International Journal of Sport, Exercise and Health Research

Research Article

IJSEHR 2024; 8(1): 11-14

www.sportscienceresearch.com
Received: 03-12-2023
Accepted: 10-02-2024
DOI: 10.31254/sportmed.8103

Body height impact on cardiorespiratory fitness among physically active adult

***Anindya Bhowmik*[1]**

[1] *State Aided College Teacher, Department of Physical Education, Seva Bharati Mahavidyalaya, Jhargram, West Bengal, India*

Abstract

Background: Physical exercise is the major key to aerobic or cardiorespiratory fitness for all ages. It is affected by body composition, body mass index and physical stature. Objective: the objectives of the study was to compare cardiorespiratory fitness (CRF) among stature categories of height (SCH) i.e., tall, above medium, medium and low height of physically active adult males and to find an association between height and cardiorespiratory fitness of the subjects. Methods: 84 male physically active subjects, age 21-26 years were randomly included in this study. Body height was measured by stadiometer and Copper 12 minutes run and walk test was conducted to test CRF. Subjects were categorised into four groups as per their height: tall 170-179.9 cm, above medium 167-169.99 cm, medium 164-166.99 cm and low150-163 cm. ANOVA statistical and Pearson correlation were used to test the hypothesis. Result: The sampled subjects were: 26.19% were tall their average height and CRF was 172.14 ± 1.34 and 2518.64 ± 154.20, 20.24 % was above medium their average height and CRF was 167.84 ± 0.70 and 2677.47 ± 216.47, 32.14 % was medium average height was 165.29 ± 0.82 and CRF was 2446.29 ± 251.27 and 21.43 % was low their average height and CRF was of 160.88 ± 2.01and 2379.59 ± 245.81. The study shows relationship between tall height and CRF of r=0.13 p=0.55, between above medium height and CRF r=0.00p= 0.99, between medium height and CRF r=0.34 p=0.86 and between low height and CRF 0.21 p=0.39. All p values are not significant (p<0.05). Conclusion: CRF among SCH showed a significant difference, above medium categories CRF was significant better then medium and low categories of height. Study found no significant relation between CRF and SCH.

Keywords: Stature categories, College Students, Physical education, Aerobic capacity.

INTRODUCTION

Cardiorespiratory fitness is one of the major components of physical fitness. It is the ability of the heart, blood vessels and respiratory organs to supply fuel to the working muscles to generate energy for prolong period that requires continuing the exercise. Physical exercise is one of the major keys to cardiorespiratory fitness. The American Heart Association recommends at least one hundred fifty minutes of moderate intensity exercises or seventy five minutes of vigorous exercises in a week or a combination of both, preferably for cardio-respiratory fitness. Both aerobic and anaerobic physical exercises have unique and collective positive correlations to improve cardio-respiratory fitness.[1] Body height has significant effects on cardiovascular fitness, a systematic review study found body height has an inverse relationship to cardiovascular diseases. The increase body height has significant relation to low blood pressure and low risk of cardiovascular diseases.[2] The risk factors of cardio metabolic disease was reduced with the increase of height of Chines adult, in consent of short stature was high risk factors of cardio metabolic disease.[3] Past studies defined increases of BMI and body fat lead to low cardiorespiratory fitness of youngers.[4] The body fat has more significant effect for reducing vo2 max rather than body height.[5] Research stated taller individual was grater maximum oxygen consumption level rather than shorter individual, however in this study researcher seems taller individual grater maximum oxygen consumption level due to strong lungs capacity and incorporated of physiological factors.[6] The human body height depends on genetic characters, nutrition, economy, occupation, political scenario, socio-economic and geographical condition climate etc. In India average men's height is considered to be 165 cm and 152 cm for women, whereas North Indian adults (age 20–29 years) are taller than the other regions of India and in the case of West Bengal people, men's average height is 163 cm.[7] The body height of the Indian population is distributed as per stature categories i.e., very short <152 cm, short 152.1–162.9 cm, medium 163–172.9 cm, and tall 173-203 cm.[8] A study found a positive relation between body height and economic status. The height was classified as very short (≤149.99 cm), short (150.00–159.99 cm), below medium (160.00–163.99 cm), medium (164.00–166.99 cm), above medium (167.00–169.99 cm) and

