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Household chores or play outdoors? The intersecting influence of gender and school type on physical activity among Indian adolescents

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Abstract

Most Indian adolescents, particularly girls and private school students, do not engage in sufficient physical activity (PA). Current understanding of these sociodemographic differences is limited by a focus on exercise, which may not fully capture PA in developing countries. We examined how gender and school type are associated with multiple PA domains and whether associations with gender differ by school type. We randomly selected an equal number of girls and boys (ages 13–16) from public and private schools in Southern India (n=395). Cross-sectional 24-hour time-use surveys measured PA, which was categorized into three domains: chores, errands, and work; play; and transportation. Negative binomial and logistic regression modeled relative differences in domain-specific PA minutes and the probability of engaging in 60 minutes of moderate-to-vigorous PA (MVPA), respectively, in the prior 24-hours. Girls and boys were equally likely to meet MVPA recommendations. However, girls spent twice as much active time completing chores, errands, and work (RR=1.98, 95% CI:1.32–2.98), while boys spent twice as much active time playing (RR=2.11, 95% CI:1.23–3.62). Public and private school girls spent more active time in chores, errands, and work than boys, however, gender differences were greater among public school students (p-value for interaction<0.05). Although comparable MVPA levels for girls and boys are beneficial for physical health, girls may gain fewer cognitive, social, and emotional benefits associated with play. Additional research may clarify why the gendered burden of household responsibilities was greater among public school students. School-based programs to engage girls in active play may help reduce inequities.

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Keywords

adolescent; India; physical activity; gender; school type

Industrialization, urbanization, and technological advancements have transformed patterns of physical activity (PA) worldwide. Mechanization has reduced the need for physical labor, inactive transportation options are widely accessible, and leisure time has become increasingly sedentary (Hallal et al., 2012; Katzmarzyk & Mason, 2009). Resulting decreases in PA have contributed to the rapidly growing burden of non-communicable disease (NCD) in developing countries (Hallal et al., 2012; Sallis et al., 2016). In India, levels of PA are particularly low among adolescents: in 2007, only 30.2% of school-going children aged 13–15 met World Health Organization (WHO) recommendations for 60 minutes of moderate-to-vigorous PA (MVPA) per day (GSHS, 2007; WHO, 2015), although data suggest that levels of activity may be higher among adolescents living in rural areas (Bhawra et al., 2018).

Several studies have identified important sociodemographic differences in Indian adolescents' PA. Girls (Gulati et al., 2014; Swaminathan, Selvam, Thomas, Kurpad, & Vaz, 2011; Thakor, Kumar, & Desai, 2004), adolescents from higher-income backgrounds, and students who attend private schools (George, Sharma, Ramakrishnan, & Gupta, 2014; Mahaur & Badiger, 2018; Puri et al., 2008) tend to engage in less PA. However, current understanding of these sociodemographic differences is limited by a focus on exercise—planned and structured PA done to promote physical fitness (Caspersen, Powell, & Christenson, 1985)—and transportation-related PA. This may be insufficient in developing countries where adolescents commonly engage in other types of PA—any bodily movement produced by skeletal muscles resulting in energy expenditure (Caspersen et al., 1985)—such as household work and paid employment.

Examining activities beyond exercise and transportation may be particularly important for understanding sociodemographic differences in PA, as gender- and socioeconomic-based norms likely inform the type and amount of PA in which adolescents engage. Girls may be restricted in their movement outside of home due to safety concerns and notions of propriety, and expected to engage in home-centered activities that will prepare them for adult roles as homemakers (Singh & Misra, 2015; Verma & Sharma, 2003). In contrast, boys are often permitted more freedom of movement and encouraged to engage in work-related activities outside of home in preparation for roles as economic providers (Basu, Zuo, Lou, Acharya, & Lundgren, 2017).

Adolescents who attend private schools, which are primarily accessible to wealthier families, face significant academic pressures and are expected to devote substantial time to homework and other academic activities, which may reduce time for play (Lloyd, Grant, & Ritchie, 2008; Verma & Sharma, 2003). Still, school type is not only an indicator of household socioeconomic status; some poorer families send children to private school as an investment in future financial prospects. School type also indicates exposure to varying social and material supports for PA. For example, although private schools commonly provide greater access to sports equipment and play areas, a strict focus on academics may prevent extensive use of

these resources (Bhargava, Kandpal, & Aggarwal, 2016). In contrast, although public school students may have fewer material supports for PA, they may be allowed more unstructured play time during school hours (Bhargava et al., 2016).

