



Level of Cardiorespiratory Endurance Among Young Adults in Delhi

¹Alamin Mansuri, ²Shradha Sharma, ³Vivek Singh

¹BPT Student, Banarsidas Chandiwalala Institute of Physiotherapy, New Delhi, India

²BPT Student, Banarsidas Chandiwalala Institute of Physiotherapy, New Delhi, India

³Assistant Professor, Banarsidas Chandiwalala Institute of Physiotherapy, New Delhi, India

Email – alaminmansuri27@gmail.com, shradha.bhardwaj1999@gmail.com, vivek.singh9916@gmail.com

Abstract:

Background - Cardio respiratory endurance is one of the major health indicators. A good cardiorespiratory fitness can prevent major heart complications like premature CVD. Cardio-respiratory fitness (CRF) refers to the ability of the respiratory and circulatory systems to supply oxygen to the muscles during physical activity, enabling the production of energy in the mitochondria. The research on cardiorespiratory endurance provides crucial information for developing effective exercise and lifestyle recommendations for individuals looking to maintain or improve their cardiovascular health.

Method- 98 young adults from age 18 to 25 of both gender in Delhi were included on basis of inclusion and exclusion criteria. Participants were asked to perform 3-minute step test and cooper's test. Both tests were not performed on same the day. In 3- min step test, participant was asked to step up and down on 12-inch stepper in up-up- down -down manner for continuous 3 minutes. In cooper's test, participants were asked to run on 400m track for 12 minutes and total number of lapses were counted and total distance covered was recorded.

Result-

This study found that the mean of the HR2 (3MST) of female participants was 104.83, which falls under the average category for cardiorespiratory fitness. The mean of the distance covered in Cooper's test was 1254.48m, which falls under the poor category. On the other hand, the mean of the HR2 (3MST) of male participants was 93.75, which falls under the above-average category for cardiorespiratory fitness. The mean of the distance covered in Cooper's test was 1730.40m, which falls under the below-average category.

Conclusion- Our study shows that cardiorespiratory endurance of both male and female is significantly low but in comparison between both genders, males have average cardiorespiratory endurance in respect with normative data and were found to perform better than females. The study represents a significant public health problem because low cardiorespiratory fitness during adulthood tends to affect daily activities, and adults with poor CRF are at an increased risk for chronic disease morbidity and mortality.

Key Words: Cardiorespiratory fitness, young adults, 3- minute step test, coopers test, physical fitness, exercise.

1. INTRODUCTION:

Cardiorespiratory endurance is one of the most acknowledged health related indicators and is a major parameter for the same. Cardio-respiratory fitness (CRF) is defined as the capability of our respiratory and circulatory system to supply the demanded oxygen to the muscles mitochondria for energy production during physical activities and exercises. CRF is a predictor of several health markers, such as cardio-metabolic health, premature CVD, and mental well-being. Furthermore, over the last six decades, CRF levels have decreased globally, including in India. While the reasons for this decline are not yet fully understood, it may be due to factors such as increased sedentary time, reduced levels of moderate to vigorous physical activity, an increase in obesity rates, and social and economic changes.^[1] CRF can be directly measured as maximal oxygen consumption (VO₂max), or estimated from peak work rate achieved on a treadmill or cycle ergometer or through non-exercise algorithms. While measured VO₂ is more accurate, estimated CRF derived

from peak work rate is more commonly used, especially in epidemiological studies involving large populations. Both measured and estimated CRF have been found to be highly predictive of health outcomes in numerous studies.^[2]

The World Health Organization points out that decrease in amount of physical activity has become the fourth most important risk factor for global mortality, more than 2 million deaths happen due to lack of physical activity.^[3] The research on cardiorespiratory endurance provides crucial information for developing effective exercise and lifestyle recommendations for individuals looking to maintain or improve their cardiovascular health. Therefore, there is strong need for study of cardiorespiratory parameters in young adults of different ages. The study aims at identifying the level of cardiorespiratory endurance among young adults. The purpose of the study includes creating awareness among the participants about the importance of cardiorespiratory fitness and effects.

