

# Influences of role models and other factors on physical activity amongst 6 to 16 years overweight and obese students

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## ABSTRACT

**Background:** Physical activity is an essential aspect of living a healthy lifestyle, which offers a myriad of benefits for both the body and the mind. Nonetheless, a family history of obesity can pose significant challenges to achieving and maintaining a healthy weight, which is further exacerbated by the academic stress. Individuals who have a role model that prioritizes physical activity are more likely to develop positive and healthy habits in their lives. **Objectives:** The study aimed to examine how role models affect physical activity and its impact on addressing challenges of family obesity history and academic stress in school children. **Methods:** This cross-sectional study was conducted from October 2019 to April 2020 in three schools in Amritsar district selected by lottery method of simple random sampling. Out of 4226 students, 355 overweight and obese students were interviewed regarding their physical activity. An informed written assent and consent was taken from the children and guardians respectively. Mothers of 6 to 11-year-old students and students aged 12 to 16 were interviewed using a pre-designed, validated, semi-structured questionnaire. **Results:** 51.3% had a family history of obesity while 14.9% and 14.6% of parents of overweight students had hypertension and diabetes, respectively. Over half (52.7%) lacked interest in physical activity and almost 33.5% of males were inactive. Students who chose movie actors as role models (71.1%) and those who found their role models' information reliable (83.2%) were more likely to participate in physical activity. Of the 247 students who were knowledgeable about healthy living, a significant majority of 70.4% engaged in physical activity while 76% of overweight/obese students reported academic stress as a barrier. **Conclusions:** Study shows majority engage in physical activity regardless of gender. Over 70% have family history of obesity and healthy lifestyle knowledge. Stress reduces physical activity and students with movie/sports/fitness role models have better activity levels. Reasons for not engaging included dislike for sports and lack of time.

**Keywords:** Pediatric obesity, physical inactivity, family health history, mentorship

## Introduction

Childhood obesity has become a significant public health concern in recent years, with over 340 million children and adolescents

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aged 5–19 being reported as overweight or obese.<sup>[1]</sup> One of the leading causes for the same is the lack of physical activity and paradigm shift to a sedentary lifestyle, which increases the risk for mental stress, hypertension, type 2 diabetes, and so on. Family history also plays a role in physical activity and childhood obesity. Children with a familial history of obesity are more prone to developing the condition themselves, and they may struggle to adopt healthy habits, especially regular physical activity.<sup>[2]</sup>

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For 5–17-year-olds, World Health Organization (WHO) recommends 60 min per day of moderate-to-vigorous-intensity physical activity, which can involve walking, cycling, recreational sports, and active play across the week.<sup>[3]</sup> However, the new WHO Global status report on physical activity found that 81% of adolescents aged 11–17 years do not meet these recommended levels of physical activity needed to sustain good health and well-being.<sup>[4]</sup>

Children and adolescents often look up to their parents, teachers, and other important figures as sources of inspiration and guidance who act as role models.<sup>[5]</sup> When they see the people they admire engaging in physical activity and reaping its benefits, they are more likely to adopt these habits themselves.<sup>[6,7]</sup> Therefore, children with positive role models are less likely to become overweight or obese.<sup>[8]</sup>

One way that role models can encourage physical activity is by participating in physical activity themselves and make the same more enjoyable and appealing to children.<sup>[9]</sup>

In addition to promoting physical activity, role models can educate children about the benefits of physical activity. By teaching children about the importance of being active for their physical and mental health, role models can help to instill a lifelong commitment to physical activity.<sup>[10]</sup> However, the information given is often under scrutiny for its reliability.

With this in mind, the objective of this study was to see the influence of role models on physical activity amongst 6 to 16 years overweight and obese students.

## Materials and Methods

**Study Design:** This was an observational cross-sectional study.

**Study Setting:** The study was carried out in schools from these areas in Amritsar, that is, peri-urban, urban, and rural.

**Study Population and Study Duration:** The body mass index (BMI) of all students in the three schools was computed, and 355 overweight and obese students between the ages of 6 to 16 years were chosen. The study was conducted in the period between October 2019 and April 2020.

