Original Article

Relationship of physical activity with body image, self esteem sedentary lifestyle, body mass index and eating attitude in adolescents: A cross-sectional observational study

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Abstract

Aim: To Study Relationship of physical activity (PA) with body image, self-esteem, body mass index (BMI), sedentary lifestyle and eating attitude in adolescents. **Methods:** An observational cross-sectional study done at the Centre for Adolescent Health, Kalawati Saran Children Hospital, Lady Hardinge Medical College, New Delhi, India. Volunteering adolescents between the age group of 13 and 18 years were included and assessed using PA questionnaire for adolescents Score, Body Shape Questionnaire-34 Score, Rosenberg self esteem Score, adolescent sedentary activity questionnaire score, eating attitude test (EAT-26) and BMI Z-score. Relationship of these scales to various parameters was assessed using correlation and regression. **Results:** A total of 191 boys and girls were included in the study; 25% had underweight, 75% were normal (only 1 child had overweight and none had obesity). Three fourth (77%) of the children had low PA. The girls were relatively more inactive (83.9% girls vs. 72.1%boys). Most (90.05%) subjects did not have any concerns related to body image. Almost all the subjects had normal or high self esteem. Nearly one quarter of the subjects (23.56%) had disordered eating behaviours. Multiple regression found the PA is positively dependent on EAT 26 score and adolescent sedentary activity questionnaire (ASAQ) score (sedentary score) in girls, whereas in males ASAQ (sedentary score) score was only variable related to physical activity questionnaire for adolescents score (PAQ-A). **Conclusion:** Normal weight and underweight adolescents had minimal PA and despite this, almost all had normal self-esteem and body image. PA was significantly related to eating and sedentary behaviours.

Keywords: Adolescent, body image, self-esteem, body mass index, Sedentary lifestyle and eating attitude

Introduction

Physical inactivity is one of the biggest public health problems identified in the present century[1] It is estimated by World Health Organization[2,3] that about 2 million deaths annually in the world can be attributed to physical inactivity and is among the 10 major causes of mortality and disability in the world.

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The physical activity (PA) is one of the various factors which have a positive effect on body image and self-esteem. The benefits of PA on health are widely demonstrated by the recent scientific literature.[4,5]

Individuals with a positive body image are more likely to engage in PA than those with negative body image.[6] Body image can also influence the type of PA.[6] In adolescents, body image seems to be linked with self-esteem, as it is largely influenced not only by

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how they look but by how they think they look.[7] Body image should be assessed in clinical interactions with adolescents.[8]

Another important determinant of adolescent mental health and development is self esteem and it has been seen that low self-esteem is associated with a number of psychological, physical, and social issues that may interfere in successful transition to adulthood from adolescence, including depression, anxiety, suicide and disordered eating, violent behaviour and substance abuse.[9]

Furthermore, disordered eating behaviours have been found to associated with a number of undesirable outcomes including increased risk of eating disorders and obesity, in adolescents.[10]

The PA, body image, self-esteem and eating attitude seem linked with each other among adolescents. The present study was planned to assess the relationship of these attributes in adolescents.

Methods

This observational cross-sectional study was done at the Centre for Adolescent Health, Kalawati Saran Children Hospital, Lady Hardinge Medical College, New Delhi, India from November 2015 to March 2017. All consecutive volunteering children between the age group of 13 and 18 years were included in the study while excluding the ones with chronic illness, locomotor disability, and learning disability. A convenient sample of 150 adolescents was planned and 191 subjects were included in the study. Ethical clearance was taken from the Institution Ethical Committee. No blood sampling or any other interventions were done as a part of the study. All the information collected was kept confidential and identity of the subject was not revealed to anyone.

We developed a structured questionnaire in which basic information on the name (optional), age, gender, educational qualification, place of residence were taken. Weight was measured in light clothes with no shoes to the nearest 0.1 kg by a portable digital scale (Bird-Meditech). Height was measured while subjects were in standing position, not wearing shoes, hat, hair bends and with the normal position of shoulder to the nearest 0.1 cm by a portable stadiometer (Seca) with movable head piece.[11]

Body mass index (BMI) was calculated by the formula: weight (kg)/height (m^2) and standard deviation (SD) scores (BMI z-scores) were derived using the age and sex-specific WHO percentiles reference data 2007.[12] Adolescents were also categorized as underweight, healthy weight, overweight and obese, according to the WHO growth reference data 2007.[12]

