence of mothers and fathers on children's physical activity are relatively unexplored. Therefore, using a sample of 9-yr-old girls and their parents, the goals of this study were (a) to assess similarities and differences in mothers' and fathers' activity-related parenting practices; (b) to assess links between mothers' and fathers' parenting strategies and girls' physical activity; and (c) to examine the combined influence of mothers and fathers on girls' physical activity, specifically to examine whether there is any added benefit to having two parents who promote and encourage physical activity in comparison with one or no parents.

## METHODS

### Participants

Participants included 180 9-yr-old non-Hispanic white girls and their mothers and fathers who were enrolled in a longitudinal observational study of girls' health and development from ages 5 to 9 yr. Families were recruited for participation in the longitudinal study using flyers and newspaper advertisements. In addition, families with age-eligible female children within a five-county radius received letters inviting them to participate in the study. Eligibility criteria for girls' (and parents') enrollment in the project included living with their biological parents, the absence of severe food allergies or chronic medical problems affecting food intake, and the absence of dietary restrictions involving animal products. Only data obtained when girls were 9 yr old were used in this study. Girls and their parents visited the laboratory during the summer. Girls were individually interviewed by trained interviewers, and parents completed a series of self-report questionnaires. The study was approved by the Institutional Review board, and written consent was obtained from mothers and fathers. In addition, mothers provided written consent for their daughter's participation.

### Measures

**Activity-related parenting practices**—A questionnaire assessing parents' activity-related parenting practices was developed for the purpose of the study. The questionnaire was piloted tested with this sample when girls were 7 yr old. Due to low internal consistency coefficients, additional items were added to the scale, particularly items assessing functional ways in which parents promote physical activity among their daughters. Mothers and fathers completed the revised version of the scale when their daughters were 9 yr old (see Appendix for a copy of the scale). Items were standardized (mean = 0, SD = 1) due to the different number

of response options across items; the standardized variables were used in the analyses and the unstandardized values are reported in the tables and the text.

Exploratory factor analysis (EFA) using a promax rotation was conducted for half of the sample using SAS version 8.01. Two conceptually distinct factors that we labeled logistic support (three items) and explicit modeling (four items) were identified for mothers and fathers. We chose the label explicit modeling to indicate that parents were intrinsically motivated to be active and intentionally used their behavior to encourage their child to be active and the label logistic support to indicate that parents made provisions, such as enrolling their daughter in sports, which enabled her to be active. Confirmatory factor analysis, using AMOS software, was performed for the second half of the sample and provided clear support for fathers and acceptable support for mothers for the two-factor model identified in the EFA. The items loading onto each factor, the factor loadings for each parent and the fit indices are presented in Figure 1.

Based on the results of factor analyses, two subscales scores were created for each parent by taking the mean of the items that loaded onto the specific factor (see Appendix). The internal consistency coefficients were as follows: fathers' logistic support,  $\alpha = 0.74$ ; fathers' explicit modeling,  $\alpha = 0.69$ ; mothers' logistic support,  $\alpha = 0.61$ ; and mothers' explicit modeling,  $\alpha = 0.75$ . In terms of the validity of the items, there was some indication that parents who said that they went out of their way to enroll their daughter in sports actually did so more than parents who did not report such efforts. For example, mothers who reported high levels of logistic support had daughters who reported participating in more organized sports ( $r = 0.30, P < 0.01$ )

**Girls' physical activity**—Three measures of girls' physical activity were obtained including general inclination toward activity, participation in organized sports, and physical fitness. The short version of the Children's Physical Activity (CPA-short) scale was used to assess girls' general tendency or inclination toward activity (26). The CPA-short contains 10 items and uses a 4-point response scale from 1 = completely true to 4 = completely false (e.g., "I would rather watch TV or play in the house than play outside"). Research supports that validity of this scale: scores on the CPA were found to be significantly related to 1-mile run/walk time ( $r = -0.43, P < 0.0001$ ), body fat percentage ( $r = -0.41, P < 0.0001$ ), and BMI ( $r = -0.32, P < 0.0001$ ) (26). In the current study, Cronbach's alpha was 0.58 for the CPA.