**Sampling Technique:** A list of schools with strength more than 1000 students was procured from the education department, and it was divided into three categories according to their location. Three schools were selected by the lottery method of simple random sampling. The principal investigator, with the assistance of the class in charge, created another list of students aged 6 to 16 from the three selected schools.

### Sampling Criteria

#### a. Inclusion Criteria

Students in the age group of 6–16 years who were willing to participate and those who gave written informed assent from parents/consent for the study were included in the study.

#### b. Exclusion Criteria

Those students who were not available even after the 3rd visit were excluded from the study.

**Study Tool:** The information was collected on a semi-structured, pre-designed questionnaire which included the questions about participants' socio-demographic profile, their involvement in physical activity, reasons for abstaining from it, and the effect of their role models on the same. Additionally, the questionnaire also sought to assess participants' awareness regarding healthy lifestyle choices and impact of parents' co-morbid conditions on their physical activity habits. Before this study, the questionnaire was validated for accuracy and reliability, and a pilot study involving a separate sample of 50 students, distinct from the sample chosen for the main study, was conducted to identify and address any potential issues before starting the actual study. Face-to-face interviews were also conducted for collection of data. Furthermore, the weight and height were measured using the calibrated weighing scale and measuring tape, respectively. Those were standardised from time to time. Those students who were involved in physical activity at least 60 minutes per day across the week and vigorous activity for at least 3 days week were taken as adequate.

**Method of Data Collection:** The information was collected on a semi-structured, pre-designed questionnaire by interviewing the mothers of students between 6 and 11 years of age and the students of 12–16 years. The principal investigator personally collected the data, which ruled out the possibility of inter-observer variation. The height and weight of each student were measured. The weight of the participants of the study was measured with an ISI marked analogue weighing machine calibrated up to 100 g with minimum clothing and without shoes. The student was asked to stand still on the middle of the scale without leaning or holding on to anything. The height was measured in centimetres up to the accuracy of 0.1 cm with the help of ISI marked measuring tape. The head was directed parallel to the floor to minimise any error on the part of the investigator. Calculation of BMI was done as per the equation:  $BMI = \text{Weight (in kg)} / \text{Height (in m)}^2$ . The students were classified into normal, overweight, and obese based on the WHO BMI Charts as per age and gender.<sup>[11]</sup>

**Statistical Methods:** The information was collected and recorded in Microsoft Excel 2019. Data was cleaned, descriptive and inferential statistics were applied, and valid conclusions were drawn. Chi-square test was applied, and a value less than 0.05 was taken as significant.

**Ethical Consideration and Clearance:** Ethical consideration and clearance before data collection were obtained from

the Institutional Ethical Committee. An informed written assent was taken from the mothers. The study was granted permission by Institutional Ethic Committee vide letter no BFUHS/2K19p-TH/862 dated – 16.09.19.

### Results

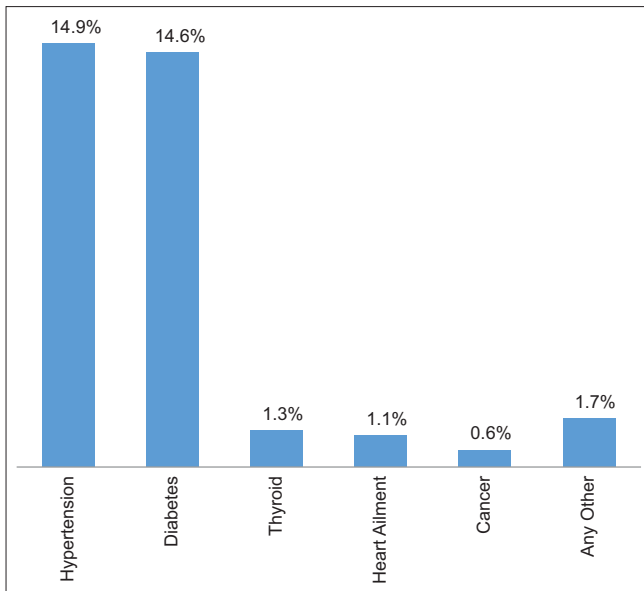
In the study, 355 participants were included. Of these, 189 (53.2%) were overweight and 166 (46.8%) were obese. Among the obese participants, 53 were females, and among the overweight participants, 102 were males. Males (33.5%) had a higher incidence of insufficient physical activity as compared to females (27.1%) [Table 1]. A positive family history regarding obesity was found in 182 students (i.e., 51.3%). Compared to children in peri-urban and rural schools, a greater percentage of students in urban schools (71.6%) reported insufficient physical activity. Students from nuclear households (69.1%) and those whose head of the family were more educated (75%) participated in physical exercise less frequently, while