PA of the child was assessed using a PA questionnaire for adolescents (PAQ-A)[13] which is a self-administered, nine-item, 7-day self-report recall questionnaire. Each question is scored on a 5-point scale (the 9th item does not factor into the overall score) and combined for a total PA score. Based on the PAQ-A score, the students are classified according to their PA as low with the score of 1–3, moderate with the score of 3–4 and high with the score of 4–5. Sedentary behaviour was assessed using ASAQ.[14] Time spent in five categories of sedentary behaviour and total time being sedentary were calculated for weekdays; weekend days; all days along with SD. Body image was assessed using body shape questionnaire (BSQ)-34[15] which is a self-applied questionnaire with 34 items. Each question is answered on six points Likert scale ranging from never to always. The scores are classified into 4 categories: not worried about body shape <81, slightly worried = 81–110, moderately worried = 111–140, extremely worried >140.Self-esteem was assessed with Rosenberg self esteem (RSE)[16] score which is a ten-item Likert-type scale with items answered on a four-point scale-from strongly agree to strongly disagree. The scale ranges from 0 to 30, with 30 indicating the highest score possible. The higher score suggested of higher self Esteem. Eating attitudes were assessed using eating attitude test (EAT)-26[17] which is a 26-item self-administered. Each item can be rated as 1 of the 6 responses ranging from 'never' to 'always' and individuals are classified having a normal attitude (score <20) or they have an disordered eating (score >20).

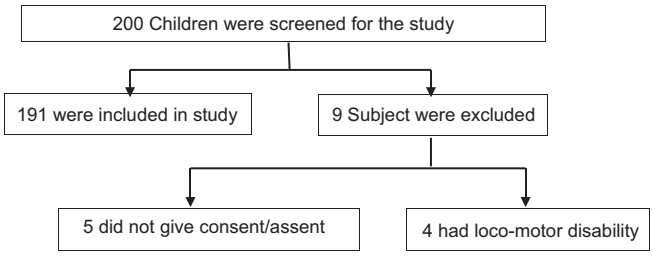
All data collected was entered into Microsoft Excel software and was analysed by SPSS version 20 (SPSS Inc., Chicago, IL, USA). Descriptive analysis was done, calculating mean and SD for continuous variable and proportions for the categorical variable. Confidence intervals (95% CI) were calculated for each variable, $P < 0.05$ were considered statistically significant. Co-relation and regression linear analysis of various variables was also done.

Results

During the study period, a total of 191 children were included in the study after meeting inclusion and exclusion criteria as shown in the Flowchart 1.

The results of various parameters are shown in Table 1.

The mean age of the sample was 15.2 years (SD = 1.39) with almost equal gender distribution (54.45%-male, 45.55%-female). The one-fourth of the children were underweight with rest being in normal weight range in both male and females. One study participant was overweight with none being obese.



Flowchart 1: During the study period, a total of 191 children were included in the study after meeting inclusion and exclusion criteria as shown in the flowchart

Three fourth (77%) of the children had low PA. The girls were relatively more inactive (83.9% girls vs. 72.1%boys). Both boys and girls spent nearly 10 h on sedentary behaviours. Small screen recreation (TV, computer, mobile) accounted for a major share of sedentary behaviour among the subjects.

Table 1: The results of various parameters

Characteristic	*n* (%)
Sex	
Male	104 (54.45)
Female	87 (45.55)
BMI	
Underweight	47 (24.61)
Normal weight	146 (74.87)
Over weight	1 (0.52)
Physical activity (PAQ-A)	
Low	148 (77.49)
Moderate	38 (19.90)
High	5 (2.62)
Body image (BSQ-34)	
No concern	172 (90.05)
Mild concern	13 (6.81)
Mod concern	4 (2.09)
Marked concern	8 (4.29)
Self-esteem (RSE)	
Low	1 (0.52)
Normal	97 (50.79)
High	93 (48.69)
Eating attitude (EAT-26)	
Normal	146 (76.44)
Disordered eating	45 (23.56)

BMI: Body mass index; PAQ-A: Physical activity questionnaire for adolescents; BSQ: Body shape questionnaire; RSE: Rosenberg self-esteem; EAT-26: Eating attitude test-26

Most (90.05%) subjects did not have any concerns related to body image. Almost all the subjects had normal or high self-esteem. Nearly one-quarter of the subjects (23.56%) subjects had disordered eating behaviours.

The low PA was associated with increase in sedentary behaviour (Pearson correlation coefficient *(r* = 0.424, *n* = 191, *P* ≤ 0.005).

Increases in sedentary lifestyle were found to be correlated with a decrease in (BSQ) body image scores (Pearson correlation coefficient (*r* = −0.165, *n* = 191, *P* = 0.023).