An activity checklist that was designed for the larger longitudinal study was used to assess girls' participation in organized sports. Girls were presented with a checklist of 24 activities (e.g., basketball, soccer, and softball) and were asked to indicate whether they participated in the activity at an organized level (i.e., belonged to a team or had lessons or classes). Finally, girls' physical fitness was assessed using the Progressive Aerobic Cardiovascular Endurance Run (PACER) (10,11). This is a progressive test providing an index of aerobic fitness and is suitable for children of all ages. Children run back and forth between markers spaced 20 m apart at a specified pace that progressively increases. The more "laps" completed and an ability to maintain the specified pace indicate a higher level of aerobic capacity and in turn a higher level of fitness. Previous research illustrates the test-retest reliability of the PACER and has shown that the number of laps completed is significantly and positively correlated with measured  $VO_{2max}$  ( $r = 0.69$  boys and  $r = 0.51$  for girls) (12).

A summary physical activity score was created for girls using all three measures. An activity score that is based on multiple measures of activity is considered to be more representative of general activity patterns and reduces the error involved in its measurement (8). The summary score was created using principal component analysis and was highly correlated with each individual measure of activity ( $r = 0.73, P < 0.0001$ , inclination toward activity;  $r = 0.70, P <$

0.0001, sport participation;  $r = 0.57$ ,  $P < 0.0001$ , fitness). The summary score will be used in all analyses that follow.

**Anthropometries**—Trained staff members collected three measures of height (to the nearest 0.5 cm) and weight (to the nearest 0.1 kg) from girls and their parents. Average height and weight were used to calculate Body Mass Index (BMI: weight (kg)/height (m)<sup>2</sup>) for girls and their parents. Girls' BMI values were converted to BMI percentiles using the GDC 2000 growth charts, and girls were classified as overweight if their BMI percentile was  $\geq 85$  and obese if their BMI percentile was  $\geq 95$  (9). Parents were classified as overweight and obese based on BMI cutoffs of 25 and 30, respectively (30). In addition to BMI, girls' percent body fat was assessed using dual energy x-ray absorptiometry (DEXA). Whole body scans were obtained using the Hologic QDR 4500W (S/N 47261) in the array scan mode. Scans are analyzed using whole body software, QDR4500 Whole Body Analysis (Hologic, Inc).

### Statistical Analyses

Differences in mothers' and fathers' reported logistic support and explicit modeling were assessed using paired *t*-tests. Associations between (a) parents' activity support and girls' physical activity, (b) girls' physical activity and girls' weight status, and (c) parents' activity support and parents' weight status were examined using Spearman rank correlation analysis. The independent contribution of maternal and paternal logistic support and explicit modeling on girls' physical activity was assessed using multiple regression analysis. Only families who had data for both parents ( $N = 170$ ) were included in the regression analysis and for the analyses that follow.

To examine the combined influence of maternal and paternal support on girls' activity, three parent groups were created. Mothers and fathers were each categorized as providing above or below average support. Above average support was defined as reporting above average logistic support and explicit modeling. The three groups included families in which neither parent ( $N = 80$ ), one parent ( $N = 67$ ), or both parents ( $N = 23$ ) reported above-average support. Girls were classified as exhibiting high or low levels of physical activity based on the mean for the summary activity score. Using the three parent support groups (no parent/one parent/both parents) and girls' activity groups (high/low), a  $2 \times 3$  chi-square analysis was performed to assess whether girls disproportionately fell into each of the activity groups as a function of their parents' overall support of their activity. In addition, dummy variable logistic regression was performed to examine whether there were significant differences between each parent group in the percentage of girls who were highly active. No differences in family income, parents' education, or parents' work hours were identified for the three parent groups or the two activity groups; therefore, it was not necessary to control for these variables.

## RESULTS

### Sample characteristics

Parents were on average in their late 30s or early 40s (mothers' mean age =  $39.5 \pm 4.8$  yr; fathers' mean age =  $41.6 \pm 5.4$  yr), Mothers and fathers were generally well educated, and completed a mean of  $14.6 (\pm 2.2)$  and  $14.7 (\pm 2.6)$  yr of education, respectively. Nearly all fathers (99%) and approximately three quarters of mothers (78%) were employed with an average of  $44.9 (\pm 11.3)$  weekly work hours for fathers and  $24.4 (\pm 17.8)$  for mothers. Family median combined income was  $> \$50,000$ . Approximately one in three girls were classified as over-weight, and 14% were obese. Sixty percent of mothers and 82% of fathers were classified as overweight, and 28% of mothers and 31% of fathers were classified as obese. In terms of girls' physical activity, girls reported a greater inclination to be active than sedentary (mean =  $2.75 \pm 0.44$ ), and they participated in an average of two team or organized sports (mean = 2.3

$\pm 1.31$ ). In addition, 57% of girls exhibited a healthy level of physical fitness (11) (mean number of laps run =  $16.2 \pm 6.50$ ). This figure, however, is likely to under estimate fitness because the lowest reference standard available was for children a year older than girls in this study.