Sikh religion students showed greater involvement in the same (72.1%). A trend was also revealed where a higher percentage of students were physically inactive (57.4% to 76.3%), with early adolescents showing the highest incidence of insufficient physical activity.

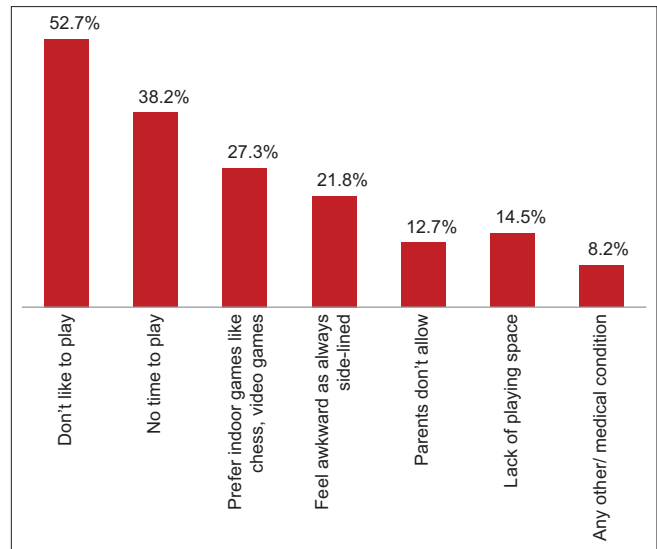
Many parents of over-nourished students had hypertension, with a proportion of 14.9%, closely followed by those affected by diabetes at 14.6% [Figure 1]. Our study results showed that out of 247 students who were aware of the healthy lifestyle, the majority, that is, 70.4%, were involved in physical activity. In the present study [Figure 2], 52.7% reported that they preferred not to be involved in any type of physical activity, while 12.7% stated lack of parental support. The study found that a majority of the overweight and obese students, that is, 76.6%, reported academic stress as a barrier to their physical activity. It was observed that out of the 152 students who chose movie actors as their role models, the majority, that is, 71.1%, were actively involved in physical activity. This was followed by 65.2% students

**Table 1: Distribution of overweight and obese students according to different variables**

Variable	Physical Activity		Total	$\chi^2$	P
	Yes, n (%)	No, n (%)			
Gender				1.5965	0.2064
Female	102 (72.9)	38 (27.1)	140 (100)		
Male	143 (66.5)	72 (33.5)	215 (100)		
School Area				3.276	0.194
Peri-Urban School	71 (30.1)	165 (69.9)	236 (100)		
Urban School	25 (28.4)	63 (71.6)	88 (100)		
Rural School	14 (45.2)	17 (54.8)	31 (100)		
Type of Family				0.001	0.977
Nuclear	51 (30.9)	114 (69.1)	165 (100)		
Joint	59 (31.1)	131 (68.9)	190 (100)		
Religion				2.73	0.256
Hindu	113 (67.3)	55 (32.7)	168 (100)		
Sikh	124 (72.1)	48 (27.9)	172 (100)		
Other Religions	8 (53.3)	7 (46.7)	15 (100)		
Education Status of the Head of Family				8.710	0.191
High School and Below	4 (25)	12 (75)	16 (100)		
Diploma and above	106 (31.3)	233 (68.7)	339 (100)		
Occupational Status				2.903	0.715
Professional	86 (29.9)	202 (70.1)	288 (100)		
Skilled	21 (38.9)	33 (61.1)	54 (100)		
Unemployed - Unskilled	3 (23.1)	10 (76.9)	13 (100)		
Age Category				11.169	0.004
Childhood (6-9 years)	46 (42.6)	62 (57.4)	108 (100.0)		
Early Adolescent (10-13 years)	42 (23.7)	135 (76.3)	177 (100.0)		
Middle Adolescent (14-16 years)	22 (31.4)	48 (68.6)	70 (100.0)		
History Of Obesity in Family				1.5342	0.2155
Yes	131 (72)	51 (28)	182 (100)		
No	114 (65.9)	59 (34.1)	173 (100)		
Healthy Lifestyle Knowledge				0.7777	0.3778
Yes	174 (70.4)	73 (29.6)	247 (100)		
No	71 (65.7)	37 (34.3)	108 (100)		
Stress Due to Studies				33.3036	<0.00001
Yes	63 (23.2)	209 (76.8)	272 (100)		
No	47 (56.6)	36 (43.4)	83 (100)		



