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Title: Physical activity attitudes among adolescents in Bangladesh

Article Type: Original Research

Keywords: Physical activity; Exercise; Attitude; Adolescents; Bangladesh

Corresponding Author: Dr. Asaduzzaman Khan, PhD

Corresponding Author's Institution: The University of Queensland

First Author: Nicola Burton

Order of Authors: Nicola Burton; Mohammad Kadir; Asaduzzaman Khan

**Abstract:** Objectives: The purpose of this study was to examine physical activity (PA) attitudes among adolescents in Bangladesh, and their associations with socio-demographic, lifestyle and activity-related factors.

Study design: Cross sectional study.

Methods: A total of 781 students (52% female; mean age 14.3 years, SD 1.1) from eight secondary schools in Dhaka, Bangladesh completed a written questionnaire. Exploratory factor analysis was used to derive positive and negative PA attitude measures. Generalized estimating equations was used to examine the associations.

Results: The most frequent positive attitudes were PA would 'get or keep me in shape' (81%), and 'be fun' (73%). Common negative attitudes were PA 'would make me hot and sweaty' (51%), and 'is hard work' (42%). Multivariable analysis showed that positive PA attitudes were more likely among adolescents who had physical education classes, adolescents involved in school sports, adolescents who ate fruit and vegetables daily, and adolescents who had breakfast regularly. Negative PA attitudes were more likely among girls, adolescents who slept  $\leq 8$  hours/night, and adolescents who were overweight or obese, and less common among adolescents who ate fresh fruit and vegetables daily.

Conclusions: This study suggests that PA interventions for adolescents should highlight benefits for being in shape and having fun as key components of positive PA attitudes, and address negative attitudes of PA being hot and hard work. Specific strategies may be needed to address negative PA attitudes among girls, adolescents who are overweight or obese, and adolescents with insufficient sleep.

26 August 2019

The Editor  
Public Health

**RE:** PUHE-D-19-00264 *Physical activity attitudes among adolescents in Bangladesh*

Dear Editor,

Thank you very much for giving us the opportunity to revise and resubmit our manuscript for possible publication in your esteemed journal. We want to thank the reviewers for positive feedback on our manuscript and suggestions to improve the content.

Our point-by-point responses to the comments from the reviewer has been provided separately as a response note. Please let us know if you need any additional information or explanation.

We look forward to hearing about the status of our revised manuscript in due course.

Yours sincerely,

A/Prof Asaduzzaman Khan, PhD  
School of Health and Rehabilitation Sciences  
The University of Queensland  
Brisbane QLD 4072 Australia  
**T** +61 7 3346 7456  
**F** +61 7 3365 1877  
**E** a.khan2@uq.edu.au

## Responses to Reviewers' Comments: PUHE-D-19-00264

### *Reviewer #1*

This paper gives an interesting description of how attitudes to physical activity could be associated with socio-demographic, lifestyle and activity for adolescents in a lower-middle-income country. This is highly relevant in relation to overweight and obesity that is a public health concern also in this context. I do however believe that the paper would gain on some clarifications, mainly in the Methods.

**Response:** We appreciate the reviewer's positive and constructive comments. We have revised the manuscript thoroughly in response to the reviewer's comments.

In the Methods, first paragraph it would be helpful to the reader to give information about how the schools were selected, how many of the invited students participated, instead of referring to another paper.

**Response:** Following the comment, we have included a detail description of how the schools and students were selected in this study (see last paragraph, page 4).

Regarding the Statistical Analysis it is unclear in which context the PA attitudes were dichotomized and why, before performing the EFA and/or the GEE? How were the other variables coded in the analysis (BMI is described)?

**Response:** Sorry for the misunderstanding caused. PA attitudes were dichotomised only to obtain descriptive frequencies. All other analyses, including the multivariable modelling, were based on scores derived from the 5-point Likert scale responses of the attitude items. In addition, we have moved the first paragraph of 'Statistical Analysis' sub-section to its end (see last paragraph, page 8). Furthermore, we have added a description about coding of other variables used in this study (see last paragraph, page 6).

The authors describe how scoring of negative and positive attitudes were derived and transformed to normal distribution, was this used in the GEE?

**Response:** Yes, the transformed scores were used in GEEs.

I would suggest that the last sentence in the last paragraph in Statistical Analysis is moved to the first paragraph in Methods.

**Response:** Good suggestion – we have moved the sentence to the second paragraph in Methods.

The final model of GEE with only significant associations are included. Is it possible to give a description of the steps to the final model?

**Response:** Good point – we have added a description of the steps to the final models in the Statistical Analysis sub-section (see 1<sup>st</sup> paragraph, page 8).

It may also be helpful for the reader with a table including descriptive data regarding the lifestyle variables.

**Response:** Following the reviewer's comment, we have added a table (#2) in the revised manuscript to describe the lifestyle variables. This information is also summarised in the results section (see 2<sup>nd</sup> paragraph, page 9).

In the Results the authors state they have adjusted for other factors in the model, which factors and why?

