

Original article

Associations between parental support for physical activity and moderate-to-vigorous physical activity among Chinese school children: A cross-sectional study

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Abstract

Purpose: The objective of this study was to examine the associations between parental support for physical activity (PA) and levels of moderate-to-vigorous physical activity (MVPA) among Chinese school children.

Methods: Study participants were 81,857 school-aged children (aged 9–17 years; mean age = 13 years; 49.0% boys) and their parents or guardians who took part in the 2016 Physical Activity and Fitness in China—The Youth Study project. The independent variables included various forms of parental support for PA ascertained through a survey completed by parents or guardians. The dependent variable was the children's average MVPA in minutes per day by self-report. Structure equation modeling was used to examine the associations between parental support for PA and children's MVPA minutes.

Results: The overall mean for MVPA participation time for the child participants was 48.82 ± 28.71 min/day. Significant associations between various forms of parental support and MVPA among children were found. Parental encouragement, accompanying, financial support, involvement, and role modeling for PA were positively associated with a high level of student MVPA participation. Parental PA knowledge-sharing was not associated with MVPA. The patterns of the associations were similar across sex, residence locale (i.e., urban and rural), and school grades (primary, junior middle, and junior high schools).

Conclusion: Findings from this study suggest that, among Chinese school children, parental support for PA is important in promoting and facilitating children's participation in MVPA.

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Keywords: Children and youth sports; Chinese family; Exercise; Parenting

1. Introduction

Although engaging in regular physical activity (PA) yields major health benefits for children and youth,^{1–4} increasing evidence shows an overall low level of PA among Chinese school-aged children and adolescents.^{5,6} For example, a recent report on PA in Shanghai revealed that only about 20% of school-aged children and youth met the PA guideline of engaging at least 60 min of daily moderate-to-vigorous physi-

cal activity (MVPA);⁷ and in 2010, about 77% of primary school and junior middle school children nationwide failed to meet PA recommendations.⁵ Other studies have shown an increasing trend in sedentary behavior^{8,9} and rates of obesity in children and youth.^{10–12}

Among many factors that influence children's PA, family members and parents play an important role in promoting and shaping their children's behaviors.¹³ Characteristics such as parental PA role modeling,^{6,14–16} support for PA,^{14,15,17,18} PA motivation,¹⁹ family type,²⁰ and socioeconomic status (SES)^{21–23} have been shown to be associated children's participation in PA. However, few studies in China have systematically examined the specifics of parental support for PA in regard to their

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children's PA, especially studies involving nationally representative samples.

With significant changes in sociodemographics,²⁴ a heavy emphasis on children's academic achievement,²⁵ and the low prevalence of PA among Chinese school children,^{5,7,26} it becomes increasingly important that family and parent factors that either promote or impede children's PA be identified so that targeted, family-based PA promotional strategies can be developed for the most vulnerable children and youth populations. This study addresses this significant knowledge gap.

The main purpose of this study was to examine associations between various forms of parental support for PA and levels of MVPA participation among Chinese school-aged children. On the basis of prior research,¹³⁻¹⁸ we hypothesized that parental encouragement, accompanying, financial support, involvement, knowledge-sharing, and role modeling of PA would be positively associated with a high level of participation in MVPA by school children. A secondary purpose of the study was to examine differences in these associations by sex, residence locale, and school grades.

2. Methods

2.1. Study design and participants

The data analyzed in this study were derived from the 2016 Physical Activity and Fitness in China—The Youth Study (PAFCTYS), which was conducted between October and November 2016. The PAFCTYS, described in detail by Fan et al.,²⁶ used a 3-stage stratified cluster (nonprobability) sampling design to sample a nationally representative group of school-aged children (aged 7–17 years) in primary schools (Grades 4–6), junior middle schools (Grades 7–9), and junior high schools (Grades 10–12) from 22 provinces, 4 municipalities, 5 autonomous regions, and 1 Xinjiang Production and Construction Corps (an independent division within Xinjiang Uygur Autonomous Region), in the Mainland of China.

The original PAFCTYS survey sample included a total of 125,281 school children, Grades 4–12, who participated in the survey portion of the study. Of these participants, children with missing information on residence locale ($n = 7029$) and those who provided out-of-range data or response values in survey questions, including family-related measures ($n = 1636$) and outcome measures of MVPA ($n = 34,759$), were excluded. As a result, data analyzed in this study came from a total of 81,857 children who provided PA data and whose parents or guardians also completed a survey.