While initial evidence suggests that gender and school type independently influence PA, researchers have yet to examine whether they interact. Historically, it has been maintained that gender inequality in India is greater among women from higher social strata, whose autonomy and freedom of movement are more restricted by notions of purity and propriety (Liddle & Joshi, 1989). However, Deshpande (2002, 2011) argues that this characterization is no longer accurate and offers evidence that women in lower social strata are subject to greater socio-economic disadvantage and less egalitarian gender norms, including more restricted decision-making; whether these experiences extend to adolescents is unknown. Examining if and how the experience of gender—and its influence on PA—differs for public and private school students may help researchers successfully target and tailor PA interventions.

We examined patterns and correlates of PA among school-going adolescents in a remote district in Southern India using data collected from 24-hour time use surveys. We examined three domains of PA: 1) household chores, errands, and work, 2) play, and 3) transportation, and assessed whether gender and school type, both independently and jointly, were associated with 1) the duration of PA in each domain and 2) the probability of engaging in 60 minutes of MVPA.

Data and methods

Setting and data collection

We conducted this cross-sectional study in northern Karnataka State, Southern India. The sample was recruited in 2012 and is representative of school-going adolescents in the district capital city. We used stratified random sampling to select three private and three public schools from the city's 32 secondary schools: we divided the city into three geographic regions and selected one private and one public school from each region. We then stratified each school's roster by gender and randomly selected girls and boys 13–16 years of age (public school: n=99 girls, 102 boys; private school: n=101 girls, 105 boys). Ninety-nine percent of selected students participated (public school: 100% girls, 99% boys; private school: 100% girls, 98% boys). The Institutional Review Boards (IRB) at Emory University and BLDE University approved all research protocols.

Outcome variables: physical activity

We assessed PA using a 24-hour time-use survey modeled after the Panel Study of Income Dynamics (PSID) Child Development Supplement Weekday Time Diary (Institute for Social Research, 2007). Adolescents reported every activity in which they engaged during the previous 24-hour period. For each activity, participants were asked where the activity took place, the time it began and ended, and who else was present. Time-use surveys have demonstrated good test-retest reliability and validity compared with accelerometer data in several populations in Australia (van der Ploeg et al., 2010) and the United States (Matthews

et al., 2013; Welk et al., 2014), but, to our knowledge, have not been tested in India. Time-use surveys are less subject to recall and social desirability bias as they require participants to account for all activities in which they engaged during the preceding 24-hours, unlike traditional PA questionnaires which only ask about selected activities and require estimates of time spent in each activity outside the context of the full 24-hour period (van der Ploeg et al., 2010).

Instructions for completing the 24-hour time-use survey were explained in the local language and demonstrated using a template. Private school students completed the survey independently following the demonstration. Public school students required individual assistance from field staff to read the survey and correctly write the names of the previous day's activities; staff did not probe for additional information while assisting. All adolescents reported their activities in chronological order from midnight to midnight on the day preceding the survey; surveys were administered on Tuesdays and Fridays.

Two teams, each comprised of one project coordinator and two supervisors, reviewed the 24-hour recalls and coded listed activities. Discrepancies were resolved through discussion; project coordinators made final coding decisions when needed. Listed activities were coded into 64 categories using PSID Child Development Supplement codes (Institute for Social Research, 2007). Coded activities were then grouped under 10 broader domains (sleeping; self-care; eating; household chores; errands; work outside the home; school; play and social activities (including organized sports); transportation; child, adult, pet, and plant care). Six domains were deemed to potentially include PA: for analysis, we grouped household chores, errands, work outside the home, and child, adult, pet, and plant care together in a chores, errands, and work domain as these activities all represent responsibilities to the household; level of responsibility to the household likely varies by gender and school type making these activities important to examine as a unified domain. Consistent with prior research, play and social activities and transportation were kept as separate domains. Within the chores, errands, and work domain, we retained activities involving PA (e.g. laundry, shopping for household items, home repairs). In the play and social activities domain, we retained activities categorized as active play (e.g. playing catch with friends). In the transportation domain, we retained activities categorized as active transportation (e.g. biking).