BMI values were found to be negatively related to eating scores (Pearson correlation coefficient *r* = −0.181, *n* = 191, *P* = 0.010) indicating that lower the BMI more are the chances of having disordered eating. BMI scores were positively related to body image scores (Pearson correlation coefficient *r* = 0.157, *n* = 191, *P* = 0.03) indicating the higher the BMI better is the body image.

Multiple linear regression analysis was done by various parameters as dependent and independent variable for boys and girls separately [Table 2].

Table 2: Regression linear analysis of variables

Dependent variable	Independent variable	Female			Male		
		B±SE	*P*	95% CI	B±SE	*P*	95% CI
PAQ-A	BMI *Z* score	0.031±0.043	0.468	−0.054-0.117	−0.016±0.033	0.638	−0.082-0.050
	RSE	−0.020±0.020	0.329	−0.060-0.020	0.000±0.013	0.978	−0.025-0.026
	EAT-26	0.012±0.005	0.036	0.001-0.022	−0.001±0.003	0.780	−0.008-0.006
	ASAQ	0.321±0.065	0.000	0.192-0.450	0.278±0.061	0.000	0.156-0.400
	BSQ-34	0.002±0.002	0.443	−0.002-0.006	0.005±0.003	0.098	−0.001-0.011
BSQ-34	RSE score	1.156±1.096	0.294	−1.024-3.336	−0.507±0.427	0.237	−1.355-0.340
	EAT-26 score	0.762±0.289	0.010	0.187-1.336	0.209±0.115	0.071	−0.018-0.437
	PAQ-A score	4.607±5.980	0.443	−7.292-16.505	5.548±3.324	0.098	−1.048-12.144
	BMI *Z* score	5.076±2.252	0.027	0.594-9.557	1.179±1.105	0.289	−1.014-3.373
	ASAQ score	−7.059±3.921	0.076	−14.862-0.743	−1.568±2.249	0.487	−6.030-2.895
RSE	EAT-26 score	0.009±0.030	0.763	−0.051-0.069	0.057±0.027	0.034	0.004-0.111
	PAQ-A score	−0.590±0.601	0.329	−1.786-0.606	0.021±0.792	0.978	−1.550-1.593
	BMI *Z* score	0.214±0.233	0.360	−0.249-0.677	0.281±0.260	0.282	−0.234-0.796
	ASAQ score	−0.286±0.402	0.478	−1.085-0.513	0 450±0.528	0.396	−0.597-1.497
	BSQ-34score	−0.012±0.011	0.294	−0.010-0.034	−0.028±0.024	0.237	−0.075-0.019
EAT-26	PAQ-A score	4.589±2.157	0.036	0.296-8.882	−0.818±2.919	0.780	−6.610-4.974
	BMI *Z* Score	−2.584±0.808	0.002	−4.192-−0.976	−1.71±1.947	0.074	−3.591-0.169
	ASAQ score	−1.088±1.472	0.462	−4.017-1.841	−0.4321±0.952	0.825	−4.307-3.442
	BSQ-34score	0.104±0.039	0.010	0.026-0.182	0.157±0.086	0.071	−0.014-0.328
	RSE score	0.123±0.407	0.763	−0.687-0.933	0.781±0.364	0.034	0.058-1.503
BMI *Z* score	ASAQ score	0.064±0.191	0.737	−0.316-0.445	0.216±0.204	0.291	−0.188-0.620
	BSQ-34score	0.012±0.005	0.027	0.001-0.022	0.010±0.009	0.289	−0.008-0.028
	RSE score	0.048±0.053	0.360	−0.056-0.153	0.042±0.039	0.282	−0.035-0.119
	EAT-26 score	−0.043±0.014	0.002	−0.070-0.016	−0.019±0.010	0.074	−0.040-0.002
	PAQ-A score	0.209±0.286	0.468	−0.361-0.778	−0.144±0.306	0.638	−0.751-0.463

SE: Standard error; CI: Confidence interval; BMI: Body mass index; PAQ-A: Physical activity questionnaire for adolescents; BSQ: Body shape questionnaire; RSE: Rosenberg self-esteem; EAT-26: Eating attitude test-26; ASAQ: Adolescent sedentary activity questionnaire

PA is positively dependent on EAT 26 score and ASAQ score (Sedentary score) in girls, whereas in males ASAQ (sedentary score) score was the only variable related to PA (Patient Scar Assessment Questionnaire) score.

BSQ34 (body image score) was not statistically significantly associated with any variable in boys, whereas in girls EAT 26 score and BMI Z-score positively contributed to BSQ34 (body image score).