The study was approved by the Institutional Review Board of Shanghai University of Sport. Permission to conduct the study was obtained from principals of each school participating in the PAFCTYS. Verbal consent was obtained from the children's parents or guardians and from all participating children prior to data collection.

2.2. Procedures

In a school classroom setting, trained research staff provided a detailed description of the study and instructions on completing the survey. Each child completed a 4-page survey (online or

on paper) that included questions about their PA and other demographic information. The parents or guardians of each child were also asked to complete a 4-page adult version of the survey at home that included questions about parental support for PA and other family-related characteristics. Trained research staff administered the survey and answered any question about it.

2.3. Measures

2.3.1. MVPA

Children's MVPA was assessed via a Chinese version²⁷ of the International Physical Activity Questionnaire Short Form (IPAQ-SF).²⁸ Psychometric properties of the IPAQ-SF with the Chinese student population have been previously established.²⁷ Relevant to this study, items related to participating in moderate-intensity and vigorous-intensity activities were used.²⁶ The children's report of the average number of daily minutes of engaging in MVPA (in the past 7 days) was calculated and used as a dependent measure.

2.3.2. Parental support for PA

Parental support for children's PA was assessed by 6 questions completed by the children's parents or guardians. The questions included (1) "Do you encourage your child take part in physical activity/exercise?" (Parental PA encouragement), (2) "Do you accompany your child when he/she attends physical activity/exercise sessions?" (Parental PA accompanying), (3) "Do you provide financial support when your child participates in physical activity/exercise?" (Parental financial support of PA), (4) "Do you join your child when he/she participates in physical activity/exercise?" (Parental PA involvement), (5) "Do you share your knowledge of the health benefits of physical activity/exercise with your child?" (Parental PA knowledge-sharing), and (6) "Do you serve as a role model for your child by engaging in physical activity/exercise?" (Parental role modeling for PA). The parent or guardian responded these questions on a 5-point scale, based on the following scores: 1 = *never*, 2 = *not very much*, 3 = *not sure*, 4 = *sometimes*, and 5 = *very much so*, with high scores indicating positive support for PA. The 6-item scale has a Cronbach α (internal consistency) coefficient of 0.82. In this study, we defined the term "parent" to include any guardian who was responsible for the welfare of the child (i.e., "parent" was not limited to biological parents).

2.3.3. Other measures

Demographic information about each child's date of birth was retrieved from his or her student ID. Children's height was measured to the nearest 0.1 cm in bare feet whereas body weight was measured to the nearest 0.1 kg. Both of these measures were assessed using a portable instrument (GMCS-IV; Jianmin, Beijing, China). Each child's body mass index (BMI) was then calculated as (weight in kg)/(height in m)². Residence locale information (urban, rural) for each child was obtained through his or her self-report on the survey. Information on family type and SES was ascertained from the parent and guardian survey in which the parent or guardian was asked who was most responsible for raising the child: both parents, single parent (father or mother), grandparents, stepfather, stepmother,

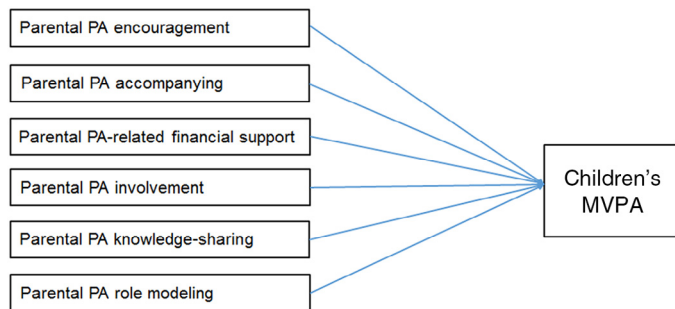


Fig. 1. A path model depicting the associations between parental support for PA factors and MVPA among Chinese school-aged children. MVPA = moderate-to-vigorous physical activity; PA = physical activity.

or others. The parent or guardian report on educational attainment was used as a proxy for the family's SES.

2.4. A path model

To examine the hypothesized associations between parental support for PA and school children's MVPA minutes, a path model (Fig. 1) was specified. This model was formulated with a set of 6 exogenous (parental support for PA) variables: parental PA encouragement, parental PA accompanying, parental PA-related financial support, parental PA involvement, parental PA knowledge-sharing, and parental PA role modeling. As indicated by the directional arrow lines, all parental support variables were hypothesized to relate to the endogenous outcome variable of average daily minutes of MVPA in school-aged children. We tested this model on the total sample (primary purpose) but also explored differences in the hypothesized associations by sex, residence locale, and school grades (secondary purpose).