**Response:** Sorry for the confusion caused. In the revised version, we have added a description about how the variables were selected for the final models (see first paragraph, page 8). Explanatory variables were selected based on statistical significance of their association (at 15% level of significance) with the outcomes of interest. Once the variables were included in the multivariable models, they were adjusted for each other in explaining their association with the outcomes.

**Reviewer #2:**

The study is valuable as it explores country-specific research which the authors have established as a gap in the evidence. Prior to publication I have some concerns which I would like to see addressed.

**Response:** We appreciate the reviewer's positive and constructive comments, which have been addressed in the revised manuscript.

\* Tables 1 and 2 are duplicated within the paper -why is this?

**Response:** Sorry for this – it was by mistake and has been corrected.

\* The research highlights are not a good representation of the results reported -with no mention of gender or healthy eating -despite these being key themes in the abstract.

**Response:** We have revised the highlights to include results on healthy eating and gender.

There is also a lack of clarity in the abstract and the implications section - examine the following sentence: -

"with a specific attention to those who are female, overweight or obese, and those with poor sleep and unhealthy eating habits."

I would read this as suggesting that there are two groups who need attention: -

1. Females who are overweight or obese
2. Those with poor sleep and unhealthy eating habits.

However this is not my interpretation of the results sections. Firstly, they need to be clear that each of the characteristics above are separate, so it is a list: females, people who are overweight/obese, those with poor sleep, those with unhealthy eating habits. If statistical analysis has been carried out to give the 2 groups shown above, it is not adequately reported. Given the overlap of the confidence intervals for females compared to males, the data does not strongly support this conclusion anyway -certainly not sufficiently to ignore the needs of the males which is what the conclusion and abstract seem to suggest.

**Response:** The abstract, results, discussion and implications text has been revised to clarify that these are separate groups of adolescents. We have revised the implications text to reduce the emphasis on female adolescents (see 2<sup>nd</sup> paragraph, page 13).

We are not sure about the reviewer's comment on adequacy of reporting results. We have presented the odds ratio of being female (compared to male) to report negative PA attitudes as 1.20 with 95% confidence interval 1.02-1.38,  $p=0.012$ , which clearly demonstrate that being female was significantly associated with reporting negative PA attitude. Hence, we believe that the results support the conclusion.

Secondly, although the survey asked about a wide range of eating habits, the only ones that showed a correlation with negative PA attitudes were breakfast and fruit eating. If multiple unhealthy eating habits have been examined the authors need to be specific about which ones they mean

**Response:** Good point. In response to the first reviewer's comments, we have added a table [#2] with lifestyle variables including adolescents' dietary behaviours in the revised manuscript. Although fast food intake and consumption of dairy product were associated with positive PA attitudes at the univariate level (at 15% level of significance), they were not significant (at 5% level of significance) in the multivariable model [#1]. This information has been added as a footnote of Table 3. We have also revised the manuscript text to be more specific about which eating habits were associated with PA attitudes.

\* The authors have chosen to use a five-point Likert scale with a "neutral" answer, but then presented the results as a dichotomous choice -agreed, or not agreed. This is probably due to this paper being written as a secondary analysis of data collected for another purpose, but I would suggest that the authors need to address this in their discussion and explore whether this threatens the validity of the conclusions drawn. If planning a survey for a dichotomous analysis, surely the questions would have forced a choice. What impact does this have on the results?

**Response:** As reported in the revised manuscript, dichotomisation of the attitude item responses (agree, not agree) was used only to provide descriptive results; all the other analyses including EFA, GEEs were based on the original 5-point Likert scale scores, and as such, the modelling results and the driven conclusion were unlikely to be affected by dichotomisation. This has been indicated in the discussion of the revised manuscript (see 2<sup>nd</sup> paragraph, page 12).

\* There is a lack of consistency in the manuscript about the approach to negative and positive attitude. On P4 Line 34, the authors state that negative attitudes are a stronger predictor of physical activity than positive attitudes. Granted, the paper referenced refers to pre-adolescents, but having included that information, the authors make no further mention of this difference. Their conclusion then focuses solely on positive attitudes with no explanation.

**Response:** The conclusions in the abstract and manuscript have been revised to refer to both positive and negative attitudes.

\* Finally, I am concerned that a recommendation of the paper is that physical activity should be of low to moderate intensity (P11, Line 8) which is at odds with the very WHO guidelines which the paper purports to seek to support.

**Response:** This text has been deleted, and other more relevant information from the WHO recommendations about PA provided (see pages 12-13).

# Physical activity attitudes among adolescents in Bangladesh

N.W. Burton PhD<sup>1</sup>, M.A. Kadir PhD<sup>2</sup>, A. Khan PhD<sup>3\*</sup>

<sup>1</sup> School of Applied Psychology, Griffith University, Brisbane, Australia

<sup>2</sup> Social Marketing @ Griffith, Griffith University, Brisbane, Australia

<sup>3</sup> School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane, Australia

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## Declaration of interest:

The authors declare that they have no conflict of interest, real or perceived.