***Corresponding author:**
Dr. Anindya Bhowmik
State Aided College Teacher, Department of Physical Education, Seva Bharati Mahavidyalaya, Jhargram, West Bengal, India
Email: anindyak4@gmail.com

tall (170.00 cm).[9,10] The secular trend refers to human height as an increasing matter especially in developed countries. In between 1914 to 2014 the India men average height increase by about 3 cm to reach 165 cm and women by about 5 cm to reach 153 cm. The objectives of the study was to compare cardiorespiratory fitness among stature categories of height (tall, above medium, medium and short) of physically active adult males and to find association between height and cardiorespiratory fitness in physically active adult males.

MATERIAL AND METHODS

Subjects

The male students of B.P.Ed. (Bachelor of Physical Education) course of Seva Bharati Mahavidyalaya, Jhargram, West Bengal were the target population in this study. B.P.Ed course is an under graduate teachers training course, that prepares the trainees to be trained teachers of physical education, sports, games and physical fitness education. The student's age was between 21-26 years old. The random method was used to select the subject, and the number of subjects was defined based on the William G Cochran formula. Populations were considered as 120 and confidence level of 90 %, confidence interval level of 5% was set. A total of 84 male students (N = 84) were included as subjects of the study.

Study Design

It is an observational study. As per stature categories of height (SCH) subjects were classified into four group's tall height was considered 170-179.99 cm, above medium height was considered 167-169.99 cm, medium height was considered 164.00–166.99 cm and short height was considered 150-163cm. [9,10] Cardiorespiratory fitness was compared among the four categories of height and correlation was found between the height categories and the cardiorespiratory fitness of the subjects.

Data Collection

The standing height without foot wear was measured by stadiometer and measurements was taken to the nearest 0.1 cm. The 12 minutes run and walk test was taken to measure cardiorespiratory fitness. The test was conducted on the football field of the respective institution. A square of 50 yards on each side was marked in the field and markers were placed every 10 yards in the marked square area. The total distance in yards covered in 12 minutes was recorded as a score of cardiorespiratory fitness. [11]

Statistical Analysis

ANOVA was analysed among the tall, medium and short height groups to find out better cardiacrespiratory fitness in the four categories of height, Further Pearson correlation was conducted to find correlation between height and cardiac fitness. All the statistical analysis was calculated in the MS Excel 10 version. The level of significant was set at $p<0.05$ in all the cases.

RESULT

Table 1 represents subject's age, height, CRF and SCH. Their average age were 23 ± 1 year, average height were 66.65 ± 2.20 cm, whereas all subjects minimum and maximum body heights were 157.7 cm and 174 cm and their average cardiorespiratory fitness level were 2497.73 ± 240.55 yard. As per SCH among the study subjects (n=84) tall height (170-179.9 cm) subjects were 26.19 %, their average height was 172.14 ± 1.31 cm above medium height (167-169.99 cm) were 20.24 %, average height 167.84±0.70 cm and Medium height (164-166.99 cm) subjects were 32.14 %, average height 165.29 ± 0.82 cm and low height (150-163 cm) subjects were 21.43 % of total study subjects, 160.88 ± 2.01 were their average height.

The table 2 shows comparison of CRF among stature categories of height i.e. tall, above medium, medium and low. The tall height subjects CRF was 2518.64 ± 154.20 yards, height above medium subjects CRF was 2677.47 ± 216.97 yards, medium height subjects CRF was 2446.29 ± 251.27 yards and low height subjects CRF was 2379.59 ± 245.81 yards respectively. Their F-value was 5.99 and p-value 0.00, that has significant difference ($p<0.05$) among the height categories.