For each activity and domain, we calculated: 1) duration (total number of minutes), 2) metabolic equivalent (MET) minutes, and 3) participation in ≥ 60 minutes of MVPA (yes/no), all during the previous 24-hours. To further characterize PA in this population, we also calculated activity frequency (number of bouts of PA, of any length), and participation (yes/no) in ≥ 1 bout of PA, both during the previous 24-hour period.

We used the Compendium of Energy Expenditures for Youth to assign each activity a MET value (Ridley, Ainsworth, & Olds, 2008). Three team members reached consensus on the MET value assigned to each activity. We could not identify a suitable match in the Compendium for two activities ('home repairs & outdoor chores' and 'other outdoor chores'), so MET values from the Adult Compendium of Physical Activities were used (Ainsworth et al., 2011). Per WHO guidelines, we classified activities with MET values ≥ 3.0

as MVPA (WHO, 2011). We summed the durations of activities meeting this criterion and categorized the result as either above or below the 60-minute threshold.

Exposure variables: gender and school type

Exposures of interest were adolescent's gender (girl or boy), school type (public or private), and the interaction between gender and school type.

Covariates

Multivariate analyses were adjusted for potential confounding by socio-demographic characteristics, household gender norms, and social and environmental support for PA. Socio-demographic characteristics included: adolescent age, primary caregiver's highest level of education (no formal education vs. lower primary school vs. higher primary school vs. post-secondary education), religion (Hindu vs. non-Hindu), caste (General caste (most advantaged) vs. Other Backward Class vs. Scheduled caste/tribe (least advantaged), and income (<10,000 vs. 10,000 Indian rupees (INR) per month). Household gender norms included: whether the family only allows boys to play outside (vs. both boys and girls, only girls, or neither) and whether girls in the family are responsible for 1 household chore (yes/no). Measures of support for PA included: whether the adolescent's friends encourage them to be active (yes/no), whether there is sports equipment available in the home (yes/no), and whether 1 of the adolescent's primary caregivers regularly exercises (yes/no).

Analysis

Survey weights were used in all analyses to account for the unequal probability of selection in the sampling design (by design, equal distribution of school type and gender). We excluded nine adolescents who did not have valid 24-hour recall data, yielding an analytic sample of 395. To retain the few participants missing covariate data (four covariates each missing less than 1.5% data), we used mean imputation (missing values replaced with the mean of a variable's non-missing values). All analyses were conducted in Stata 14 (College Station, TX).

We used independent sample t-tests to assess differences in the duration of overall, domain-specific, and activity-specific PA by gender and school type. We used Pearson chi-squared tests to assess differences in participation in 60 minutes of MVPA by gender and school type.

We used negative binomial regression (an extension of Poisson regression for over-dispersed count data) to estimate the relative difference in minutes spent in each activity domain in the prior 24-hours. Model results are presented as adjusted rate ratios. We used logistic regression to assess adjusted associations between exposures of interest and participation in 60 minutes of MVPA in the prior 24-hours. Because odds ratios may overestimate prevalence ratios when the outcome is common (prevalence of participation in 60 minutes of MVPA=59.75%), we converted odds ratios to prevalence ratios (Zhang & Yu, 1998).

We estimated two models for each outcome: a main effects model for the independent associations of gender and school type with PA, and an interaction model. We assessed

interaction between gender and school type on the additive scale using the relative excess risk due to interaction (RERI) measure. An $RERI > 0$ indicates positive additive interaction (i.e. the effect of both exposures is greater than the sum of their independent effects) while an $RERI < 0$ indicates negative additive interaction (i.e. the effect of both exposures is less than the sum of their independent effects). We examined additive, rather than multiplicative, interaction because it can provide insight into the absolute excess risk attributable to the presence of both exposures, thus highlighting the most salient sub-groups in which to intervene (VanderWeele & Knol, 2014).

