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Physical activity in adolescents of Rathnapura district of Sri Lanka: Prevalence and associated factors

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Abstract
Background: The aim of this study is to describe the physical activity pattern and associated factors among adolescent school children aged 13-14 years studying in Sinhala medium government schools of the Rathnapura district, Sri Lanka.
Methods: A school based cross sectional study was conducted and students were selected using two stage cluster sampling technique. Physical activity level and possible correlates were assessed using self administered questionnaires.
Results: Out of total 1041 students, 49% was boys and mean age of the sample was 13.8 (0.4) years. Approximately 38% of adolescent school children were sufficiently active where 40% of boys and 36.4% of girls were sufficiently active. There was no significant difference between physical activity levels by gender. Approximately 47% of adolescents either walk or ride to school while 53% used public or own vehicles for schooling.
Multivariate regression model controlling for confounders showed statistically significant associations of sufficient physical activity with type 1 AB or 1C schools; parents being physically active for >5 days per week ; thoughts and availability of active physical activity choices by adolescents when a recreational choice had to be made.
Conclusions: The study findings suggest that physical activity level of adolescent school children of Rathnapura district need to be promoted.

Keywords: Physical inactivity, correlates, sedentary behaviour, school children

Introduction
Regular physical activity is associated with a wide range of physical, mental and social health benefits and also economic benefits to people by reducing health care costs and increasing productivity [1]. Due to globalization and rapid industrialization, it is easy to adopt unhealthy behaviours. World Health Organization (WHO) states that even in rural areas of developing countries sedentary activities such as watching television are becoming popular [1].
Physical activity declines with age starting from adolescence age group onwards [1, 2]. The decline in physical activity is largely due to the increased participation in common sedentary activities such as watching television, playing computer games and using computers. The use of vehicles for transportation rather than cycling and walking to school also contributes to this decline in physical activity [1].
Due to globalization and rapid industrialization, Sri Lankan children and adolescents too have developed a more sedentary lifestyle. A study conducted among 8-12 years old school children in an urban area of Sri Lanka, found that children are more sedentary and prevalence of overweight and obesity among older children is on the rise [3]. Knowledge on physical activity and sedentary behavior pattern and factors that affect physical activity in adolescents is necessary to plan effective heath intervention programmes.
However, minimal research has been done regarding physical activity pattern of Sri Lankan adolescents. The aim of the study was to describe the level of physical activity and associated factors for physical activity among adolescent school children aged 13-14 years studying in Sinhala medium government schools of the Rathnapura district, Sri Lanka in order to do interventions to promote physical activity and thereby reduce the risk behaviours contributing to non communicable diseases.

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Methods

This school based cross sectional study was carried out in Sinhala medium government schools of the Rathnapura district, in Sri Lanka. The schools in Sri Lanka can be divided into two categories as government and non-government schools. Non-government schools consist of estate schools, pirivenas, special schools, approved/certified schools, preschools and international schools. Majority of students attend government schools and therefore non-government schools were excluded in this study. The government schools are categorized as 1AB, 1C and Type 2 and type 3 schools. 1AB schools have classes from grade 1-13 or 6-13 with advanced level classes in science, arts, commerce and aesthetic streams and they are also considered as "National schools". 1C schools have classes from grade 1-13 with advanced level streams other than science. Type 2 schools have classes from grade 1-11 while Type 3 schools are having classless from grade 1-5 and only provide primary education.

In Rathnapura district, there are 580 government schools and out of which 372 schools are Sinhala medium schools with classes above grade 5. According to functional classification of schools adopted by the Ministry of Education, there are 25 type 1AB, 79 type 1C, and 268 type 2 Sinhala medium schools in the Rathnapura district with grade 9 classes. There are 17408 (92%) Sinhala medium grade 9 students in schools of the Rathnapura district.

Adolescent school children studying in grade 9 classes who are usually aged 13-14 years participated for the study. Children with any physical disability or chronic diseases that limit their physical activity and children who are not capable of reading and understanding Sinhala satisfactorily and children studying in non-government schools were excluded from the study.