The post-hoc test table 3, Tukeys HSD (honestly significant difference) shows the CRF was significant difference between above medium and medium height categories and above medium and low height categories. Between the above medium and medium height categories mean difference was 231.17 yards and p-value was 0.00 ($p<0.05$). Between the above medium and low height categories mean difference was 297.91 yards and p-value was 0.00 ($p<0.05$). CRF of above medium height categories was significantly higher than medium and low categories height groups.

The relationship between height and cardiorespiratory fitness shows in Table 4 that there was no significant relationship between the stature categories of height SCH (tall, above medium, medium and low height) and cardiorespiratory fitness ($p<0.05$).

Table 1: Characteristic with Stature Categories of Height among Subjects

Parameters	Frequency	%	Mean ± SD
Age in Years	84	100	23±1
Height	84	100	66.65 ± 2.20
CRF	84	100	2497.73 ± 240.55
Tall Height (170-179.99 cm)	22	26.19	172.14 ± 1.31
Above Medium (167-169.99 cm)	17	20.24	167.84±0.70
Medium Height (164-166.99 cm)	27	32.14	165.29 ± 0.82
Short Height (150-163 cm)	18	21.43	160.88 ± 2.01

Abbreviation: CRF – Cardiorespiratory fitness, SCH – Stature Categories of Height

Table 2: Compare Cardiorespiratory fitness among Stature Categories of Height

SCH	CRF (Mean ± SD)	F-Value	P-Value p<0.05
Tall	2518.64 ± 154.20	5.99	0.00
Above Medium	2677.47 ± 216.97		
Medium	2446.29 ± 251.27		
Low	2379.59 ± 245.81		

Abbreviation: CRF – Cardiorespiratory fitness, SCH – Stature Categories of Height
*Significant level 0.05

Table 3: Post-hoc Tukeys HSD (honestly significant difference) result of Cardiorespiratory Fitness among Stature Categories

Treatments Pair	Mean Difference	Tukey HSD Q Statistic ($Q_{0.05= 3.71)}$	P-value (p<0.05)
Tall Vs Above Medium	158.83	3.23	0.10
Tall VS Medium	72.34	1.47	0.75
Tall Vs Low	139.08	2.83	0.19
Above Medium Vs Medium	231.17	4.71	0.00
Above Medium Vs Low	297.91	6.07	0.00
Medium Vs Low	66.74	1.36	0.77

Tukey HSD Q Statistic ($Q_{0.05}$ = 3.71)

Table 4: Correlation between Height and Cardiorespiratory fitness

Stature Categories of Height (SCH)	Cardiorespiratory fitness (CRF)
Tall	r= 0.13 p=0.55
Above Medium	r=0.00 p=0.99
Medium	r=0.34 p=0.86
Low	r=0.21 p=0.39

p<0.05 = Significant

DISCUSSION

The present study found 26.16 % were tall, 20.24 % were above medium height, 32.14 % were medium height and 21.43 % were low height of the total 84 sampled subjects. The Cardiorespiratory fitness (CRF) of stature categories of height (SCH) was significant difference. The above medium height (167-169.99 cm) CRF was significantly higher than the medium height (164-166.99 cm) and low height (150-163cm). The result of the study is nearly similar to the previous study, where oxygen consumption capacity was better in tall active male subjects and tall young girls subjects than in short height subjects [6,12] There is a chance of cardiometabolic disease in short height, whereas tall height has protective factors for cardiometabolic disease.[3] The study also indicated that in tall height (170-179.9 cm) subjects CRF was not significantly better than the others. The increase in height here did not increase the CRF, Subjects in these stature categories were likely to have low physical fitness, otherwise in the above medium stature categories subjects were more physically active and had a better fitness level. The study findings indicate there was no significant correlation between height and CRF among physically active male students, which is consistent with past study where was no significant correlation between height and cardiorespiratory fitness,[13] the another study inconsistent with this present study where found significant correlation between vo2 max and body height.[14] Syamsuryadin and others concluded no significant correlation between body mass index and cardiovascular fitness among volleyball players.[15]

CONCLUSION

Study concluded the cardiorespiratory fitness among stature categories of height was a significant difference, above medium categories cardiorespiratory fitness was significant better then medium and low categories of height. Study also concluded no significant correlation between cardiorespiratory fitness and stature categories height.