Results

Table 1 reports weighted characteristics of school-going adolescents in the district capital city. Adolescents were 14.4 years old on average. The majority attended public schools (72.2%) and approximately 53% were boys. Most households were Hindu (74.7%), reported a monthly household income below 10,000 INR (56%), and belonged to Other Backward Classes (55%). Twenty-eight percent of primary caregivers had no formal education, 27% had completed lower primary school, 21% had completed higher primary school, and 24% had some post-secondary education. As seen in Table 1, private school students had caregivers with higher levels of education, were more often Hindu, belonged to higher castes, and lived in households with higher monthly incomes.

Total PA duration

On average, adolescents spent 144 minutes engaged in PA during the previous 24-hours (Table 2). Average duration was similar for boys (148 minutes) and girls (139 minutes), but significantly higher among public (169 minutes) compared with private (80 minutes) school students. More than two-thirds of adolescents participated in 60 minutes of MVPA during the previous 24-hours. Again, there were no significant differences between boys (71%) and girls (65%), but there were large differences between public (78%) and private (42%) school students. Activity frequency and the proportion of adolescents who participated in 1 bout of PA are presented in the Appendix.

Domain-specific PA duration

On average, adolescents spent 53 minutes engaged in chores, errands, and work, 39 minutes in active play, and 52 minutes in active transportation in the previous 24-hours (Table 2). Girls spent significantly more time completing chores, errands, and work compared to boys (72 vs. 37 minutes). Specifically, girls spent the most time doing laundry (15 minutes vs. 0.4 minutes), indoor cleaning (13 minutes vs. 2 minutes), and meal cleanup (10 minutes vs. 0 minutes). Girls spent significantly less time in active play than boys (21 vs. 54 minutes), particularly in active play outdoors (16 minutes vs. 49 minutes).

Public school students spent significantly more time engaged in chores, errands, and work than private school students (68 vs. 14 minutes). Public school students spent the most time engaged in home repairs and outdoor chores (12 minutes vs. 3 minutes), doing laundry (10 minutes vs. 0.2 minutes), and indoor cleaning (9 minutes vs. 1 minute). Public school students also spent significantly more time engaged in active play (45 minutes) compared

with private school students (21 minutes), particularly active play outdoors (40 minutes vs. 17 minutes).

Adjusted models of PA

Table 3 displays results for negative binomial and logistic regression models estimating the relative difference in minutes spent in each PA domain, and the probability of engaging in 60 minutes of MVPA, respectively (main effects only). In chores, errands, and work, girls spent 1.98 times the minutes compared to boys (95% CI:1.32–2.98), and public school students spent 3.10 times the minutes compared to private school students (95% CI:1.79, 5.37). In active play, girls spent approximately one-third as many minutes as boys (RR=0.31, 95% CI:0.20–0.49), and public school students spent approximately twice as many minutes as private school students (RR=2.11, 95% CI:1.23–3.62). In active transportation, girls spent three-quarters as many minutes as boys (RR=0.73, 95% CI:0.56–0.96), but there were no significant differences by school type. Finally, public school students were 1.85 times as likely to engage in 60 minutes of MVPA in the previous 24-hours compared to private school students (95% CI:1.38–2.49). The likelihood of engaging in 60 minutes of MVPA did not differ by gender.

Interaction analysis

We observed positive additive interaction between gender and school type in the chores, errands, and work domain, indicating that adolescents who were both girls and public school students engaged in more minutes of chores, errands, and work than would have been predicted from the sum of the independent effects of being a girl and being a public school student (Table 4). As illustrated in Figure 1, Panel A, while girls in both public and private school spent more minutes doing chores, errands, and work than boys, the difference between girls and boys was greater among public school students. There was no evidence of significant additive interaction in active play, active transportation, or engagement in 60 minutes of MVPA.

Discussion

This study examined patterns and correlates of PA among Southern Indian adolescents in overall MVPA and three PA domains: chores, errands, and work; active play; and active transportation. Consistent with prior regional estimates (Shridhar et al., 2016; Swaminathan et al., 2011), the majority of adolescents (68.3%) engaged in 60 minutes of MVPA during the previous 24-hours. However, there were important differences by gender and school type. While girls and boys engaged in similar amounts of PA, *how* they spent their active time differed considerably. Girls spent the majority of their active time completing chores, errands, and work, while boys were primarily engaged in active play and transportation. A different pattern emerged by school type: compared to public school students, private school students were less active overall *and* across domains. Notably, we found evidence of additive interaction in the chores, errands, and work domain: while girls in both public and private school spent more time in this domain than boys, the difference between girls and boys was greater among public school students.