Design and sample

A two stage stratified probability sampling method was used and schools were used as primary sampling units (PSU) from which 30 PSUs were selected with a population proportion to size (PPS) technique [4]. Each school was stratified in to 1AB, 1C and type 2 schools. A cluster was a grade 9 class with 30 or more students. If there were more than one grade 9 class in the selected school, one class was selected randomly (Figure 1).

Study instruments

Three self administered questionnaires were used in this study including two student questionnaires and one parental questionnaire. One of the two student questionnaires assessed socio-demographic characteristics and physical activity and sedentary behavior of adolescents. Patient centered assessment and counseling for exercise plus nutrition (PACE+) physical activity measure for adolescents developed by Prochaska et al. [5] was adopted to assess physical activity level. The two questions assess the accumulated 60 minutes of moderate to vigorous physical activity (MVPA) in past 7 days and in a typical/usual week. This two- item measure was pre-tested and validated for Sri Lankan adolescents prior to the study. To assess overall sedentary behavior pattern, students were asked: "How much time do you spend during a typical or usual day sitting and watching television, playing computer games, watching DVD/VCD or surfing internet, or doing other sitting activities?" Response categories for this question were 0 hours through to more than 5 hours.

The second student questionnaire was used to assess perceived correlates of physical activity and for that purpose "PACE+ Psychosocial and Stage-of-change Measures (PACE+ PSM) for adolescents" that was developed by Norman et al. [6] was adopted. The perceived correlates assessed in this study were self efficacy, physical activity change strategy, family support, friend support, pros and cons of physical activity, environmental factors, physical activity enjoyment and recreational choices. Change strategies describe the thoughts, activities, and feelings that adolescents may use when making a behaviour change. For example, five items related to "friends support" assessed the frequency that friends provided support and encouragement for participating in physical activity. In one of these five items, children were asked "Do your friends do physical activity or play sports with you" and students responded using a five point scale from one "never" to five "every day".

Information on parents' education level, monthly income of the family and physical activity level of parents were collected from the parental questionnaire. The height of each child was measured to the nearest 0.1 cm using a portable stadiometer. Weight was measured to the nearest 0.1 kg using electronic seca scale. The students answered the two questionnaires in their own classroom.

Approval to conduct this study was obtained from the Ethical Review Committee of Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka. Written informed consent was obtained from parents and students prior to the study.

Data analysis

Data analysis was done by using SPSS – 15.0 for windows (SPSS Inc, Chicago 2005). Descriptive analysis was performed for all the variables.

The scores of the last 7 days and typical week physical activity were averaged to form a composite summary measure. This measure yielded a score of days per week the adolescents engaged in 60 minutes of MVPA [5]. Based on the physical activity guidelines for adolescents that recommend adolescents to accumulate 60 minutes of MVPA for most days of the week, a dichotomized summary measure of physical activity was developed. Prochaska et al. [5] suggest that 60 minutes of MVPA for 5 days or more is sufficient to get some health benefits of physical activity for adolescents. Therefore, those students who reported to being engaged in 60 minutes or more of MVPA for at least 5 days per week were classified as sufficiently active while those who reported MVPA for less than 5 days per week were classified as insufficiently active.

Logistic regression was used to assess the relationship between physical activity level and other variables. The association of physical activity level with perceived physical activity correlates were assessed with crude odds ratios (OR) and 95% confidence intervals (CI).

Sedentary composite measure was dichotomized as less sedentary versus more sedentary based on cut off of 4 hours per day. American Academy of Pediatrics Policy statement on children, adolescent and television recommends limiting children's total media time (with entertainment media) to no more than 1 to 2 hours of quality programming per day [7]. Norman et al. had taken 4 hours as the cut off value in deciding the sedentary behaviour of adolescents in their study, taking into account the other types of sedentary behaviours [6]. Therefore, four hours (240 minutes) of sedentary time was taken as the cut off value in present study as our students are also computer games and watching videos in addition to TV viewing. Those who engaged in sedentary activities for more

than four hours per day ($\geq$ 4 hours) were classified as more sedentary while less than four hours per day ($<$ 4 hours) were classified as less sedentary.

Results

One thousand and forty one adolescent school children participated in the study. The mean age of the participants was 13.8 (0.39) years. Fifty one percent of the sample was girls while 89% of the students were from rural settings. Forty three percent (43%) of adolescents usually walked to school while 34% had used public bus service. BMI level of participants and majority of students (62%) were having a normal BMI while 0.4% of students were obese. Thirty five percent of students were underweight (Table 1).