Acknowledgments

The study was self-funded. The author carefully designed the study, followed by the research ethic. The author gratefully acknowledges the institutions and all participants in this study for their kind cooperation in the study's purpose.

Conflict of interest

The author reports no conflicts of interest.

Financial Support

None declared.

ORCID ID

Anindya Bhowmik: https://orcid.org/0000-0003-3212-6444

REFERENCES

1. Patel H, Alkhawam H, Madanieh R, Shah N, Kosmas CE, Vittorio TJ. Aerobic vs anaerobic exercise training effects on the cardiovascular system. World J Cardiol 2017; 9(2): 134-138.
2. Cochran JM, Siebert VR, BatesJ, Butulija D, Kolpakchi A, Kadiyala H, et al. The relationship between adult height and blood pressure. Cardiology 2021;146:345–350.
3. Yuan Y, Zhou B, Wang S, Ma J, Dong F, Yang M, et al. Adult body height and cardiometabolic disease risk: The China National Health Survey in Shaanxi. Frontiers in Endocrinology 2020;11:587616.
4. Vijaykumar N, Vivek P, Jadhav S, Basavaraju K, Badiger S. Influence of body fat, lean body mass, and body mass index levels on maximal oxygen consumption using submaximal exercise in young adults: An observational study. Natl J Physiol Pharm Pharmacol 2021;11(07):683-687.
5. Shah H, Prajapat T, Singh SK. Association of body mass index with vo2 max in Indian adults. Int J Basic Appl Physiol 2016;5(1),155-159.
6. Siahkouhian M, Impact of height on the prediction of maximum oxygen consumption in active young men. Journal of Applied Science 2009;9(12):2340-2343.
7. Mamidi RS, Kulkarni B, Singh A, Secular trends in height in different states of India in relation to socioeconomic characteristics and dietary intakes. Food and Nutrition Bulletin, 2011;32(1):23-34.
8. Gautam RK, Adak DK, Bharati P, Mathur KS, Jhariya J, Kumar P, et al. Human Stature and Development with special reference to Indian population. OIDA International Journal of Sustainable Development 2018;11(9):49-66.
9. Som S, Ulijaszek S, Pal M, Bharati S, Bharati P, Variation in height and bmi of adult Indians. Journal of Biosocial Science 2014;46(1):47-65.
10. Das BM, Deku R, Physical Anthropology Practical, 1st ed, New Delhi: Kitab Mahal;Print Edition 2017.
11. Johnson BL, Nelson JK, Practical measurement for evaluation in physical education, 3rd ed, Delhi:Surjeet Publication;Second Print 1988.
12. Bolboli L, Siahkouhian M, Poorrahim A, Narimani M, Ganji M, Barahmand U, Is the cardiorespiratory Fitness affected by the height of young girls. Kaj. J. Biol 2009;11(11),:1510-1513
13. Razak S, Justine M,, Mohan V, Relationship between Anthropometric Characteristics and Cardiorespiratory fitness among Malaysian Men and Women. Journal of Exercise Rehabilitation 2021;17(1):52-58.
14. Chatterjee S, Chatterjee P, Bandyopadhyay A, Prediction of maximal oxygen consumption from body mass, height and body surface area in young sedentary subjects. Indian J Physiol Pharmacol 2006;50(2): 181–186.
15. Syamsuryadin, Suharjana, Laksmi AR, Dewangga MW, Sirada A, Hutomono S, et al. Correlation between body mass index and cardiovascular fitness of volleyball athletes at athletes training center during the Covid-19 pandemic, J. Med. Chem. Sci. 2022; 5(4):631-636.