## \* Corresponding author:

Associate Professor Asaduzzaman Khan, PhD

School of Health and Rehabilitation Sciences

The University of Queensland

Brisbane QLD 4072 Australia

**T** +61 7 3346 7456

**F** +61 7 3365 1877

**E** a.khan2@uq.edu.au

Physical activity attitudes among adolescents in Bangladesh

Abstract

Objectives: The purpose of this study was to examine physical activity (PA) attitudes among adolescents in Bangladesh, and ~~their whether such attitudes were~~ associations ~~ed~~ with socio-demographic, lifestyle ~~and/or~~ activity-related factors.

Study design: Cross sectional study.

Methods: A total of 781 students (52% female; mean age 14.3 years, SD 1.1) from eight secondary schools in Dhaka, Bangladesh completed a ~~self-administered~~ written questionnaire ~~which included 12 items about PA attitudes~~. Exploratory factor analysis was used to derive positive and negative PA attitude measures. Generalized estimating equations (~~GEE~~) was used to examine the associations.

Results: The most frequently ~~reported~~ positive attitudes were PA would ‘get or keep me in shape’ (81%), and ‘be fun’ (73%), ~~and ‘give me energy’ (58%)~~. Commonly ~~reported~~ negative attitudes were PA ‘would make me hot and sweaty’ (51%), and ‘is hard work’ (42%), ~~and ‘requires serious commitment’ (39%)~~. Multivariable analysis showed that *positive* PA attitudes were ~~significantly~~ more likely among adolescents who had physical education classes, adolescents who were involved in school sports, adolescents who ate fruit and vegetables daily, and adolescents who had breakfast regularly. *Negative* PA attitudes were ~~significantly~~ more likely among ~~females girls, adolescents those with insufficient who slept ≤8~~ hours/nights sleep, and adolescents who were overweight or obese, and less common among adolescents those who ate fresh fruit and vegetables daily.

Conclusions: This study suggests that PA interventions for adolescents should highlight ~~promote benefits for being in shape and~~ having fun as key components of positive PA attitudes, and address negative attitudes of PA being hot and hard work, aspects and benefits for being in shape and re-energising with a specific attention to. Specific strategies may be

needed to address negative PA attitudes among ~~those who are~~ female adolescents girls,  
adolescents who are overweight or obese, and adolescents ~~those~~ with insufficient ~~poor~~ sleep  
and ~~unhealthy eating habits~~.

Keywords: Physical activity; Exercise; Attitude; Adolescents; Bangladesh



## Introduction

Among adolescents, physical activity (PA) has beneficial effects for self-concept, self-esteem, internalising and externalising problems, cognitive performance, academic achievement, self-reported health, weight, anxiety and depression<sup>1-3</sup>. PA, in particular organised sports, during adolescence, can track to adulthood PA<sup>4</sup>, which in turn is associated with a reduced risk of all-cause mortality and the primary and secondary prevention of chronic ~~medical~~ conditions including cardiovascular diseases, type-2 diabetes, and several types of cancers<sup>5,6</sup>. However, a significant proportion of school-aged adolescents are not sufficiently active, with four out of five not meeting the World Health Organization (WHO) recommendations of 60 min/day of moderate-to-vigorous PA (MVPA)<sup>7</sup>.

Motivation is a key psychological correlate of PA participation among adolescents<sup>8</sup>, and is derived in part from attitudes which reflect positive or negative evaluations of engaging in the behaviour<sup>9</sup>. A positive attitude toward PA is positively associated with PA participation among adolescents<sup>10,11</sup>, and higher levels of PA after five and ten years, independent of baseline behaviour<sup>12</sup>. Research with pre-adolescents suggests that negative attitudes are a stronger (inverse) predictor of PA than positive attitudes<sup>13</sup>.

Attitudes towards PA can vary by socio-demographic and activity-related factors. Less positive attitudes towards PA, including intensive exercise, sporting competitions and ~~or~~ sport, have been found among obese adolescents in Belgium and Germany<sup>14,15</sup>. ~~R,~~ and research in Tunisia suggests ~~this may be moderated by that overweight and obesity were significantly associated with negative attitudes towards PA among those not meeting the recommended levels of PA, but no difference in perceptions by weight status among those who were~~ meeting the PA recommendations<sup>16</sup>. An American study indicated that high school students who were male, students who were in a higher grade, and those who had with lower BMI had more positive PA attitudes than their counterparts<sup>17</sup>. PA attitudes may also

1  
2 be associated with other socio-demographic and lifestyle factors previously identified as  
3  
4 correlates of adolescent PA, such as maternal education and family income <sup>18</sup>, healthy eating  
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6 practice <sup>19,20</sup>, and screen time <sup>21</sup>; however little work has been done to assess such  
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8 relationships in adolescents in resource-poor settings.  
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10 Attitudes can ~~also~~ be shaped by experiences and cultural influences <sup>9</sup>, so country-  
11  
12 specific research on PA attitudes is important due to between country variations in socio-  
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14 cultural, economic, and environmental conditions. ~~Previous~~ Earlier research has indicated  
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16 that people from Asia and women in Bangladesh have specific cultural beliefs and attitudes  
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18 towards exercise <sup>22,23</sup>. We are not aware of any research on PA attitudes among adolescents  
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20 in Bangladesh; where, nationally, 59% of adolescents ~~did~~ not meet the PA  
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22 recommendations, ~~according to the Global School-based Health Survey~~ <sup>24</sup>. The aims of this  
23  
24 study were therefore, to assess positive and negative PA attitudes of adolescents ~~from Dhaka~~  
25  
26 ~~city~~ in Bangladesh, and the socio-demographic, lifestyle, and activity-related factors  
27  
28 associated with PA attitudes.  
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## 31 32 33 **Methods**