When mean levels of logistic support and explicit modeling were compared for mothers and fathers, results indicated that mothers reported significantly higher levels of logistic support ( $3.19 \pm 0.64$ ) for girls' activity than fathers ( $2.77 \pm 0.64$ ) ( $t = 6.12$ ,  $df = 169$ ,  $P < 0.0001$ ) and that fathers reported significantly higher levels of explicit modeling ( $2.86 \pm 0.90$ ) than mothers ( $2.60 \pm 0.90$ ) ( $t = 6.12$ ,  $df = 169$ ,  $P < 0.001$ ). Although mothers and fathers tended to report different methods of encouraging their daughters to be physically active, each method was positively correlated for mothers and fathers within families. That is, in families in which mothers reported high levels of support, fathers tended to report high levels of support (see Table 1). In addition, mothers and fathers who reported higher levels of logistic support also reported higher levels of explicit modeling. These results indicate that families who supported their daughter's physical activity did so in a number of ways across both parents.

Associations between girls' physical activity and weight status and between parenting strategies and parents' weight status were examined for descriptive purposes. Results indicated that girls with higher percent body fat ( $r = -0.41$ ,  $P < 0.0001$ ) and girls with higher BMI percentiles ( $r = -0.25$ ,  $P < 0.0001$ ) were less physically active. For parents, physical activity-related parenting practices were not linked with their weight status. One exception was mothers' explicit modeling; mothers who reported higher levels of explicit modeling were less overweight than mothers reporting lower levels of modeling ( $r = -0.25$ ,  $P < 0.01$ ).

With respect to associations between parenting strategies and girls' physical activity, fathers' explicit modeling and mothers' logistic support were associated with significantly higher levels of activity among their daughters (see Table 1). Results from the regression analysis indicated that mothers' logistic support ( $\beta = 0.21$ ,  $P < 0.01$ ) and fathers' explicit modeling ( $\beta = 0.24$ ,  $P < 0.01$ ) were independently associated with higher levels of physical activity among their daughters, after controlling for girls' percentage body fat ( $\beta = -0.38$ ,  $P < 0.01$ ) ( $R^2$  for full model = 0.27;  $R^2$  for model with only parenting variables = 0.12).

The chi-square analysis assessing the combined influence of mothers and fathers on girls activity indicated that girls disproportionately fell into each of the activity groups as a function of their parents' overall support of their activity ( $\chi^2(2,170) = 14.45$ ,  $P = 0.0007$ ). As shown in figure 2, only 32% of girls from families in which neither parent provided a high level of overall support for their activity were classified as being highly active. This figure increased to 56% for families in which one parent encouraged their daughter to be active and increased again to 70% for families in which both parents encouraged their daughter to be active. Results from the logistic regression analyses indicated that the percentage of girls who were highly active was significantly higher when one versus no parents provided a high level of support (OR = 0.19, CI = 0.08–0.47). However, the difference in the number of girls who were highly active was not statistically significant for families in which one versus two parents reported a high level of support (OR = 1.74, CI = 0.63–4.64). A follow-up analysis focused on the group in which only one parent encouraged activity. In this group, girls' level of activity did not differ based on whether it was the mother or the father who encouraged activity ( $\chi^2(2,67) = 0.60$ ,  $P = 0.43$ ).

## DISCUSSION

Mothers and fathers tended to favor different strategies when encouraging their daughters to be active. Mothers provided higher levels of logistic support, that is, they were more likely to enroll their daughters in sports and to support their daughters at sporting events. Fathers, in



contrast, were more likely to use their own behavior to encourage activity, for example, by leading a family outing involving activity. Although parents tended to favor different strategies to encourage their daughter to be physically active, both forms of support were associated with higher levels of physical activity among girls. In addition, a dose-type response was noted in the combined impact of parents on girls' physical activity. Only 30% of girls reported high levels of physical activity when neither parent provided a high level of overall support for activity. This figure increased to 56% when one parent provided a high level of support and increased again to 70% when both parents provided high levels of support.