Approximately 38% of participants were engaging in MVPA for 60 min per day 5 or more days per week (Table 1). Among adolescent boys 39.6% and among adolescent girls 36.4% were sufficiently physically active the difference was not significant (Table 2).

Physical activity level of male and female adolescent school children were found to be statistically significantly associated with the type of school. Location of school was considered as urban if the school is situated in the municipal council or urban council area and rural if school is situated in a pradeshiya shaba area and 45.2 % of urban school children and 36.3% rural schools were physically active and showed a statistically significantly association with physical activity level of adolescents. Among children residing in urban areas 46.6% and among children from rural areas 36.8% were physically active. Physical activity level was significantly higher among children residing in urban areas compared to children residing in rural areas.

Physical activity level of adolescents was not significantly associated with parents' education level. However, Family monthly income level and physical activity level of adolescents showed a significant association and as the income level of the families increases physical activity level of adolescents also increases.

Physical activity levels of adolescents were not significantly associated with BMI level. The association between physical activity level and BMI by sex was not significant. If parents are engaged in MVPA at least 30 minutes per day they were classified as sufficiently active. Physical activity level of adolescents was significantly associated with physical activity level of parents. When parents were physically active at least 30 minutes per day every day, 44.3% of adolescents were found to be sufficiently active. Physical activity level of adolescent girls showed a significant association with physical activity level of parents but boys showed no significant association.

Factors that perceived to be associated with physical activity showed significant association with all factors except physical activity cons and the physical activity enjoyment variables (Table 3).

The variables that showed significant association with physical activity level in the present study and variables that were found to be associated with physical activity based on the literature findings were included in the multivariate logistic regression model to control for confounding effects. Results are presented in Table 4.

Forty three percent of adolescents usually spend 1-2 hours per day in sedentary activities. The study found that 16.1% of adolescents spend in sedentary activities for more than 4 hours. Median time spent on sedentary activities by adolescent school children were 2 hours per day. Fourteen point six percent males and 17.4% of girls were participating sedentary activities for more than 4 hours per day (more sedentary). This difference was not statistically significant.

Table 1: Description of characteristics related to physical activity

Characteristics	Number	%
Age		
13 years	206	19.8
14 years	835	80.2
Gender		
Boys	513	49.3
Girls	528	50.7
Mode of traveling to and from school		
On foot	447	42.9
Bicycle	41	3.9
Motor bicycle	24	2.3
Vehicle (Public or personnel)	529	50.8
Participation in sport teams		
0 teams	357	34.3
1 team	333	31.9
>2 teams	351	33.7
BMI		
Normal (5th -85th percentile)	645	62.0
Underweight (<5th percentile)	364	35.0
Overweight (>85th percentile)	28	2.7
Obese (>95th percentile)	4	0.4
Physical activity level		
Sufficiently active (MVPA for at least 60 minutes per day for 5 or more days per week)	395	37.9
Insufficiently active	646	62.1
Sedentary behavior (Time spend on sedentary activities per day in typical week)		
Less than 1 hour per day	88	8.5
1-2 hours per day	447	42.9
3-4 hours per day	339	32.6
5-6 hours per day	103	9.9
7 hours or more per day	64	6.2