**Figure 1:** Distribution of overweight and obese students according to their parent's co-morbid conditions\* (n = 355). \*Multiple choices were allowed in this question



**Figure 2:** Distribution of overweight and obese students according to the reasons provided for non-involvement in physical activity (n = 110). \*Multiple choices were allowed in this question

**Table 2: Distribution of overweight and obese students according to their role models and physical activity (n=330)**

Fitness role model	Physical activity		Total n (%)
	Yes n (%)	No n (%)	
Movie Actors	108 (71.1)	44 (28.9)	152 (100)
Sports Person	73 (65.2)	39 (34.8)	112 (100)
Any Other (Parents, Teachers)	16 (47.1)	18 (52.9)	34 (100)
Fitness Trainer	27 (84.4)	5 (15.6)	32 (100)
Total	224 (67.9)	106 (32.1)	330 (100)

The chi-square statistic is 11.830. The P=0.008. The result is significant at P<0.05

actively being involved in the physical activity who looked up to sports persons as their role models, the findings of which were statistically significant [Table 2]. Our study findings suggest that a substantial proportion of students who perceived the information from their role models as reliable were observed to be actively involved in physical activity, with 83.2% of them participating in such. It is noted that the students' perceptions of the reliability of the information provided by their role models were based on their own assessment [Table 3].

## Discussion

Gender variations can affect how much children participate in physical activity, which is important for lowering childhood obesity. According to the results of our study, of the total 355, 110 participants were physically inactive, which was statistically significant. The proportion of physically active individuals was found to be higher among females (72.9%) compared to males (66.5%). However, the findings of our study contrast with previous research conducted by Rani *et al.*<sup>[12]</sup> in Chennai and Aniza *et al.*<sup>[13]</sup> in Malaysia, who reported higher levels of physical activity among males compared to females. The probable reason

could be due to involvement of different geographical settings and age groups. In Punjab, many people are landholders, where son preference is deeply embedded. The region is also known for having one of the lower female-to-male sex ratios, contributing to the strong son preference. Such attitudes and gender roles are nurtured in their upbringing, resulting in males being mostly confined to sedentary activities and being less involved in physical activity. Consequently, they become habituated to this lifestyle. Cultural and societal factors greatly influence physical activity patterns among males in Punjab. More research is needed to understand regional variations and their impact on activity behaviours compared to previous studies.

Physical activity plays a crucial role in a child's development, and parental education on this subject is key to promoting a healthy and active lifestyle. It was also seen that roughly 31% of students, whose parents had a higher level of education, were similar to the results of the study by Gulati *et al.*,<sup>[14]</sup> though the association was insignificant.

The complex landscape of children's health and well-being intersects with age groups, physical activity, and childhood obesity. The proportions of kids who had engaged in physical activity were 23.7% for early adolescents and 31.4% for the middle adolescent age group, which is statistically significant. The results however contrast from the study conducted by Li *et al.*<sup>[15]</sup> owing to different geographical settings of the quoted study.