2. MATERIALS AND METHOD:

A sample size of 98 individuals fulfilling the inclusion and exclusion criteria were selected. Entire procedure of test and research was explained to the individuals. Written Consent of each individual was taken. Demographic data was collected from the selected participants. Identities of the participants were kept confidential, with participants being assigned an identification number based on the order of survey submission. Two tests were used to measure cardiorespiratory endurance: **I. 3-minute step test** **II. Coopers test**

Each participant performed both the tests. Both test for same individual were not performed on the same day. After collecting data from 98 participants, statistical analysis was performed in terms of the objectives of this study using Microsoft Excel and SPSS software version 22.

In 3- min step test, participant was asked to step up and down on 12-inch stepper in up-up- down -down manner for continuous 3 minutes with the metronome set on 96bpm.

Pulse rate was measured at 4 different time.

- i. Resting pulse rate.
- ii. Measurement just after completion of test within 5 seconds.
- iii. After 1 minute of rest.
- iv. After 2 minutes of rest.



Figure 1. Participant performing 3 min step test.

In coopers test, participants were asked to run on 400m track for 12 minutes and total number of lapses were counted and total distance covered was measured and recorded. They were encouraged to walk for 5 -10 minutes after the test was completed for proper cooling down.

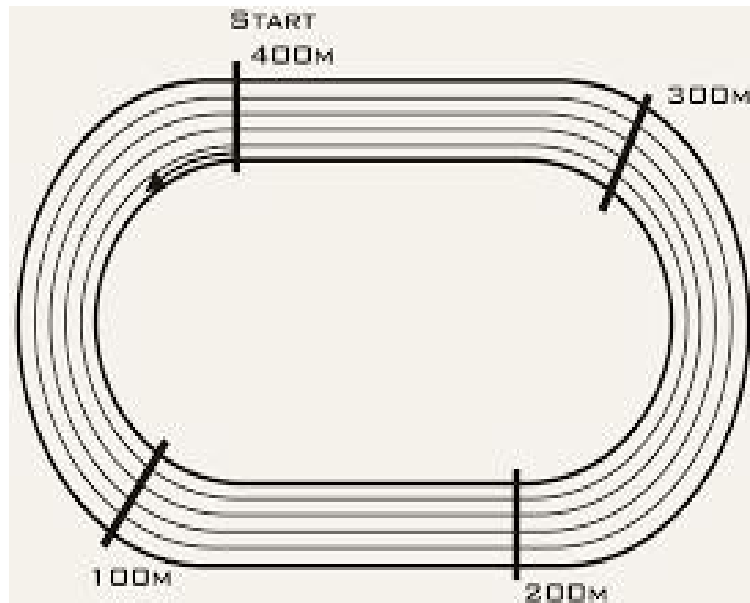


Figure 2. Cooper's test track



Figure 3. Participant performing cooper's test.

3. DISCUSSION:

The results of our study showed that only a small proportion of females (2%) had excellent CRF, while the majority (34.8%) had below-average to poor CRF. These findings are consistent with previous research, which has shown that cardiorespiratory fitness tends to decline with age, and is lower in females compared to males.^[4,5]

The findings of our study reveal that when the cardiorespiratory endurance of females when assessed using Cooper's test, only 8.2% of the female participants were found to have a below average CRF while 91.8% of the female participants had a poor CRF. This data suggests that there is a significant proportion of young adult females in Delhi who have poor cardiorespiratory endurance, which is a cause for concern.

The present study found a high prevalence of poor cardiorespiratory endurance among young adult females in Delhi. The high prevalence of poor cardiorespiratory endurance among females is a cause for concern, and highlights



the need for interventions to improve their cardiorespiratory endurance. Physical activity has been found to be significantly associated with cardiorespiratory endurance among young adults.

Our study found that only 4.1% of the males had excellent cardiorespiratory fitness, while 28.6% had below-average to poor CRF. Cardiorespiratory endurance is a crucial component of overall fitness, and its assessment is essential to understanding an individual's health status.