Table 2: Physical activity level of adolescents by selected variables

Variable	Total number	% active	χ^2	p value
Gender				
Male	513	39.6	1.137	0.286
Female	528	36.4		
BMI				
Normal MBI	645	35.8	4.358	0.113
Underweight	364	40.7		
Overweight or obese	32	50.0		
Sector				
Urban	116	46.6	4.108	0.043
Rural	925	36.9		
School location				
Urban	188	45.2	5.148	0.023
Rural	853	36.3		
School classification				
Type 2	283	34.3	15.453	0.000
1 C	440	33.9		
1 AB	318	46.9		
Education level of father				
Up to grade 5 or no education	295	36.3	5.787	0.055
Up to O/L or passed O/L	589	36.5		
A/L or higher education	138	47.1		
Education level of mother				
Up to grade 5 or no education	213	33.3	2.598	0.273
Up to O/L or passed O/L	655	38.6		
A/L or higher education	167	40.7		
Income				
Low income (< Rs. 5000/=)	347	33.1	5.085	0.024
High income (>Rs. 5000/=)	661	40.4		
Social class				
Social class I-II	234	40.6	1.099	0.295
Social class III-V	734	36.8		
Physical activity level of parents				
MVPA for 1-2 days per week	395	33.7	9.160	0.01
MVPA for 3-5 days per week	311	36.3		
MVPA for 6-7 days per week	334	44.3		
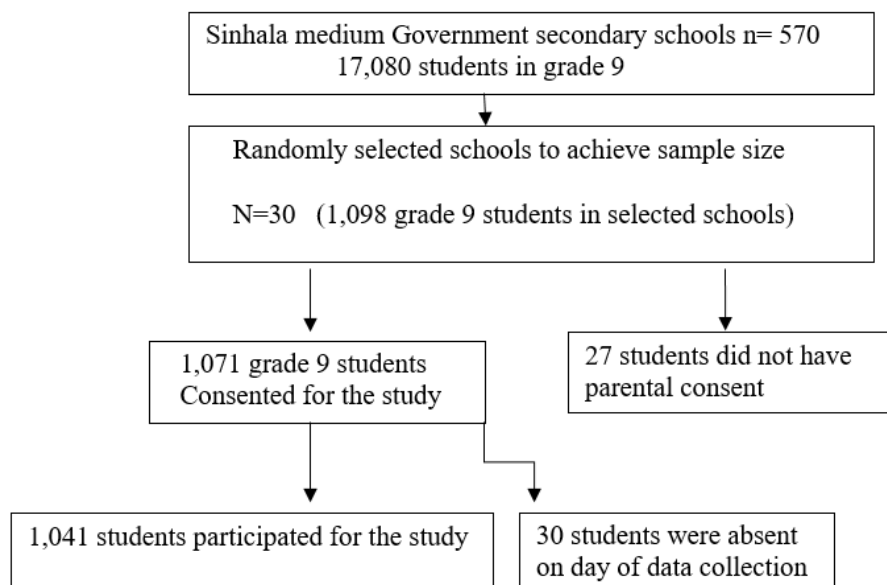
Fig 1: Study design

Discussion

In the present study, it was found that 38 % of adolescents were physically active for at least 60 minutes of per day for 5 or more days per week. The Global School Based Student Health Survey (GSHS) study conducted in India in 2007 found that 30.2% of adolescents students aged 13-15 years were physically active' for at least 60 minutes per day on all 7 days during the past 7 days [8]. Singh *et al.* carried out a study among 510 students of 9th -12th classes of an urban school in New Delhi using the modified GSHS questionnaire and found that 18.3% of boys and 22.2% of girls were not physically active for 60 minutes per day at least three days in a week [9]. If 60 minutes of MVPA every day during the past 7 day were considered, sufficiently physically active adolescents'

percentage in school children of New Delhi would have been reduced significantly. National survey done in Indonesia using GSHS questionnaire found that only 15.9% of adolescent school children were physically active for at least 60 minutes per day on all 7 days during the past 7 days [8]. GSHS questionnaire use the same questions as PACE+ 2 item measure to assess the physical activity level. However, the researchers have not used the same physical activity guidelines. Sport and Physical activity surveys (SPAS) conducted in New Zealand in 1997/98, 98/99 & 2000/ 2001 found that 37% of New Zealand adolescents aged 13-17 years are physically inactive [10]. All the study findings suggest that present day children and adolescents are not sufficiently active and not meeting the current international recommended guidelines for physical activity. However, different studies have used different recommendations and frequencies (e.g. 5 days per week, every day) so that comparison among countries cannot be made. In the present study MVPA 5 or more days per week was taken as sufficient level of physical activity. Prochaska et al. and Booth et al. had used 60 minutes of MVPA for 5 days or more per week as the physical activity recommendation for adolescents when they validated the physical activity questionnaires for adolescents [5, 11]. Australian guideline for adolescents recommends adolescents to participate 60 minutes or more of MVPA every day. However, Olds et al. suggest that strict interpretation of "every day" would be quite unreasonable as it does not allow for illness etc. [12]

Approximately 47% of adolescents had either walked or cycled to school (Table 1) while 53% had travelled to school by motorized transport. Most of the parents in Sri Lanka try to send their children to schools with more facilities and so that children are often forced to use motorized transport to go to a faraway school. That in turn can affect the physical activity level of adolescent school children.