Previous research has yielded conflicting evidence about the comparative importance of mothers versus fathers on children's physical activity (5,6,28). This lack of consistency may be due to the fact that previous studies have generally adopted single item questions to assess parents' own activity or their encouragement of activity. By developing a questionnaire that assessed a broader range of parenting practices that may promote physical activity, we found that mothers and fathers report similar levels of encouragement, but their methods tend to differ. The different support strategies adopted by mothers and fathers in this study (i.e., logistic support versus direct modeling) mirror gender differences identified in general parenting strategies in that mothers generally adopt a nurturing and organizational role and fathers adopt a more hands-on, playful approach to parenting (14). The fact that each method was associated with higher levels of physical activity among girls is encouraging because it suggests that parents can be given the freedom to provide activity support in a manner that is most comfortable to them.

When assessing the combined impact of mothers and fathers on girls' physical activity, results indicated that girls were significantly more likely to be highly active when at least one parent reported a high level of support in contrast to when no parents provided a high level of support. In addition, in families in which one parent provided a high level of support, it did not matter whether it was the mother or the father. These findings suggest that in situations where it is infeasible for both parents to provide a high level of support, the positive influence of parental support may still be evident if at least one parent is supportive. Although it may be assumed that parental support leads to higher levels of physical activity among children, the directionality of this relationship cannot be determined in this study due to its cross-sectional design. For example, the pattern of associations may also reflect the possibility that highly active girls elicited higher levels of support from their parents. Further research using a longitudinal sample is needed to determine whether support from parents is associated with increases in children's physical activity and whether parental support protects girls against the noted decline in physical activity across adolescence (27).

Although parental support was associated with higher levels of physical activity among girls, parental support explained a relatively small amount of variance in girls' activity (12%). This is likely to reflect the fact that physical activity among children is shaped by many factors including child specific characteristics (e.g., age, gender, and perceived self-efficacy) (1,18), parents (17), peers (17), the school environment (21), and community level factors (e.g., neighborhood safety and access to play areas (3,20)). In addition, the relative contribution of these factors is likely to change at various developmental phases. Results from this study are likely to underestimate the contribution of parents because there are domains of parental support that were not assessed such as the extent to which parents restructure the home to make it less conducive to sedentary activity and because we did not have a direct measure of physical activity such as accelerometers. Although combining information from two questionnaires and an objective measure of fitness (an indirect measure of physical activity) provides a more comprehensive measure of physical activity than a single questionnaire, direct assessment of physical activity provides a more reliable and valid assessment of physical activity. Using a

direct measure of physical activity would likely increase the predictive power of parental support with respect to children's physical activity due to lower levels of measurement error.

In summary, although mothers and fathers tended to report different forms of activity support, both were associated with higher levels of physical activity among their 9-yr-old daughters. Links between parental support and girls' activity provide evidence of the predictive validity of the measure of parents' activity-related parenting practices that was developed for this study. Findings from this study, in combination with what we know about the benefits of physical activity among children and adolescents, suggest that mothers and fathers can play an important role in promoting the physical and emotional well-being of their daughters by encouraging them to be physically active.

Future research could build on this study by examining associations between parental support and children's activity using more diverse samples and families with alternative living situations (this study included two parent, middle-income, non Hispanic white families), by using a longitudinal design to assess the temporal sequence of parental support and children's physical activity, by assessing additional domains of parental support, and by using a direct measure of physical activity. Finally, the measure of activity-related parenting practices may be useful in future research. For example, the scale could be modified to be completed by children with reference to their parents, it could be used to assess change in parental practices across time, and it could be used to assess mediation models in intervention research.