34  
35 A total of 11 secondary schools in Dhaka, the capital city of Bangladesh, were invited  
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37 to participate in the study and eight agreed. All students (aged 13-17 years) in grades 7-10 of  
38  
39 these schools were then invited to do the survey. With permission from the headmasters/  
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41 principals of the schools and class teachers, the principal investigator (AK) attended classes  
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43 and explained the rationale, purpose and requirements of the study. A written information  
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45 sheet and consent form were distributed to students to be given to their parents/guardians for  
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47 their review and consent for the adolescents and parents to participate. After obtaining the  
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49 individual written informed consent from the students and their parents/guardians, students  
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51 completed the survey in the classroom. The principal investigator (AK) and a class teacher  
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1  
2 were present to monitor progress and to answer any questions or address any concerns the  
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4 students had. Nonconsenting students engaged in alternate activities of their choice during  
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6 this time. A section of the survey was given to students to take home and completed by one  
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8 parent/guardian of the participating student to provide family-level data. The completed  
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10 survey was returned by the student to the research team the following day. The survey was  
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12 available in English and Bangla [the local language] and took approximately 45-50 minutes  
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14 to complete. Data for this study were collected during the winter season (November 2012 to  
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16 January 2013). Of the 1476 surveys distributed across the eight participating schools, 898  
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18 students responded. The study was approved by the Behavioural Social Sciences Ethics  
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20 Review Committee at The University of Queensland, Australia. Data for this study were from  
21  
22 a cross-sectional survey conducted among students of eight secondary schools purposively  
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24 selected from Dhaka, the capital city of Bangladesh. More details about the study are  
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26 available elsewhere. All students in grades 7-10 at the selected schools were invited to  
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28 participate in the study. The research was approved by the Behavioural Social Sciences  
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30 Ethics Review Committee.

### 31 32 33 Measures

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35 Participants completed a self-administered written questionnaire. Attitudes toward PA  
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37 were measured by 12 items scored on a 5-point Likert scale with response options ranging  
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39 from 1= strongly disagree to 5= strongly agree. The student questionnaire also included  
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41 items to assess socio-demographic (gender, age, private or public school), physical health,  
42  
43 life-style (sleep duration; frequency of consuming each of fast food, fresh fruit and  
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45 vegetables, dairy products, sugary drinks, and breakfast) and activity-related (participation in  
46  
47 physical education classes, involvement with team and non-team sports at school, screen-  
48  
49 time) factors. Parents of the participating students provided Hh household/family level data  
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51 provided by the parent/guardian of the participating students; included edu education,  
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2 occupation, and family income, via a written questionnaire. Of the 898 students who  
3 participated in the survey, 781 (87%) completed the PA attitude items and formed the  
4 analytical sample.  
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9 Participants' height and weight were measured by the research team members, and  
10 Centers for Disease Control and Prevention (CDC) growth charts were used to determine the  
11 corresponding body mass index (BMI) for-age and sex percentile<sup>25</sup>. Obesity was defined as a  
12 BMI at or above the 95th percentile for children of the same age and sex; overweight was a  
13 BMI between the 85<sup>th</sup> and 95th percentiles, healthy weight was a BMI less than the 85th  
14 percentile but at or above the 5th percentile, and underweight was a BMI less than the 5th  
15 percentile. Categories of overweight and obese were combined to facilitate interpretation of  
16 comparisons.  
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26 Consumption of fruit and vegetable was assessed using two items (fresh fruit, salad or  
27 fresh vegetables) and responses dichotomised as at least once a day during the past week or  
28 less than once a day in the past week. Dairy intake (milk or milk products such as yoghurt or  
29 cheese) was assessed using one item and responses dichotomised as at least once a day during  
30 the past week or less than once a day in the past week. Fast food consumption (meals or  
31 snacks) was assessed using one item and responses dichotomised as at least once during the  
32 past week or none in the past week. Sugary soft drink intake was assessed using one item and  
33 responses categorised as 3 or more, 1-2, or no cans, bottles or glasses in the past week.  
34 Breakfast frequency was assessed using one item and responses categorised as regular  
35 breakfast, which was defined as having breakfast on 5-7 days during the past week, and  
36 irregular breakfast which was having breakfast on 1-4 days in the past week. Sleep duration  
37 was assessed using one item and responses categorised as < 7 hours, 7-8 hours and > 8 hours  
38 in a usual night.  
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## Statistical Analysis