Likely due to our approach of measuring PA across domains, rather than only in terms of exercise and transportation, we did not observe gender differences in the likelihood of achieving adequate levels of MVPA. Studies that do not measure all domains likely underestimate MVPA and may systematically underestimate the MVPA of girls. One of the only other studies to measure multiple domains of PA among Indian youth also found no significant gender differences in MVPA (Swaminathan et al., 2011). They did, however, report higher MVPA *intensity* among boys, a possibility in our sample as well: boys may have spent more time in vigorous-intensity PA, such as biking, while girls may have spent more time in moderate-intensity PA, such as indoor cleaning. While the largely comparable amount of active time for girls and boys is positive in terms of physical health, there may be other advantages and disadvantages to time spent in specific domains. Although girls may obtain physical benefits from MVPA, they may gain fewer of the cognitive, social, and emotional benefits associated with play, such as confidence, resiliency, creativity, conflict resolution skills, and learning readiness (Ginsburg, 2007; Yogman, Garner, Hutchinson, Hirsh-Pasek, & Golinkoff, 2018). Guidelines, policies, and programs may need to explicitly promote specific types of PA, like play, to ensure that these non-physical health benefits are accessible to adolescents of all genders.

Our results are consistent with previous findings that private school students engage in less PA than public school students (George et al., 2014; Mahaur & Badiger, 2018). Private school students spent very little time in household work, but this did not appear to translate into additional time for active recreation. In a recent qualitative study, private school students in New Delhi discussed their academic workload as one of the most significant barriers to PA (Satija et al., 2018), and Bhargava et al. (2016) found that private schools in the northern Indian state of Uttarakhand were well-equipped with sports materials and structured play areas, but allotted little time for PA. As of 2019, India's Central Board of Secondary Education (CBSE) requires all schools to implement a daily 60-minute physical education period for students in grades 1–12 (ages 5–18). However, the CBSE does not regulate all schools in the country and implementation and enforcement vary widely (Bhawra et al., 2018). Monitoring and evaluation plans as well as accountability mechanisms and funding to develop physical infrastructure in lower-resourced schools will likely be needed to achieve population-level impacts.

Our study provides the first evidence that gender differences in PA may be more pronounced among public school students. Our findings are consistent with Deshpande's (2002, 2011) assertion that gender inequality may be greater among women from lower social strata. Exploring factors that help explain greater gender disparities among women from lower social strata, including factors unique to younger women and girls, are important avenues for future research. To this end, Iyer (2007) offers a useful distinction between 'pure bias' and 'rationing bias'. The latter occurs when gender hierarchies emerge in the context of socio-economic constraints to inform the distribution of resources and responsibilities. Such gender hierarchies become less salient as resources increase and decisions regarding distribution are no longer relevant. Rationing bias may help explain why we only observed greater gender differences among public school students in the chores, errands, and work domain. Because private school students belonged to families with higher incomes and higher social standing (Table 1), female servants and home appliances, such as washing

machines, refrigerators, and mixers and grinders, may have performed the chores for which girls would have otherwise been responsible. In addition, the mothers of girls who attended private school had higher levels of education than the mothers of public school girls (Table 1) and may want their daughters to attain as much, if not more, education than themselves. As a result, they may have enabled their daughters to focus on academic extracurricular activities rather than housework.

Increasing knowledge of PA's positive effects on cognitive performance (Chang, Labban, Gapin, & Etnier, 2012) may increase teacher and parent receptivity to incorporating PA into student schedules. Opportunities for play in the school environment, where students spend a substantial portion of each day, offer an immediate strategy for increasing adolescents' access to the physical and non-physical benefits of play across gender and school type. Still, interventions will likely need to attend to physical infrastructure needs in public schools and gender-specific barriers to PA participation to avoid exacerbating existing inequities. Adolescent girls in India have reported various barriers to PA including, norms limiting 'acceptable' activities, unsuitable dress codes (e.g. skirts), lack of confidence, and concerns about getting tan or sweaty (Satija et al., 2018). Programs that promote positive body image, offer examples of Indian women in sports, and offer various activity options may help facilitate equal participation. Formative intervention development work may also benefit from a deeper exploration of gender identity, socialization processes, and role conformity as they pertain to the type and amount of PA in which adolescents engage.