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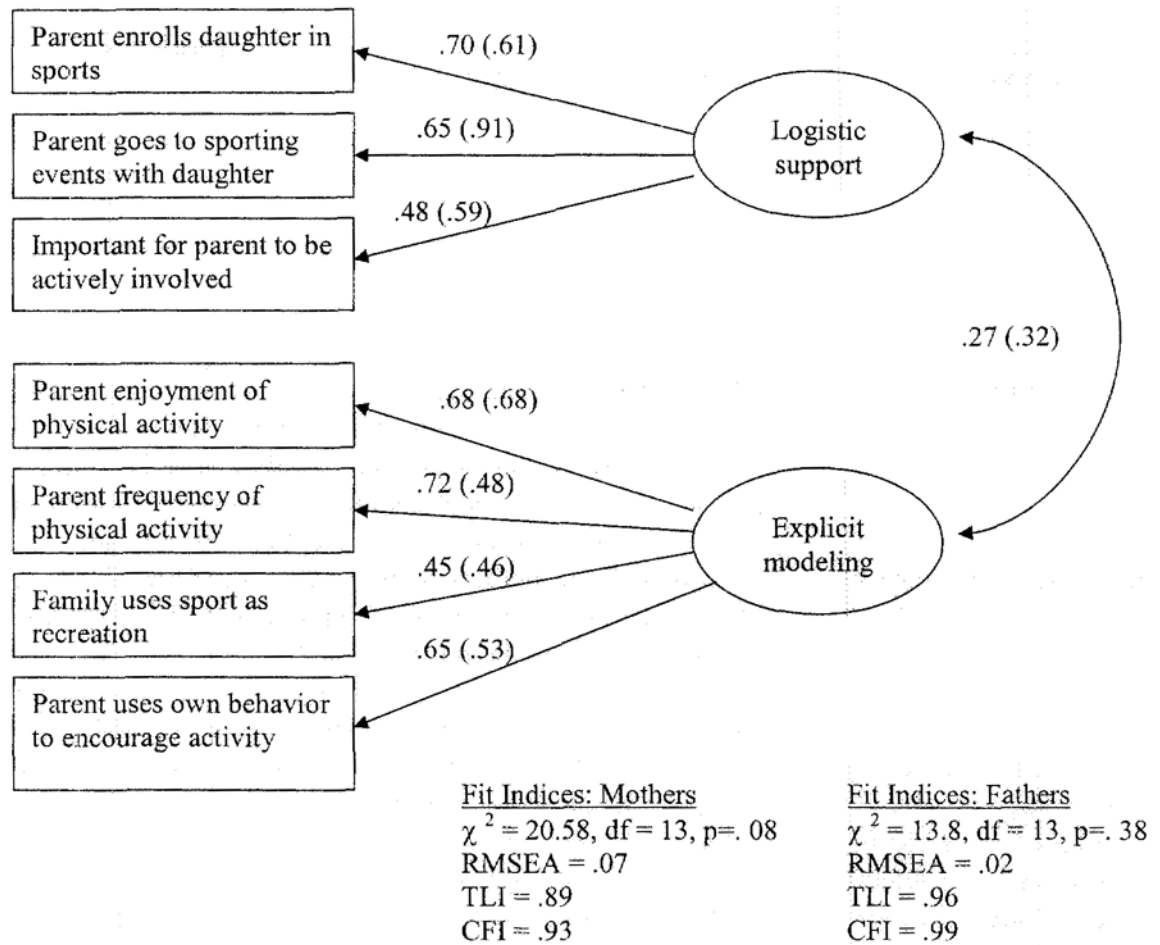
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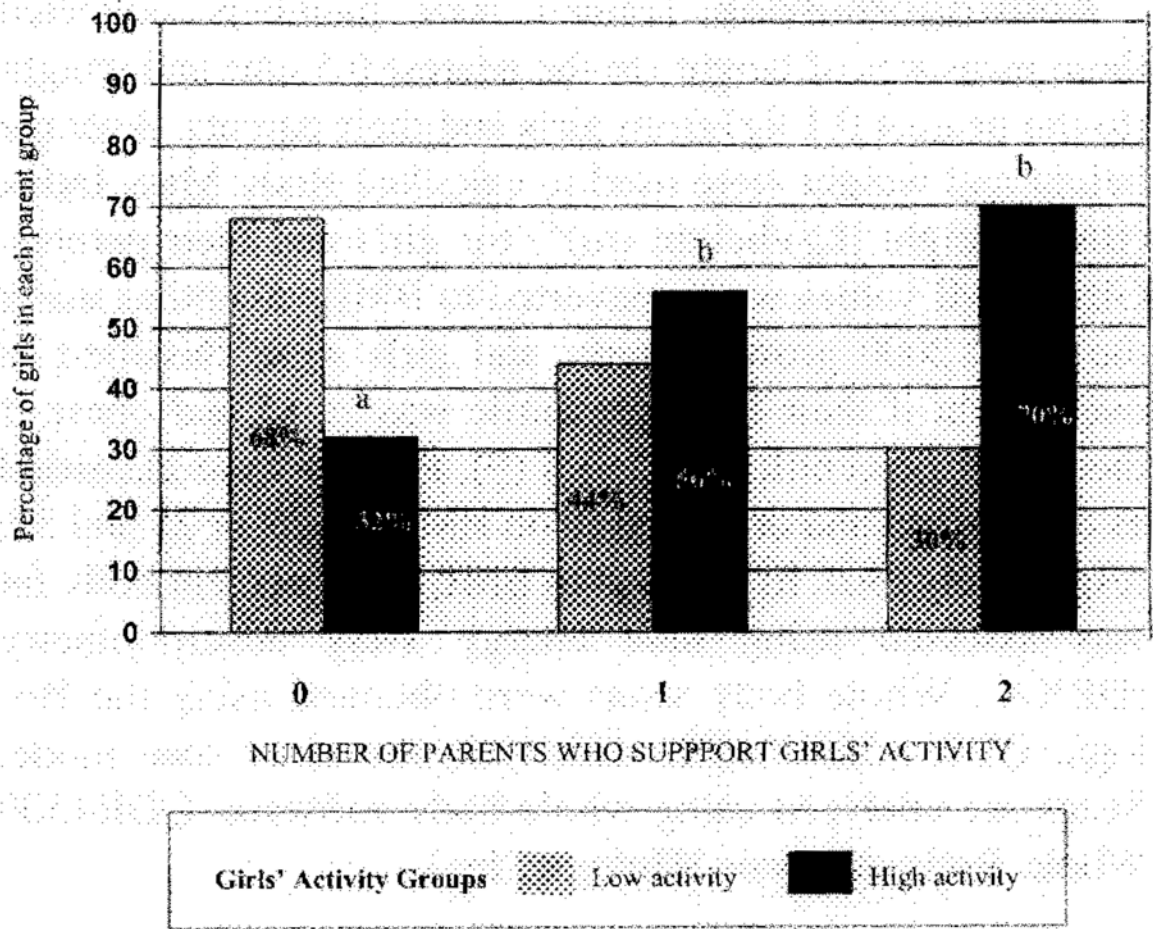
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**FIGURE 1.** Confirmatory factor analysis for the measure of parental support of activity. Note: Item loadings and factor correlations outside of parentheses are for mothers and inside the parentheses are for fathers.