~~For each of the PA attitude items, responses were collapsed into a dichotomous grouping of 'agreed' ('agree' or 'strongly agree') and 'not agreed' ('neutral', 'disagree' or 'strongly disagree'). The proportion of adolescents who agreed with each of the positive and negative PA attitudes is presented in Figure 1.~~

To examine whether the 12 PA attitude items could be summarized through unobserved constructs or factors, exploratory factor analysis (EFA) using principal components analysis extraction method and Varimax rotation was performed. Only eigenvalues over one were accepted for extraction of factors, and a cut-off of >0.45 was used for factor loadings. A high value (0.82) of the Kaiser-Meyer-Olkin measure of sampling adequacy and significance of the Bartlett test of sphericity ( $p < 0.001$ ) suggested that the factor analysis was appropriate for the survey data. The factor analysis offered a two-factor solution explaining 53% of the variance. The first factor was labelled "positive attitudes", explained 29% of variance, and included six items: (i) help me cope with stress; (ii) be fun; (iii) help me make new friends; (iv) get or keep me in shape; (v) make me more attractive; and (vi) give me energy. The second factor was labelled "negative attitudes", explained 24% of the

Analyses indicated satisfactory reliability coefficients for both of the factors with Cronbach's  $\alpha = 0.87$  and  $0.83$ , respectively, for positive and negative attitude items. Participant scores reflecting positive attitudes and negative attitudes were derived by taking the average of the responses to the respective items. Distribution of the factor scores were examined to ensure normality, and a square transformation was implemented on positive attitude scores to obtain a normal distribution.

To examine whether positive and negative PA attitude scores differed by any of the socio-demographic, lifestyle, or activity-related factors, we used Generalized Estimating Equations (GEE) which takes into account the non-independence of adolescents' attitudes toward PA nested within their schools. Initially, all potential explanatory variables were examined at the univariate level to assess their association with the outcomes of interest. A less conservative significance threshold of 15% was used at the univariate level to screen explanatory variables for subsequent multivariable analyses. For modelling the variables associated with positive PA attitudes, nine variables were associated with the outcome of interest at the univariate level, and four retained their significance (at 5% level of significance) at the multivariable level (model 1). For modelling the variables associated with negative PA attitudes, seven variables were associated with the outcome of interest at the univariate level, and four retained their significance (at 5% level of significance) at the multivariable level (model 2). Variables associated with positive and negative PA attitudes at the univariate level but not significant at the multivariable level are listed in the notes of Table 3. Residuals of the fitted models were examined to ensure normality of residuals and free from outliers. Only significant variables associations at from the final multivariable models are presented in the form of odds ratios (OR) and their 95% confidence intervals (CI). ~~All tests were performed at 5% level of significance. Of the 898 students who participated in the survey, 781 (87%) completed the attitude items and formed the analytical sample.~~

To describe the PA positive and negative attitudes among adolescents, item responses were collapsed into a dichotomous grouping of 'agreed' ('agree' or 'strongly agree') and 'not agreed' ('neutral', 'disagree' or 'strongly disagree'). The proportions of adolescents who agreed with each of the positive and negative PA attitudes are presented in Figure 1.

## Results

A summary of the characteristics of the study participants is provided in Table 1. The average age of the participants was 14.3 (SD=1.14) years, and half (52%) were female. Parent level data indicated that 76% of the fathers and 58% of the mothers of the participants had tertiary level education, and 47% reported a monthly family income less than Taka 50,000.

*Table 1 about here*

Lifestyle factors of the participating adolescents are presented in Table 2. Just less than a quarter (23%) of adolescents reported having both fresh fruit and vegetables at least daily, and 41% consumed dairy products at least daily, during the past week. Consumption of carbonated sugary drinks was considerably high with a quarter of adolescents reporting having had at least three bottles/cans/glasses of sugary soft drinks during the past week. A third of the adolescents had fast food at least once during the past week, while over two-thirds (70%) had breakfast regularly (5-7 days/week).

*Table 2 about here*

As shown in Figure 1, the most frequently reported positive attitudes were that PA would ‘get or keep me in shape’ (81%), ‘be fun’ (73%), and ‘give me energy’ (58%). The most frequently reported negative attitudes toward PA were: ‘makes me hot and sweaty’ (51%), ‘hard work’ (42%), and ‘requires serious commitment’ (39%).

*Figure 1 about here*

A summary of the multivariable GEE modelling results is provided in Table 32. After adjusting for other factors, there were higher odds of reporting *positive* PA attitudes among adolescents who had physical education classes at school, adolescents were involved with sports (team or non-team) at school, adolescents who ate fresh fruit and vegetables at least

~~daily every day~~, and ~~adolescents~~ who had breakfast regularly (~~5-7~~ days/week). Negative PA attitudes were more likely among ~~female~~ adolescents ~~who were female, adolescents who were or~~ overweight/obese, and ~~adolescents~~ who ~~had insufficient sleep (slept~~  $\leq 8$  hours/night). Negative PA attitudes were less likely among adolescents who ate fresh fruit and vegetables ~~at least daily every day in the past week~~.