The results of this study are consistent with previous studies as a study conducted by Zhang et al in China found that only 9.4% of the participants had excellent cardiorespiratory fitness, while 42.7% had poor cardiorespiratory fitness.^[6] The results of our study indicate that a significant proportion of young adults in Delhi have poor cardiorespiratory endurance. Specifically, when males were assessed using Cooper's test, about 77.6% of the participants were found to have below-average CRF, while 22.4% of the participants had poor CRF. These results are consistent with past studies that have reported low levels of cardiorespiratory endurance among young adults in India. The sedentary lifestyle and lack of physical activity are major factors contributing to poor cardiorespiratory endurance. A study conducted in Delhi found that 84.3% of the participants led a sedentary lifestyle. Another reason for the low level of cardiorespiratory endurance among young adults in Delhi is the lack of awareness about the importance of physical activity and fitness. In a study conducted by Singh et al. in 2017, the authors assessed the level of knowledge and awareness about physical activity and fitness among college students in Delhi. The results of the study revealed that only 43.4% of the participants had adequate knowledge about physical activity and fitness.^[7]

4. RESULT:

This study found that the mean HR₂ (3MST) of female participants was 104.83, which falls under the **average** category for cardiorespiratory fitness. The mean distance covered in Cooper's test was 1254.48m, which falls under the **poor** category.

Table 1- Mean data and standard deviation of female participants (n = 49).

	3MST HR ₂ (bpm)	Cooper's Test Distance (m)
Mean	104.83 (average)	1254.48 (poor)
Standard Deviation	14.91133	136.97721
Minimum	66.00 (best)	930.00
Maximum	140.00	1500.00 (best)

On the other hand, the mean HR₂ (3MST) of male participants was 93.75, which falls under the **above-average** category for cardiorespiratory fitness. The mean distance covered in Cooper's test was 1730.40m, which falls under the **below-average** category.

Table 2- Mean data and standard deviation of male participants (n = 49)

	HR ₂	Distance (m)
Mean	93.75 (Above-average)	1730.40 (Below-Average)
Std. Deviation	15.08	252.42
Minimum	68.00 (best)	1080.00
Maximum	126.00	2150.00 (best)

Through in 3MST it was seen that among the female participants, 16.3% of the females were found to have a good HR₂ range showing a good cardiorespiratory fitness (CRF). 24.5% fell under the average category for CRF, while a major percentage (34.8%) had a below average to poor CRF. Only 2% of the females were found to have excellent CRF.