2.5. Statistical analyses

Preliminary statistical analyses were conducted using SPSS Version 21.0 (IBM Corp., Armonk, NY, USA). Taking into account the complex survey design in the PAFCTYS,²⁶ all analyses used sample weights to account for the clustering effect of sampling by school. Analyses were performed using a listwise deletion method in which missing, incomplete, or non-normality data were removed.

Descriptive statistics were calculated to describe the study population characteristics. We also calculated bivariate 0-order correlations between parental support for PA variables and average daily minutes of MVPA overall and separated by sex, resident locale, and school grades. To evaluate the hypotheses related to the main study aim, we tested the path model (Fig. 1), in which all variables shown were observed, using *Mplus* structural equation modeling software (Version 7.4),²⁹ which allowed us to account for nonindependence of observations due to cluster sampling of schools. Important confounders such as family structure,²⁰ family SES,²¹⁻²³ and children's perceptions of academic burden³⁰ were used as control variables in the model tested. Overall model fit was evaluated by the χ^2 statistic and root-mean-square error of approximation, with values of 0.06 or less indicating an acceptable level of fit.³¹ The path coefficients in the model

were estimated by the maximum-likelihood method. Both unstandardized (*b*) and standardized regression coefficients (β) were calculated, with a conservative *p* value < 0.01 (2-tailed) being considered statistically significant.

To address our secondary propose of the study, we conducted subgroup analyses that evaluated the structural relationships shown in Fig. 1 by sex, residence locale, and school grades. Analyses were conducted using a multigroup approach in which the structural paths (parameters) specified in our path model were first allowed to differ (unconstrained model) across the groups of interest and then tested against a model in which equality constraints on the structural paths were imposed across groups (constrained model). The difference in unconstrained and constrained models was tested and evaluated using χ^2 statistics.

3. Results

3.1. Participant characteristics

The average age of the school-aged children in this study was 13.06 ± 2.49 years, approximately 75% reported living with both parents, and about 50% lived in urban areas and received their schooling there. Sex distribution was about equal (51% girls). The average BMI percentile score was 19.75 ± 3.50 , 14.4% were classified as overweight (85%–94% BMI percentile), and 11.9% were obese ($\geq 95\%$ BMI percentile). More than half of the children's parents (50.8%) reported that they had completed at least a high school degree. Table 1 presents descriptive statistics (weighted) for the study population.

Overall, children reported spending an average of 48.82 ± 28.71 min of MVPA per day (341.75 ± 200.95 min/week). Higher MVPA time was reported in boys (50.70 ± 29.38 min/day) compared with girls (47.01 ± 27.93 min/day) ($p < 0.001$), for rural children (49.87 ± 29.18 min/day) compared with urban children (47.78 ± 28.19 min/day) ($p < 0.001$), and for junior middle school children (51.44 ± 28.54 min/day) compared with primary school children (50.46 ± 29.42 min/day) ($p < 0.001$) and junior high school children (44.53 ± 27.64 min/day) ($p < 0.001$). In addition, children living with both parents (49.39 ± 28.93 min/day) or both parents and grandparents (48.91 ± 28.84 min/day) scored higher on MVPA compared with children living in other arrangements combined (48.71 ± 28.66 min/day) ($p = 0.004$). Children whose parents' education level was at the master or doctoral level (50.56 ± 29.02 min/day) had a higher MVPA time compared to students whose parents reported lower levels of education (48.76 ± 28.69 min/day) ($p < 0.001$).

3.2. Relationships between parental support variables for PA and children's MVPA

Bivariate correlations among the study variables for the total sample ($n = 81,857$) are shown in Table 2. All parental support variables for PA were shown to be statistically correlated with children's MVPA (all $p < 0.001$). The overall strength of these observed relationships, however, varied significantly, ranging from 0.086 (Parental PA knowledge-sharing and MVPA) to 0.108 (Parental PA encouragement

Table 1
Descriptive statistics for the study population.