In respect to RSE (self-esteem score), none of the studied variables was significantly related to self-esteem score in girls whereas weak relationship was found with EAT score in boys ($P = 0.034$).

In our analysis, BMI Z-score was negatively related to an EAT-26 score in girls whereas this relation was not significant in boys.

A positive relation was also found between BMI Z-Score and body image score (BSQ34) in girls signifying that higher BMI Z-Score improve the body image score (BSQ34). It should be noted that none of the studied subjects had obesity and only one was overweight.

A *t*-test [Table 3] was conducted using low PAQ-A and mod/high PAQ-A as the independent variable and EAT Score, BSQ-34, RSE score and BMI Z-Score as a dependent variable.

There was a significant difference observed in score for low PAQ-A (M-14.04, SD-11.54) and high PAQ-A (M-33.00 SD-24.04) with EAT-26 score; t (189) = −2.290, $P = 0.023$, CI = −35.29 to −2.62.

Discussion

Our study showed that the majority (77.5%) of the adolescents are involved in nil or very low PA assessed by PAQ-A scale, both during school hours and after school hours.

As per WHO, 81% of school going adolescents are insufficiently physically active globally.[18] School going adolescent are less active with 84% boys and 78% girls not meeting WHO recommendations.[18] Adolescents from the WHO South-East Asia Region showed by far the lowest prevalence of insufficient PA (74%). The observations made in our study strongly support the global low levels of PA among adolescents.

The majority of children in the study had nil or little concern about their body image (90.1%) and had either normal or high self-esteem (99%) in both boys and girls which is similar with earlier studies. Morin *et al.*[19] in their 4-year longitudinal study revealed that the relationship between self-esteem and body appearance remained high and stable amongst the adolescent population. Though on the global level,[20-23] there is an increasing dissatisfaction with body image which is leading to reduced self-esteem and few other studies like Singh *et al.*[24] found only 38% of adolescents perceiving their body image as normal. Shah *et al.*[25] are of opinion that more girls are not satisfied with their body image as compared to boys.

It is noteworthy that despite being so inactive, they did not have any concerns about body image and self-esteem. This reflects that physical inactivity is hardly a concern for self-esteem and body image.

Both girls and boys are spending approximately 50% of their leisure time using small screen recreation (TV, computer, mobile) in sedentary behaviour. Boys (10.5 h/day, SD = 3.9, $P = 0.000$) are spending more time on small screen than girls (9.7 h/day, SD = 3.8, $P = 0.000$), as found by other authors.[26,27]

With using the eating score (EAT-26), 23.56% students were defined as having disordered eating attitudes. Comparing results from other studies which showed the prevalence of disordered eating as US: 22%–26%, Canada: 16%, Japan: 35%, South Africa: 21.2%, Turkey: 45.2%, Singapore: 10.5%. Our results are comparable to these.[28] The disordered eating habits co-related negatively to BMI score ($r = −0.181$, $n = 191$, $P = 0.12$).

Table 3: *T*-test for independent sample

	Mean±SD		*P*	95% CI
	Low PAQ-A	Mod/high PAQ-A		
BSQ-34 score	56.81±21.20	85.50±37.47	0.006	−58.57-1.20
RSE score	25.39±3.10	23.00±2.82	0.280	−1.95-6.73
EAT-26 score	14.04±11.54	33.00±24.04	0.023	−35.29-−2.62
BMI *Z* score	−1.11±1.30	−0.050±0.707	0.512	−2.42-1.21

SD: Standard deviation; CI: Confidence interval; BSQ: Body shape questionnaire; RSE: Rosenberg Self Esteem; EAT-26: Eating attitude test-26; BMI: Body mass index; PAQ-A: Physical activity questionnaire for adolescents

Conclusion

PA, body image, self-esteem and eating attitude are related to each other and probably mediated by similar psychological traits[29] both in boys and girls. Even though the majority of the adolescents have normal eating attitudes, significant numbers (26%) appear to have disordered eating and need proper counselling to prevent the progress of an eating disorder.

Normal weight and under-weight boys and girls have minimal PA but did not have any concerns about body image and self-esteem, which suggest that physical inactivity is hardly a concern for self-esteem and body image. This finding can guide us in designing the publicity campaign for the promotion of PA among adolescents.

PA, body image, self-esteem and disordered eating behaviour should be assessed in all clinical interactions with adolescents. Early detection of abnormality in these attributes should alert us to assess these adolescents in detail and to follow them to prevent the development of eating disorders.

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Conflicts of interest

There are no conflicts of interest.

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