Table ~~32~~ about here

## Discussion

This study assessed positive and negative PA attitudes of school-based adolescents from Dhaka city in Bangladesh, and the associated socio-demographic, lifestyle, and activity-related factors. The most common positive PA attitude was that PA would ‘get or keep me shape’. This is consistent with other research on adolescents’ expectations of PA <sup>26-28</sup>, and research indicating body shape attitudes as a predictor of adolescent PA participation <sup>29, 30</sup>. The second leading positive attitude was that PA would ‘be fun’. Fun has previously been identified as an important factor for adolescent PA <sup>30-33</sup>, and is associated with diversified activities, challenge but not competition, positive practice experiences, presence of friends, no parental pressure, perceived competence, and autonomy <sup>32</sup>.

Positive PA attitudes were more likely among adolescents who had physical education classes and ~~adolescents~~ ~~were~~ involved in school sports, which supports other studies <sup>10, 11</sup>. It may be that these experiences promote positive PA attitudes by providing time with friends, and social support and encouragement from school-based leaders. Other research has identified that school-based ~~PA~~ opportunities and motivating teachers are ~~a~~ key enablers of PA among adolescents in India <sup>28</sup>. Our study also found that positive attitudes towards PA were more common among adolescents who ate fruit and vegetables ~~at least~~ daily; and ~~adolescents who ate~~ breakfast regularly (5-7 days/week). This could reflect the



results of other research indicating that active adolescents relate both exercise and nutrition with ~~the definition of~~ being healthy <sup>34</sup>.

Other research indicates that nNegative attitudes may be a stronger ~~(inverse)~~ predictor of PA than positive attitudes <sup>13</sup>. In the current study, common negative attitudes among adolescents were PA ‘would make me hot and sweaty’ and ‘is hard work’. As a tropical country, Bangladesh has a hot and humid climate. Poor or extreme weather has previously been identified as a barrier to PA <sup>35</sup>, and people living in areas with moist tropical conditions have lower PA levels than those with dry moderate conditions <sup>36</sup>. Perceptions of PA as hard work can reflect low activity efficacy, low perceived competence, competing time demands or lack of support and encouragement, which are all barriers to adolescent PA <sup>32</sup>.

Negative PA attitudes were more likely among female adolescents ~~who were female~~, adolescents with had insufficient sleep (<8 hours/night) and adolescents who were overweight or obese; and less common among adolescents these who ate fruit and vegetables at least daily. For some adolescent girls, PA and sport is inconsistent with feminine stereotypes, and therefore risks negative judgements <sup>32</sup>. This may be particularly salient in countries like Bangladesh where there are strong gender norms and roles. Other research in India highlighted that sociocultural expectations can be strong deterrents to PA among adolescent girls, and relate to the appropriateness of types of PA, clothes worn for PA and who PA is done with <sup>28</sup>. ~~Getting hot and sweaty was the most common negative PA attitude in our study, and is a common negative perception of PA among adolescent girls in general~~ <sup>27, 28</sup>. Adolescent girls are also more likely than boys to report low activity-efficacy and high perceived exertion for PA <sup>28, 37</sup>. Adolescent girls may also be concerned about safety or and neglecting studies and homework as a result of PA participation <sup>28</sup>. Getting hot and sweaty was the most common negative PA attitude in our study, and is a common negative perception of PA among adolescent girls in general <sup>27, 28</sup>. Adolescents with insufficient sleep

Field Code Changed

can experience fatigue, which is a barrier to PA<sup>38, 39</sup> and likely to contribute to negative PA attitudes ~~of PA being hard work~~~~reflecting perceptions of effort and demand~~. Lack of sleep and being tired has previously been identified as a barrier to PA among adolescents girls in India<sup>28</sup>. The positive association in our study between overweight/obesity and negative PA attitudes complements previous research demonstrating less positive attitudes towards PA among obese adolescents<sup>14, 15</sup>. Similarly, the inverse association in our study between ~~at least daily fruit and vegetable consumption~~~~healthy eating behaviours~~ and negative PA attitudes reflects previously discussed research among young adolescents linking exercise and nutrition with the definition of being healthy<sup>34</sup>.

Data for this study were from a large urban sample with a good response rate. The study included both positive and negative PA attitudes, and explored a wide range of socio-demographic, lifestyle and activity-related factors as potentially associated with PA attitudes. ~~Although the individual PA attitude item responses were dichotomised (agree, not agree) to obtain descriptive frequencies, the statistical analyses including EFA, GEEs used generated summative scores based on the original 5-point Likert scale responses.~~ Participants were volunteers recruited from a limited number of schools in a metropolitan area, which ~~may have ean result in created~~ selection bias. Results, therefore, may not be generalisable to all adolescents, in particular those in regional areas. ~~Positive and negative~~ PA attitudes were assessed using a limited number of items, and different results may have been obtained if different attitude items were assessed. Self-report of PA attitudes may be vulnerable to social desirability bias.