This study has several notable strengths. It extends the limited existing literature by providing a detailed picture of PA beyond the conventional domains of exercise and transportation, and highlighting the importance of gender and school type as independent and intersecting influences on PA. Utilizing 24-hour time-use surveys allowed us to capture the range of activities in adolescents' lives and may also reduce social desirability and recall bias by requiring participants to account for all activities in the previous 24-hours, rather than select activities (van der Ploeg et al., 2010).

At the same time, it is important to note that time-use surveys do not provide an objective measure of energy expenditure, like accelerometers, and are subject to measurement error. Because accelerometers do not capture activity type, the two methods are likely best used in combination. An additional limitation is the assistance field staff provided to public school students during survey administration. While this may have contributed to small reporting differences between public and private school students, field staff were careful not to probe and limited their assistance to reading and writing. We assessed the average number of activities listed over the 24-hour period by public and private school students and observed minimal differences (21.8 and 20.8 activities, respectively.) It is also important to note that our sample was restricted to school-going adolescents. Approximately 25% of adolescents in India are not enrolled in secondary school (The World Bank, 2013); these adolescents may engage in different types of PA not reported by the adolescents in our sample. Finally, the cross-sectional study design precludes discussion of the temporality or causality of associations.

Promoting PA among adolescents may help address the growing burden of NCDs in India as elsewhere. Promoting the holistic benefits of PA, including its positive effects on cognitive performance, may be helpful in gaining buy-in from schools and families. Interventions that are tailored to the resources available in various school environments, and responsive to the norms that govern time use and notions of acceptable and expected behavior, are necessary to ensure that PA promotion efforts benefit all.

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Appendix

Appendix.

Physical activity among school-going adolescents in Southern India, by gender and school type

	Total (n=395)		Boys (n=197)		Girls (n=198)			Public school (n=198)		Private school (n=197)		
Physical activity measure	Mean or %	SE	Mean or %	SE	Mean or %	SE	p	Mean or %	SE	Mean or %	SE	p
Duration (min/day) (mean)	144.08	5.92	148.14	8.62	139.48	8.01		168.83	7.31	79.70	7.22	***
Frequency (bouts/day) (mean)	3.75	0.13	3.62	0.16	3.90	0.20		4.43	0.16	1.99	0.11	***
Participated in 1 activity (%)	95.06	0.01	95.71	0.01	94.33	0.01		99.02	0.01	84.76	0.03	***
60 min of MVPA (%)	68.33	0.02	70.87	0.03	65.45	0.04		78.33	0.03	42.32	0.04	***

Note. All results are survey adjusted. Duration and frequency compared across strata using independent samples t-tests. Participated in 1 activity and 60 min of MVPA (moderate to vigorous physical activity) compared across strata using Pearson chi-squared tests.

*
p<.05;
**
p<.01;

p<.0001

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Figure 1.

Interaction between gender and school type, by activity domain

Note. Predicted values adjusted for covariates. PA = physical activity; MVPA = moderate to vigorous physical activity.

Table 1.
Weighted characteristics of school-going adolescents in Southern India, by gender and school type