	Sample size (n (%))	MVPA (min/day, mean ± SD)
Total sample	81,857 (100)	48.82 ± 28.71
Sex		
Boy	40,109 (49.0)	50.70 ± 29.38
Girl	41,748 (51.0)	47.01 ± 27.93** ^a
Residence locale		
Urban	41,032 (50.1)	47.78 ± 28.19
Rural	40,825 (49.9)	49.87 ± 29.18** ^b
School grade		
Primary	27,351 (33.4)	50.46 ± 29.42** ^c
Junior middle	27,339 (33.4)	51.44 ± 28.54
Junior high	27,167 (33.2)	44.53 ± 27.64** ^c
Family type		
Both parents	11,762 (14.4)	49.39 ± 28.93** ^d
Both parents and grandparents	2393 (2.9)	48.91 ± 28.84** ^d
Grandparents	61,639 (75.3)	48.80 ± 28.66
Single parent and step-parent	809 (1.0)	48.36 ± 28.12
Single parent	4724 (5.8)	47.95 ± 28.59
Other	530 (0.6)	46.44 ± 29.77
Parental education		
Primary school or under	10,270 (12.6)	46.13 ± 28.11
Junior middle school	29,989 (36.6)	48.21 ± 28.29
Junior high school	18,849 (23.0)	49.32 ± 28.74
College	8581 (10.5)	50.31 ± 29.50
University bachelor	11,075 (13.5)	50.44 ± 29.35
University master or higher	3093 (3.8)	50.56 ± 29.02** ^e
BMI	81,857 (100)	19.75 ± 3.50

Note: BMI is presented as average BMI percentile ± SD, kg/m².

* $p < 0.01$.

** $p < 0.001$.

^a Compared with boys.

^b Compared with urban children.

^c Compared with junior middle school children.

^d Compared with children living in other arrangements combined.

^e Compared with children whose parents reported lower levels of education.

Abbreviations: BMI = body mass index; MVPA = moderate-to-vigorous physical activity.

and MVPA). Correlation matrices by sex, residence locale, and school grades are shown in the online supplement (Tables S1–S3).

Testing of the hypothesized path model for the total sample resulted in $\chi^2 = 8212.62$; $df = 28$; $p < 0.001$; root-mean-square error of approximation = 0.063 (95% confidence interval (CI): 0.055–0.072), indicating a reasonable fit of the hypothesized model to the empirical data. Model parameter estimates (both

unstandardized and standardized) are presented in Table 3. Results show that parental encouragement ($b = 1.98$), accompanying ($b = 0.90$), financial support ($b = 1.07$), involvement ($b = 0.85$), and role modeling ($b = 0.71$) for PA were positively associated with a high level of child participation in MVPA ($p < 0.001$). Parental PA knowledge-sharing, however, was not significantly associated with MVPA ($p = 0.53$).

3.3. Multigroup analysis by sex, residence locale, and school grades

The χ^2 difference tests between constrained and unconstrained models in our multigroup analyses reveal a similar pattern to the structural relationships shown in our main analyses, which indicates that the path estimates in our model were invariant for boys and girls, between children living in urban and rural areas, and across the 3 school grades (see Table S4 of the online supplement for model testing using χ^2 difference). Estimates of path coefficients in the model by sex, residence locale, and school grades are presented in the online supplement (Tables S4–S5). The results are consistent with the overall model based on the total sample and show no statistically significant difference in the path coefficients between parental PA support variables and children’s MVPA across the 3 demographic variables examined.

4. Discussion

Using the 2016 PAFCTYS data, we examined the associations between various forms of parental support for PA and levels of MVPA participation among Chinese school-aged children. We found that high parental encouragement, accompanying, engagement, role modeling, and financial support for PA were positively associated with high levels of children’s participation in MVPA. These associations were found to be similar across boys and girls, residence locale (urban and rural), and school grades (primary, junior middle, and junior high schools).

This is one of the few studies that examined associations between parents’ support of PA and children’s MVPA in China. Findings from this study are consistent with the extant literature published in western countries showing the important role parents play in promoting and facilitating children’s PA¹³ and findings from China that demonstrate the modeling effect

Table 2
Zero-order correlations between parental support for PA factors and MVPA among Chinese school-aged children ($n = 81,857$).