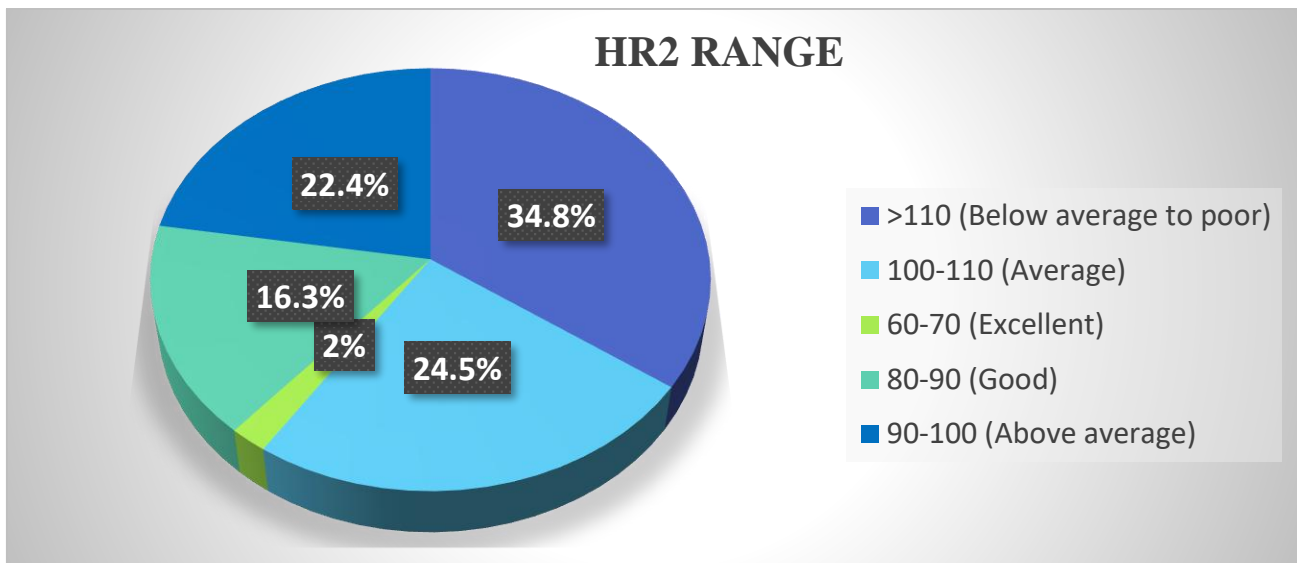


Figure 4: HR₂ (3MST) variations among the female participants.

Whereas in males HR₂ among the participants 18.4% of the males were found to have a good HR₂ range showing a good cardiorespiratory fitness (CRF). 48.9% fell under the average to above-average category for CRF, while 28.6% had a below average to poor CRF. Only 4.1% of the males were found to fall under the excellent category for CRF.

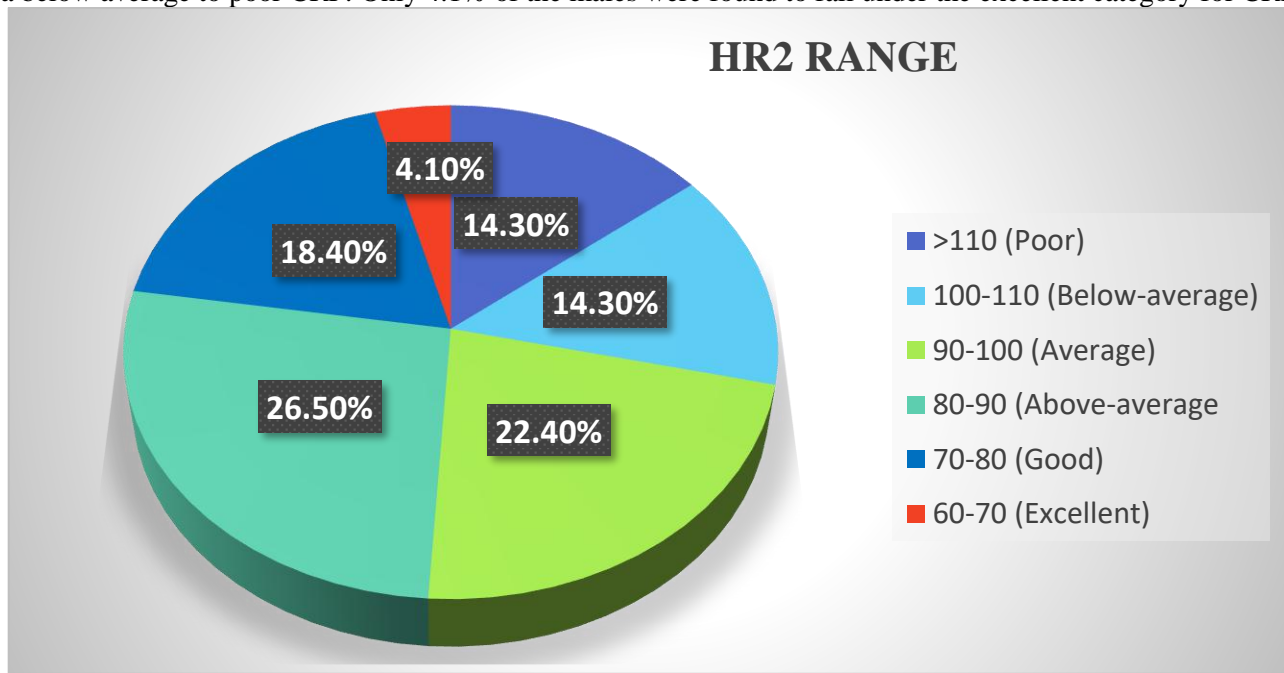


Figure 5: HR₂ (3MST) variations among the male participants.