Characteristics	Total (n=395)			Boys (n=197)			Girls (n=198)			Public school (n=198)			Private school (n=197)		
	%	SE	p	%	SE	p	%	SE	p	%	SE	p	%	SE	p
Total															
Age (mean)	14.36	0.06		14.43	0.08		14.29	0.08		14.42	0.07		14.20	0.06	*
Mother/primary caregiver's education															***
No education	27.90	0.03		26.31	0.04		29.67	0.04		37.05	0.03		4.09	0.01	
Lower primary school	27.01	0.03		27.67	0.04		26.28	0.04		32.56	0.03		12.58	0.02	
Higher primary school	21.07	0.02		21.18	0.03		20.94	0.03		17.79	0.03		29.60	0.03	
Post-secondary education	24.03	0.02		24.85	0.03		23.11	0.03		12.61	0.02		53.73	0.04	
Religion															***
Hindu	74.65	0.02		70.27	0.04		79.55	0.03		69.57	0.03		88.36	0.02	
Non-Hindu	25.35	0.02		29.73	0.04		20.45	0.03		30.43	0.03		11.64	0.02	
Caste															***
General	18.84	0.02		17.61	0.03		20.22	0.03		11.57	0.02		37.99	0.03	
Other Backward Class	55.01	0.03		61.19	0.04		48.09	0.04		54.25	0.04		55.92	0.04	
Scheduled caste/tribe	26.15	0.03		21.20	0.03		31.69	0.04		34.19	0.03		6.10	0.02	
Monthly household income															***
<10,000 INR	56.02	0.03		59.07	0.04		52.60	0.04		69.33	0.03		21.65	0.03	
10,000 INR	43.30	0.03		40.31	0.04		46.63	0.04		30.67	0.03		75.89	0.03	

Note. All results are survey adjusted. Characteristics compared across strata using Pearson chi-squared tests, with the exception of adolescent age compared across strata using independent samples t-test.
INR = Indian rupee

* p<.05;

**

p<.01;

p<.0001

Physical activity among school-going adolescents in Southern India, by gender and school type

Table 2.

	Total (n=395)			Boys (n=197)			Girls (n=198)			Public school (n=198)			Private school (n=197)		
	Mean or %	SE		Mean or %	SE		Mean or %	SE		Mean or %	SE		Mean or %	SE	p
Total duration (min/day) (mean)	144.08	5.92		148.14	8.62		139.48	8.01		168.83	7.31		79.70	7.22	***
Chores, errands, work duration (min/day) (mean)	53.35	4.72		36.70	6.60		72.17	6.33	***	68.35	6.24		14.35	3.32	***
Shopping: household items	5.62	1.54		7.41	2.70		3.59	1.15		6.45	2.04		3.46	1.55	
Shopping: clothes, games	0.27	0.22		0.11	0.11		0.45	0.45		0.37	0.30		0	0	
Shopping: snacks, tobacco, drinks	0.23	0.21		0	0		0.49	0.45		0.32	0.29		0	0	
Errands	4.95	1.21		4.87	1.70		5.05	1.72		5.40	1.48		3.80	2.02	
Preparing food	3.29	0.93		0.32	0.24		6.64	1.91	**	4.20	1.27		0.92	0.43	*
Serving food	2.02	0.79		0.12	0.12		4.17	1.65	*	2.67	1.08		0.34	0.25	*
Meal cleanup	4.91	1.02		0	0		10.47	2.05	***	6.70	1.39		0.26	0.26	***
Indoor cleaning	6.98	1.12		1.58	1.10		13.08	1.89	***	9.20	1.53		1.21	0.42	***
Laundry	7.01	1.36		0.36	0.22		14.52	2.72	***	9.63	1.87		0.19	0.15	***
Home repairs & outdoor chores	9.20	2.19		10.64	3.84		7.58	1.69		11.78	2.99		2.50	1.09	**
Other indoor work around house	1.03	0.33		1.03	0.47		1.03	0.46		1.43	0.46		0	0	**
Other outdoor chores	0.94	0.43		0.43	0.42		1.52	0.78		1.24	0.59		0.15	0.15	
Vehicle care	0.74	0.34		1.29	0.63		0.11	0.11		1.01	0.47		0.03	0.03	*
Paid work	5.90	2.53		8.54	4.16		2.90	2.61		7.63	3.48		1.39	1.02	
Gardening	0.02	0.02		0	0		0.05	0.05		0	0		0.09	0.09	
Playing with younger child	0.25	0.25		0	0		0.53	0.53		0.34	0.34		0	0	
Active play duration (min/day) (mean)	38.65	3.40		54.46	5.53		20.79	2.99	***	45.32	4.50		21.32	3.12	***
Active play outdoors	33.48	3.24		49.26	5.30		15.64	2.69	***	39.79	4.30		17.06	2.88	***
Active play indoors	5.17	1.27		5.20	2.08		5.14	1.32		5.53	1.66		4.26	1.48	
Active transportation duration (min/day) (mean)	52.07	3.18		56.98	4.16		46.53	4.82		55.17	3.94		44.03	5.07	
Biking	12.13	1.50		19.54	2.51		3.75	1.08	***	13.57	1.95		8.38	1.86	
Walking or running	39.95	3.01		37.44	3.80		42.78	4.75		41.60	3.75		35.65	4.67	
60 min of MVPA (%)	68.33	0.02		70.87	0.03		65.45	0.04		78.33	0.03		42.32	0.04	***