Identification of correlates of physical activity is crucial in planning intervention programmes to promote physical activity. There are modifiable physical activity correlates as well as un-modifiable correlates such as sex and age of adolescents. Association of age and gender with physical activity level of adolescents had been observed in most of the research [13, 14]. In the present study only grade 9 students were studied. If a broader age group was selected this association could have been observed in the Sri Lankan settings too. The gender difference of physical activity has been seen in studies of both developing and developed countries. This observed difference of activity by gender could be due to the biologic reasons as well as due to different socialization of girls. The cultural norms and perceptions that kept Sri Lankan girls away from vigorous activities and outdoor games has been changed with time. Nowadays girls enjoy similar privileges as boys in sports and play. That may explain the present study finding of not observing a significant gender difference in engaging physical activity. A study done in Maringa, Brazil among group of adolescents aged 14-18 years also showed no significant differences in physical activity level between girls and boys [15].

In the present study parents education was not associated with physical activity level of adolescents. Gorden-Larsen[16] found that high level of maternal education was significantly associated with increased likelihood of being physically active and Riddoch et al. [14] also found that both maternal and paternal education levels were inversely associated with total physical activity level of children. Family monthly income level and physical activity level of adolescents showed a significant association. This suggests that adolescents in low income families' are insufficiently active compared to the adolescents of high income families. However, family monthly income level and physical activity level of adolescents by sex showed no significant association. Gorden-Larsen found that highest family income and medium family income had an increased likelihood of falling in the highest category of moderate to vigorous physical activity [16].

It is generally acknowledged that as physical activity level increases, BMI decreases. In the present study BMI was not significantly associated with physical activity level of adolescent school children. However, only 3% of the sample was either overweight or obese and it may be the reason for not observing an association with BMI and physical activity level in our study. A study done among a group of female Australian adolescents aged 13-15 showed that physical activity increase as the BMI decrease [17].

Results of logistic regression analysis indicated that physical activity change strategy, recreational choices, functional classification of schools and parental physical activity level were significantly associated with physical activity level of adolescent school children. Availability of play grounds, availability of various sport teams and access to equipments and facilities for sport and availability of trained physical education teachers may affect the physical activity level of school children. Type 1 AB schools have more facilities compared to other types of schools. Physical activity change strategy reflects thoughts, feelings and activities of adolescents that help them to make a positive behaviour change.

The present study found a significant association between physical activity levels of adolescents and parents. Framingham children's study revealed that when both parents were active the chances of having active children were 5.8 more than children of inactive parents [18]. However, having an active parent does not necessarily make the child more active. This association may be due to the role modeling effect or the supportive environment. Parent's motivation, provision of facilities to be active may also affect this association.

In the present study it was found that 43% of adolescents usually spend 1-2 hours per day in sedentary activities. Sixteen percent (16%) of adolescents spend in sedentary activities for more than 4 hours and on an average an adolescent spends approximately 3 hours per day on sedentary activities. According to the national survey on emerging issues among adolescents in Sri Lanka, the percentage of adolescents that usually engage in leisure activities such as watching television (TV), reading, listening to music increased with age [19]. More girls than boys spend the leisure time watching TV, reading and going to tuition classes. According to the present study findings, 86% of 14 year old boys and 91.8% of 13 year old boys were less sedentary. Among girls 90.7% 13 year olds and 80.5% 14 year olds were less sedentary.

This study relied on self reported data and it is a limitation due to possible recall bias. However, the current study was done among adolescents and researchers have found that adolescents have a satisfactory level of recall ability compared to children less than 10 years old. There is a possibility of giving socially acceptable answers and to over report the time spent on moderate to vigorous physical activity when self repot measures were used to assess behaviour pattern of adolescents.

The proportion of adolescent school children who participate

in MVPA for at least 60 minutes per day on most days of the week is not satisfactory. Interventions to promote physical activity among adolescents should be started immediately.

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