In addition to lack of physical activity, having a family history of obesity is a recognised risk factor for developing obesity in children. A positive family history was found in 182 (i.e., 51.3%). In a study by Marwah *et al.*,<sup>[16]</sup> it was reported that the family history of obesity in obese children was found to be in the majority, the results of which are similar to our study. The results

**Table 3: Distribution of students in regard to physical activity vis-a-vis their perception about the reliability of adv given by role models (n=330)**

	Advise given by role models			$\chi^2$	P
	Reliable	Not Reliable	Total		
Physical Activity					
Adequate	40 (67.8)	19 (32.2)	59 (100)	34.334	0.000
Inadequate	84 (50.9)	81 (49.1)	165 (100)		
No Physical Activity	25 (23.6)	81 (76.4)	106 (100)		
BMI Category According to Area					
OBESE – Peri-Urban	40 (35.4)	73 (64.6)	113 (100)	17.397	0.004
OBESE – Rural	2 (20)	8 (80)	10 (100)		
OBESE – Urban	13 (41.9)	18 (58.1)	31 (100)		
OVERWEIGHT – Peri-Urban	66 (59.5)	45 (40.5)	111 (100)		
OVERWEIGHT – Rural	11 (52.4)	10 (47.6)	21 (100)		
OVERWEIGHT – Urban	17 (38.6)	27 (61.4)	44 (100)		

were however not in concordance with the studies conducted by Macwana *et al.* in 2016<sup>[17]</sup> and Jain *et al.*<sup>[18]</sup> in Rajasthan, who stated that 20.3% and 26.4% had family history of obesity, respectively. The reason for the difference in both the findings could be attributed to the inclusion of all students irrespective of their weight, while the current study included only overweight and obese students.

Regular physical activity can help reduce the risk of childhood obesity, especially in cases where there is a history of parents' comorbid conditions. It was also observed that a large number of the parents of over-nourished students had hypertension, with a proportion of 14.9%, closely followed by those affected by diabetes at 14.6%, which is not in concordance with the study conducted by Deshpande *et al.*,<sup>[19]</sup> which could be due to geographical and time period variations in the quoted study.

Achieving a healthy lifestyle not only involves more than just maintaining a balanced diet but also requires a comprehensive understanding of the significance of regular physical activity. Our study results showed that out of 247 students who were aware of the healthy lifestyle, the majority, that is, 70.4%, were involved in physical activity.

Despite the well-known health benefits of physical exercise, many children still tend to procrastinate it. The present study, 52.7%, reported that they preferred not to be involved in any type of physical activity, while 12.7% stated lack of parental support. This is nearly in concordance with a study conducted by Anjali *et al.* 2018<sup>[20]</sup> among students who quoted personal and social reasons, and among them was the discouragement by parents as the latter prioritise academic success over exercise. In another study conducted by Balaji SM *et al.*,<sup>[21]</sup> it was revealed that a significant portion, that is, 75%, of the subjects without access to a nearby playing area were found to have inadequate physical activity levels. It is possible that the variation in the results from our study was a result of the study's focus on a distinct age group.

Physical activity has been shown to play a vital role in reducing the negative effects of academic stress, providing a potential pathway

to better physical and mental health outcomes. Nevertheless, our study found that a majority of the overweight and obese students, that is, 76.6%, reported academic stress as a barrier to their physical activity, which was found to be statistically significant. The results, however, are not similar to the study conducted by Balaji SM *et al.* (2018),<sup>[21]</sup> where 52% of the students reported the same. The probable difference in the results could be due to the involvement of a different age group in the quoted study.

Positive role models who emphasise the importance of physical activity can help prevent childhood obesity by encouraging children to engage in regular physical activity. It was observed that 71.1%, students who chose movie actors and 65.2% students who looked up to sports persons as their role models were actively being involved in the physical activity, the findings of which were statistically significant. However, the parents did not play as significant role models, which was in concordance with the studies which concluded that 40% and 53.5% of the parents were classified as healthy and unhealthy role models, respectively.<sup>[22]</sup> Also, in another study, it was seen that 18% professional athletes were reported under the role model category for physical activity, which differs from our results. This could be due to the involvement of an older age group, indicating possible differences in cultural influences across generations.<sup>[23]</sup> In Punjab, one of the states with high obesity rates (NFHS 5),<sup>[24]</sup> both parents and children are struggling with weight issues, possibly due to the prevalence of energy-dense foods. Moreover, it was noticed that mothers often deny the true nature of their children's weight, with some perceiving their obese or overweight child as having a normal weight. This perception may dissuade or hinder their involvement in encouraging their children to participate in physical activities.