Note. All results are survey adjusted. Minutes/day compared across strata using independent samples t-tests. Participated in 60 min of MVPA compared across strata using Pearson chi-squared tests. MVPA = moderate to vigorous physical activity.

1000>d

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**
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Correlates of minutes of physical activity among school-going adolescents in Southern India: Adjusted negative binomial regression models (main effects models) (n=395)

Table 3:

	Chores, errands, work			Active play			Active transportation			60 minutes MVPA ^a	
	Rate ratio	95% CI		Rate ratio	95% CI		Rate ratio	95% CI		Prevalence ratio	95% CI
Gender (ref = boy)											
Girl	1.98	**	1.32 2.98	0.31	***	0.20 0.49	0.73	*	0.56 0.96	0.84	0.71 1.00
School type (ref = private school)											
Public school	3.10	***	1.79 5.37	2.11	**	1.23 3.62	1.03		0.73 1.45	1.85	*** 1.38 2.49
Age (years)	0.95		0.78 1.15	0.89		0.74 1.06	1.07		0.96 1.20	0.99	*** 0.99 0.99
Mother/Caregiver education (ref = none)											
Lower primary school	0.68		0.43 1.07	1.01		0.62 1.64	0.86		0.64 1.14	0.94	0.76 1.16
Higher primary school	0.49	*	0.28 0.85	0.87		0.49 1.55	0.80		0.57 1.11	0.90	0.70 1.15
Post-secondary	0.43	**	0.23 0.77	1.36		0.80 2.30	0.88		0.61 1.26	0.91	0.71 1.16
Religion (ref = non-Hindu)											
Hindu	0.62	*	0.40 0.94	0.74		0.44 1.23	0.80		0.59 1.10	1.02	0.84 1.24
Caste (ref = scheduled caste/tribe)											
General	1.17		0.62 2.20	0.61		0.34 1.09	1.02		0.68 1.52	0.86	0.65 1.14
Other Backward Class	0.62	*	0.40 0.95	0.67		0.40 1.14	0.87		0.65 1.18	0.93	0.75 1.14
Income (ref = 10,000 INR)											
<10,000 INR	0.80		0.53 1.22	0.82		0.56 1.22	1.11		0.88 1.40	0.93	0.80 1.08
Family only allows boys to play outside	1.13		0.76 1.69	0.76		0.49 1.19	0.72	**	0.57 0.91	0.91	0.78 1.07
Girls in household responsible for 1 household chore	1.08		0.69 1.68	1.08		0.74 1.57	1.09		0.84 1.42	1.00	0.85 1.18
Friends encourage adolescent to be active	1.08		0.73 1.62	0.86		0.54 1.38	1.06		0.83 1.36	0.88	0.78 1.00
Family has sports equipment available in home	0.83		0.48 1.46	1.51		0.62 3.68	1.33		0.90 1.99	1.24	0.91 1.70
Parent regularly exercises	1.01		0.67 1.51	1.10		0.74 1.62	1.17		0.93 1.47	1.03	0.89 1.20

Note. All results are survey adjusted. MVPA = moderate to vigorous physical activity; INR = Indian rupee

^a Adjusted logistic regression model

* p<0.05;

** p<0.01;

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Correlates of minutes of physical activity among school-going adolescents in Southern India: Relative Excess Risk due to Interaction (n=395)

Table 4:

Domain	RERI	95% CI	p
Chores, errands, work	2.53	0.31 4.76	*
Active play	2.39	-0.73 5.51	
Active transportation	-0.28	-0.89 0.33	
60 minutes MVPA	2.39	-5.47 10.26	

Note. RERI = relative excess risk due to interaction; MVPA = moderate to vigorous physical activity.

* p<.05;

**

p<.01;

*** p<.0001