## Implications and Conclusions

~~Understanding PA attitudes may help inform strategies to promote a physically active lifestyle. The results of this study suggest that specific attention is needed to redress negative~~

PA attitudes among Bangladeshi adolescents who are female, overweight or obese, and those with insufficient sleep and unhealthy eating habits. Multi-component interventions could therefore, simultaneously address healthy PA, eating and sleep practices. PA interventions should promote the fun aspects and benefits for being in shape and re-energising. School based opportunities via physical education classes and sports may improve PA attitudes. Given the common negative attitudes of PA being ‘hard work’ and ‘hot and sweaty’, PA opportunities should cater for adolescents with weight concerns and low efficacy, be of low to moderate intensity, and be done in cool or climate controlled contexts. Among Bangladeshi adolescent girls, less “masculine” types of PA may be appealing, and the “feminine” benefits of PA could be highlighted. A physically active lifestyle among adolescents could track into adulthood and provide significant benefits for current and future health and wellbeing.

An understanding of positive and negative PA attitudes can inform PA interventions. The results of this study suggest that PA interventions for Bangladeshi adolescents could highlight benefits of being in shape and having fun, which contribute to positive PA attitudes. School based opportunities via physical education classes and sports may improve positive PA attitudes. Some specific types of PA (e.g., water based activities) and PA conducted in climate-controlled environments (e.g., air-conditioned venues) may counter negative attitudes of PA being hot and sweaty. To address negative attitudes of PA being hard work, PA opportunities could cater for adolescents with low efficacy and/or capability. This could include activities that provide mastery experiences and are low impact or moderate intensity, as well as activities that can be integrated into the daily schedule such as active commuting. It could also be advantageous to highlight the value of low doses of PA. As identified in the World Health Organization recommendations for children aged 5-17 years, doing some PA,

1  
2 even if below the recommended levels, offers more benefits than doing none at all, and it is  
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4 appropriate to start with small amounts of PA and gradually increase duration, frequency and  
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6 intensity over time <sup>40</sup>. As negative PA attitudes were more common among adolescents with  
7  
8 insufficient sleep and adolescents who did not eat fruit and vegetables daily, there could be a  
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10 role for multi-component interventions that simultaneously address these three health-related  
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12 behaviours. Specific strategies may also be needed to engage female adolescents who were  
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14 more likely to have negative PA attitudes than male adolescents. Highlighting the “feminine”  
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16 benefits of PA and promoting less “masculine” types of PA could potentially be appealing to  
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18 the Bangladeshi girls. Future research could explore “feminine” stereotypes of exercise and  
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20 activity types and contexts perceived as gender appropriate in this culture. Successful  
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22 implementation of such PA interventions among adolescents could provide significant  
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24 benefits for current and future health and wellbeing.  
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**Table 1** - Demographics of participating adolescents in Dhaka city, Bangladesh (n=781)

Characteristics	n <sup>a</sup>	%
Gender		
<del>Girls</del> Female	404	51.7
<del>Boys</del> Male	377	48.3
Age in years		
13	192	24.6
14	244	31.2
15	228	29.2
16	117	15.0
Mother's education		
Up-to primary or equivalent	67	8.8
Secondary or equivalent	107	13.9
Higher secondary or equivalent	147	19.2
Tertiary	445	58.1
Mother's occupation <sup>b</sup>		
Employed	174	25.9
Not employed	497	74.1
Father's education		
Up-to primary or equivalent	47	6.1
Secondary or equivalent	55	7.2
Higher secondary or equivalent	83	10.9
Tertiary	579	75.8
Father's occupation		
Public service	172	25.2
Professional	98	14.3
Working on private organization	219	32.1
Business-trade	194	28.4
Family income (BD Taka) <sup>c</sup> per month		
< 30 000	167	22.8
30 000 – <50 000	180	24.5
50 000 – <100 000	216	29.4
100 000 or more	171	23.3

<sup>a</sup> Total for each variable may not be equal to n=781 due to missing values.

<sup>b</sup> Responses were collapsed to produce comparable categories.

<sup>c</sup> BD Taka 1000 = US \$11.762 (as on 2326 AugJuly 20198)



**Table 2** - Lifestyle factors of participating adolescents in Dhaka city, Bangladesh (n=781)

<b>Characteristics</b>	<b>n<sup>a</sup></b>	<b>%</b>
Fresh fruit-vegetable intake during the past week		
Less than daily	600	77.3
At least daily	176	22.7
Consumption of dairy products during the past week		
Less than daily	462	59.4
At least daily	316	40.6
Fast-food consumption during the past week		
None	515	67.4
At least once	249	32.6
Have breakfast during the past week		
Irregular (1-4 days)	236	30.4
Regular (5-7 days)	541	69.6
Sugary soft drink intake during the past week (cans/bottles/glasses)		
None	267	34.4
1-2	314	40.5
3 or more	195	25.1
Average sleep duration in a usual night		
< 7 hours	143	22.0
7-8 hours	231	35.5
>8 hours	277	42.5

<sup>a</sup> Total for each variable may not be equal to n=781 due to missing values.

**Table 32** - Factors ~~significantly~~ associated with adolescents' *positive* and *negative* attitudes towards physical activity.