Table 3: Comparison b/w males and females using cooper's test

		Distance (m)				Total
		<1500	<1600	1500-1799	1600-2199	
Gender	Male	0	11	0	38	49
	Female	45	0	4	0	49
Total		45	11	4	38	98



When CRF of females was assessed using cooper's test, only 8.2% of the participants were found to have a below average CRF while 91.8% of the participants had a poor CRF when assessed using cooper's test. Whereas in males, only 77.6% of the participants were found to have a below average CRF while 22.4% of the participants had a poor CRF when assessed using cooper's test.

5. LIMITATION OF THE STUDY:

The level of physical activity of the participants was not assessed during the performance of the tests. The sample size used in the study is relatively small, consisting of only 98 participants. This small sample size may not be representative of the entire population of young adults in Delhi, which could affect the generalizability of the study's findings.

6. SCOPE FOR FUTURE RESEARCH:

The current study may have shown that there is a lower level of cardiorespiratory endurance among young adults in Delhi. However, future studies can explore the lifestyle factors that contribute to this. Since Delhi is an urban area, future studies can also investigate the differences in cardiorespiratory endurance between young adults in urban and rural areas. This could provide insight into the role of the environment and physical activity levels in determining cardiorespiratory endurance.

7. CONCLUSION

Our study shows that cardiorespiratory endurance of both male and female is significantly low but in comparison between both genders, males have average cardiorespiratory endurance in respect with normative data and were found to perform better than females. The study represents a significant public health problem because low cardiorespiratory fitness during adulthood tends to affect daily activities, and adults with poor CRF are at an increased risk for chronic disease morbidity and mortality.

Therefore, there is strong for implementing more and more interventions for improving CRF. This may also include creating awareness among the population about the importance of cardiorespiratory fitness and its possible effects.

REFERENCES:

1. Hergenreoder.et.al. The Influence of Body Mass Index on Self-report and Performance-based Measures of Physical Function in Adult Women. *Cardiopulmonary Physical Therapy Journal*; 2011; Vol. 22: Page 11-20.
2. Ross R, Blair SN, Arena R, Church TS, Franklin BA, Haskell WA, Sawada SS.et.al, Importance of Assessing Cardiorespiratory Fitness in Clinical Practice: A case study for fitness as clinical vital sign. *AHA Journals*; 2016; Vol.134; Page 24.
3. WHO, Physical activity for health: Global Recommendations on Physical Activity for Health. Geneva: World Health Organization; 2010. Vol.2.
4. Arazi H, Hoseinihaji M, Eghbali E. The Effects of Different Doses of Caffeine on Performance, Rating of Perceived Exertion and Pain Perception in Teenagers Female Karate Athletes. *Brazilian Journal of Pharmaceutical Science*. 2016: Vol. 52; Page 10.
5. Bouchard C, Antunes-Correa LM, Ashley EA, Franklin N, Hwang PM, Mattsson CM, Negrao CE, Phillips SA, Sarzynski MA, Wang PY, Wheeler MT. Personalized preventive medicine: genetics and the response to regular exercise in preventive interventions. *Prog Cardiovasc Dis*. 2015; Vol.57(4): Page 337-346.
6. Zheng YY, Ma YT, Zhang JY, Xie X. COVID-19 and the cardiovascular system. *Nat Rev Cardiol*. 2020; Vol.17(5): Page 259-260.
7. Singh A, Uijtdewilligen L, Twisk J. W. R, Van Mechelen W, Chinapaw M. J. M. Level of knowledge and awareness about physical activity and fitness among adolescents in Europe: A systematic review. *Public Health Reviews*.2017; Vol.38; Page 16.