No.	Variable	1	2	3	4	5	6	7
1	MVPA (min/day)	—						
2	Parental PA encouragement	0.108	—					
3	Parental PA accompanying	0.105	0.361	—				
4	Parental PA-related financial support	0.095	0.407	0.363	—			
5	Parental PA involvement	0.107	0.398	0.604	0.342	—		
6	Parental PA knowledge-sharing	0.086	0.543	0.376	0.378	0.430	—	
7	Parental PA role modeling	0.100	0.440	0.465	0.360	0.528	0.447	—

Note: All correlation coefficients in the table are statistically significant at $p < 0.001$.

Abbreviations: MVPA = moderate-to-vigorous physical activity; PA = physical activity.

Table 3
Parameter estimates of parental support for PA in association with MVPA in children ($n = 81,857$).

Variable	Unstandardized estimates (b)	SE	p	Standardized estimates (β)
Parental PA encouragement	1.981	0.134	<0.001	0.052
Parental PA accompanying	0.897	0.083	<0.001	0.038
Parental PA-related financial support	1.074	0.101	<0.001	0.037
Parental PA involvement	0.850	0.087	<0.001	0.034
Parental PA knowledge-sharing	0.074	0.118	0.528	0.002
Parental PA role modeling	0.706	0.091	<0.001	0.027

Abbreviations: MVPA = moderate-to-vigorous physical activity; PA = physical activity; SE = standard error.

parents have in influencing their children's engagement in and levels of MVPA.^{15,16} The current study, however, extends the literature in a significant way by examining multiple parenting factors that are deemed to be relevant and important to Chinese school children in relation to their MVPA.

4.1. Study limitations and strengths

As alluded to in other studies published in this special issue,^{26,30,32,33} there are inherent methodological weaknesses in the PAFCTYS data, including the cross-sectional design and the fact that the data are predominantly from self-reports (including the data used in this study). Thus, this study lacks some of the well-developed, well-tested, and psychometrically sound measurement tools used to assess parents' support for PA. Future studies should develop reliable and valid measures in order to better understand the role of parenting practices in promoting and influencing children's PA. Self-reported PA behavior in children is known to be subject to recall bias and to result in underestimations.^{27,34} Therefore, our observed associations between parents' support of PA and children's MVPA behavior should be interpreted with that limitation in mind. Last but not least, among various correlates of PA within a socio-ecological framework,³⁵ we only focused on parental influences. It is likely that the strengths of parental social support for children's PA found in this study may interact with other dimensions of social support (e.g., friends, school teachers, neighborhood networks) and neighborhood environmental factors (e.g., neighborhood safety, availability of and access to PA facilities, street connectivity).³⁶⁻³⁸ Therefore, a comprehensive evaluation approach may be needed to gain a better understanding of patterns and levels of MVPA among school children.

A notable strength of the study is its use of a large and nationally representative sample of Chinese school children. Another strength is that we considered different forms of parental support for children's PA, which allowed a clear delineation of the specific types of support provided by parents in promoting or facilitating their children's PA behaviors. We were also able to analyze children's MVPA levels by various important demographics (sex, residence locale, and school grades), which are of high practical importance for developing targeted community- and family-based policies and interventions. The nonsignificant findings across various demographic variables in our study suggest the need for more finely grained analysis of children's MVPA by considering the effect of interactions, such as between sex and age and

specific forms of parental support, to show how influences of parental support for PA on children's MVPA may be moderated by demographic characteristics.

4.2. Practical implications

Findings from this study on parental support for PA suggest that the parents' promotion of certain PA-related behaviors, including accompanying their children to PA sessions, offering their children financial support (paying fees for PA or sports training and equipment), and being personally engaged with children in PA, can directly facilitate children's PA. Our findings corroborate the existing evidence^{13,15,39} and indicate that by offering their children intangible (or indirect) social support, such as verbal encouragement and role modeling for PA, Chinese parents can influence their children's MVPA in a positive way. MVPA among Chinese school children could also be enhanced if appropriate interventions were developed that targeted both children and their parents. For example, fostering positive parent-child interactions and engagement in routine and leisure-time PA could reduce sedentary time and improve fitness, both of which are needed for populations of Chinese school children.^{32,33}

5. Conclusion

This study indicates that parental support, either direct or indirect, is related to increased levels of MVPA among Chinese school children.

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Authors' contributions

YL made a substantial contribution toward analyzing the data and wrote the original manuscript; YZ, SC, JZ, and ZG carried out the data collection and discussed and commented on the draft; PC designed the study and commented on the draft. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

Appendix: Supplementary material

Supplementary data to this article can be found online at doi:10.1016/j.jshs.2017.09.008

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