Characteristics	Odds Ratio	95% Confidence Interval		p-value
<i><b>Model 1<sup>a</sup></b></i>				
<i><b>Positive attitudes</b></i>				
Physical education classes at school (Ref=No)				
Yes	2.70	1.22	5.98	0.015
Sport involvement at school (Ref=No)				
Yes	4.65	2.13	10.18	<0.001
Fresh fruit and vegetables <del>at least daily</del> <del>everyday</del> (Ref=No)				
Yes	3.88	1.86	8.08	<0.001
Regular breakfast (5-7days/week) (Ref=No)				
Yes	4.23	1.78	10.03	0.001
<i><b>Model 2<sup>b</sup></b></i>				
<i><b>Negative attitudes</b></i>				
Gender (Ref=Male)				
Female	1.20	1.04	1.38	0.012
Weight status (Ref=Normal)				
Underweight	1.15	0.90	1.46	0.27
Overweight or obese	1.42	1.23	1.63	<0.001
Average sleep <del>duration in a usual night</del> <del>duration</del> (Ref: <del>&gt;=8+ hours/day</del> )				
7-8 <del>hours/day</del>	1.41	1.21	1.66	<0.001
<7 <del>hours/day</del>	1.38	1.19	1.61	<0.001
Fresh fruit and vegetable <del>at least daily</del> <del>everyday</del> (Ref=No)				
Yes	0.80	0.66	0.98	0.029

<sup>a</sup> Factors associated with positive PA attitudes at univariate level but not significant at the multivariable level include weight status, sleep duration, consumption of fast food and dairy products, and mother's education.

<sup>b</sup> Factors associated with negative PA attitudes at univariate level but not significant at the multivariable level include school type (public vs private), mother's occupation and father's education.

Figure(s)

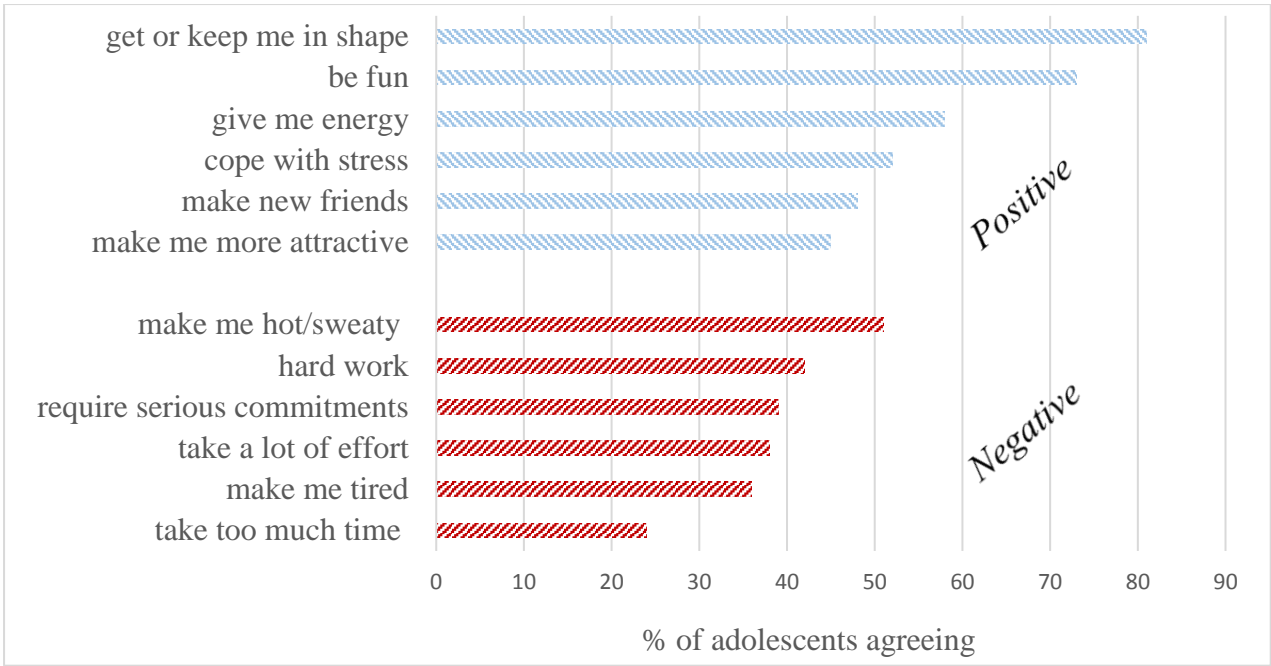


Figure 1. Proportion of adolescents agreeing with positive and negative attitude items toward physical activity.

## Research highlights

- ~~Attending physical education class and school sports is linked to positive PA attitude.~~
- ~~Insufficient sleep, and being overweight/obesity are linked to negative PA attitude.~~
- ~~PA intervention should focus on promoting healthy eating, body image and energy.~~
- Common positive attitudes are that PA helps being in shape and is fun.
- Common negative attitudes are that PA is hot, sweaty and hard work.
- Physical education class and school sports are associated with positive PA attitudes.
- Adolescents who eat fruit, vegetables and breakfast daily have better PA attitudes.
- Girls and adolescents with insufficient sleep have more negative PA attitudes.