**FIGURE 2.** Combined influence of parents on girls' physical activity. Note: Different letters indicate significant differences ( $P < 0.05$ ) between groups in the likelihood of girls being in the high activity group based on the results of the logistic regression analysis.

**TABLE 1**  
Associations between mothers and fathers activity-related parenting practices and girls Physical activity.

	Fathers' Logistic Support	Fathers' Explicit Modeling	Mothers' Logistic Support	Mothers' Explicit Modeling
Activity-related parenting practices	0.27**			
Fathers' explicit modeling		0.00		
Mothers' logistic support	0.23**	0.23**	0.21	
Mothers' explicit modeling				
Girls' physical activity				
Summary activity score	0.14	0.25	0.18	0.08

\*\*  $P < 0.01$ ;

\*  $P < 0.05$ .

## APPENDIX

## Activity-related parenting practices scale.

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1. How <i>active</i> are you in enrolling your daughter in sports?	1	I <i>rarely</i> enroll my daughter in sports.
	2	I enroll my daughter <i>once in a while</i> .
	3	I <i>frequently</i> enroll my daughter in sports.
	4	I <i>go out of my way</i> to enroll my (daughter in sports
2. How often do you go to your daughter's sporting events with tier (e.g., watch your daughter perform in a dance recital or at swim meets)?	1	Rarely
	2	Sometimes
	3	Usually
	4	Almost always
3. How important is it <i>to you</i> to be <i>actively involved</i> in your daughter's sporting events?	1	It is <i>not particularly</i> important to me to be involved.
	2	It is sort of important to me to be involved.
	3	It is <i>important</i> to me to be involved.
	4	It is <i>extremely</i> important to me to be involved.
4. How much do you enjoy sport/physical activity?	1	Don't enjoy
	2	Sort of enjoy
	3	Really enjoy
	4	Thoroughly enjoy
5. How frequently (on average) do you participate in sport/physical activity each week?	—	times per week
6. How often does your family use sport/physical activity as a form of family recreation (e.g., going on bike rides together, hiking, ice skating)?	1	Rarely
	2	Once in a while
	3	Relatively often
	4	Frequently
7. How much do you use <i>your own behavior</i> to encourage your daughter to be physically active?	1	I <i>don't</i> use my own behavior to encourage my daughter to be active.
	2	I <i>rarely</i> use my own behavior to encourage my daughter to be active.
	3	I <i>often</i> use my own behavior to encourage my daughter to be active
	4	I <i>constantly</i> use my own behavior to encourage my daughter to be active.

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