Positive role models who provide reliable information about the importance of physical activity can potentially prevent childhood obesity by promoting regular physical activity among children. Our study findings suggest that a substantial proportion of students who perceived the information from their role models as reliable were observed to be actively involved in physical activity, with 67.8% of them participating in such and found to be statistically significant. It is noted that the students' perceptions

of the reliability of the information provided by their role models were based on their own assessment.

Regarding urban, peri-urban, and rural contexts, there are differences in the validity of advice given by role models, whether they are obese or overweight. It was revealed that in peri-urban areas, students perceive the role models as reliable sources of information with 35.4% reliability, while in rural areas, this drops to 20%. In urban areas, the reliability is intermediate at 41.9%. For the overweight category, peri-urban areas find role models reliable at 59.5% and rural areas and urban areas at 52.4% and 38.6%, respectively. The association was found to be statistically significant.

Our findings support the notion that positive role models can play a crucial role in promoting physical activity among overweight and obese students. The significant association between role models and physical activity highlights the importance of providing children with inspiring and reliable figures to look up to. Despite having a family history of obesity, the students in our study showed a remarkable willingness to engage in physical activity when positively influenced by role models. This finding highlights the powerful impact that inspiring role models can have in motivating children to adopt healthy behaviours and overcome potential barriers

### Limitations of the Study

Firstly, the cross-sectional nature of the study is a significant limitation which limits ability to establish causal relationships between role models, physical activity, and childhood obesity. Cohort studies would be more appropriate to better understand how role models influence physical activity habits over time and their impact on obesity outcomes. Additionally, the reliance on self-reported measures of physical activity is another limitation which may lead to recall bias and social desirability bias, affecting the accuracy of physical activity data. Students did not have smart watches, and they may have overestimated or underestimated the number of steps they take, leading to inaccurate step count estimates, and therefore, the data are based upon their perception of physical activity. Furthermore, the sampling technique used in the study may introduce selection bias due to excluding smaller schools and other regions, limiting external validity. It is also important to consider potential confounding variables that were not accounted for in the analysis. During the study, students may have been less involved in physical activity due to exam-related stress and long hours of sitting. Lastly, the reliance on a semi-structured, pre-designed questionnaire may not provide in-depth insights, utilising qualitative methods could have offered richer information.

Coming to strengths, the study employs a thorough methodology, including validated questionnaires and ethical clearance, ensuring the reliability of findings. Thorough examination of the several factors affecting children who are overweight or obese yields important information for successful intervention plans.

## Conclusion

The study results indicated that a significant number of individuals, irrespective of gender, regularly engaged in physical activities, despite having a family history of obesity. More than 70% of the participants had a good understanding of healthy lifestyle. However, it was found that heightened levels of stress adversely impacted physical activity participation. The study also highlighted that those who looked up to celebrity actors, sports personalities, or fitness experts as their role models displayed better physical activity levels compared to others. These findings provide valuable insights into the factors that influence physical activity behaviour and underscore the potential impact of positive role models in promoting healthy lifestyles.

### Suggestions

To leverage the positive impact of role models on physical activity through long-chain communication, motivating students, and maintaining the target of low weight, we can engage local athletes, sports personalities, and gym trainers to interact with students. They can share their personal experiences and success stories and emphasise the importance of staying active. Additionally, leveraging social media, schools and organisations can collaborate with positive influencers promoting healthy living and physical activity to resonate with children and adolescents. The syllabus curriculum should include stories of renowned athletes and role models who credit their achievements to regular physical activity and can further inspire students. Lastly, conducting long-term research to assess the sustained impact of role models on physical activity in schools will aid in maintaining low weight targets and keeping students motivated.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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