International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Evaluating Cardiovascular Endurance Level in NCC Cadet through the 12 Minute Cooper Test: An Observational Study

Shahereem Shaikh[1], Bhagyasha Nandre[2]

Intern, Bachelor of Physiotherapy, Royal College of Physiotherapy, Malegaon, Nashik, Maharashtra, India
Affiliated to Maharashtra University of Health Sciences (MUHS), Nashik
Email: *principal.rcopt[at]gmail.com*

Royal College of Physiotherapy, Malegaon, Nashik, Maharashtra, India

Abstract: ***Cardiovascular endurance is a crucial component of physical fitness required for sustained physical activity, particularly among National Cadet Corps (NCC) cadets who undergo rigorous physical training. This observational study aimed to evaluate the level of aerobic endurance among NCC Senior Division and Senior Wing cadets and to analyze its association with gender and age using the 12-minute Cooper run/walk test. A total of 251 newly enrolled NCC cadets (112 males and 139 females) aged 17–23 years were assessed using convenience sampling. The distance covered in 12 minutes was recorded, and maximal oxygen consumption (VO_2 max) was estimated using Cooper's formula. Descriptive statistics, independent samples t-test, Pearson correlation, and Chi-square test were used for data analysis. The results showed that the majority of cadets demonstrated good to excellent aerobic fitness, with a mean VO_2 max of 38.97 ± 3.28 ml/kg/min. Males exhibited significantly higher VO_2 max values than females ($p = 0.002$), and a significant association was observed between gender and VO_2 max categories ($p = 0.048$). No significant correlation was found between age and VO_2 max. The study concludes that most NCC cadets possess adequate cardiovascular endurance; however, gender differences exist, highlighting the need for targeted fitness training programs.***

Keywords: Cardiovascular endurance; National Cadet Corps (NCC); VO_2 max; 12-minute Cooper test; Aerobic fitness

1. Introduction

Physical fitness is a fundamental requirement for maintaining health, functional capacity, and optimal performance during sustained physical activity. Among the various components of physical fitness, cardiovascular endurance plays a vital role in enabling individuals to perform prolonged activities without excessive fatigue. It reflects the efficiency of the heart, lungs, and circulatory system in supplying oxygen to working muscles and is an important indicator of overall health and physical preparedness.

The National Cadet Corps (NCC) is a premier youth organization in India that aims to develop discipline, leadership qualities, and national spirit among young individuals. NCC cadets are routinely involved in physically demanding activities such as drills, parades, endurance marches, obstacle training, and field exercises, all of which require adequate aerobic capacity. Therefore, maintaining optimal cardiovascular endurance is essential for NCC cadets to meet training demands effectively and safely.

Despite the emphasis on physical training in NCC programs, systematic assessment of cardiovascular endurance is not consistently performed. Objective evaluation of aerobic fitness can help identify the fitness status of cadets and guide appropriate training strategies. The 12-minute Cooper run/walk test is a simple, reliable, and widely used field test for estimating maximal oxygen consumption (VO_2 max), an accepted measure of aerobic endurance.

Understanding the cardiovascular fitness profile of NCC cadets is important for improving training outcomes and preventing fatigue-related issues. Hence, this study was undertaken to evaluate the level of cardiovascular endurance among NCC cadets and to examine the influence of gender and age on aerobic capacity.

2. Literature Survey

Cardiovascular endurance has long been recognized as a key component of physical fitness and an important determinant of health and functional performance. It reflects the capacity of the cardiovascular and respiratory systems to supply oxygen to working muscles during prolonged physical activity and is commonly assessed using maximal oxygen consumption (VO_2 max). Over the years, several field and laboratory methods have been developed to evaluate aerobic endurance, with field tests being widely preferred in large populations due to their simplicity, cost-effectiveness, and practicality.

The National Cadet Corps (NCC) plays a significant role in the holistic development of Indian youth by promoting discipline, leadership, physical fitness, and national integration. Cadets regularly participate in physically demanding activities such as marching, drills, endurance training, and adventure camps, which place considerable stress on the cardiorespiratory system. Previous studies have emphasized that adequate aerobic endurance is essential for NCC cadets to perform these activities efficiently and to cope with training-related physical demands.

Various studies have assessed cardiovascular endurance among athletes, dancers, students, and NCC cadets using tests such as the Cooper 12-minute run test, Harvard Step Test, and multi-stage fitness tests. Research comparing NCC cadets with sports persons has consistently shown that trained

athletes generally demonstrate higher aerobic endurance. Other studies have reported gender-based differences in VO_2 max, with males typically exhibiting higher values than females due to physiological factors. However, limited literature is available specifically addressing the aerobic fitness profile of newly enrolled NCC cadets.

Therefore, reviewing existing literature highlights the importance of assessing cardiovascular endurance in NCC cadets and supports the use of the 12-minute Cooper test as a valid tool for evaluating aerobic fitness in this population.

3. Methods / Approach

This study adopted an observational research approach to evaluate cardiovascular endurance among National Cadet Corps (NCC) cadets. The methodology was designed to objectively assess aerobic fitness using a standardized and validated field-based testing procedure. Newly enrolled NCC cadets of Senior Division and Senior Wing, aged between 17 and 23 years, were selected using convenience sampling from various college NCC units. Participants who met the inclusion criteria and provided informed consent were included in the study.

Cardiovascular endurance was assessed using the 12-minute Cooper run/walk test, a widely accepted method for estimating maximal oxygen consumption (VO_2 max). Prior to testing, all participants underwent a standardized warm-up to prepare the cardiovascular and musculoskeletal systems. Cadets were instructed to run or walk continuously for 12 minutes on a marked flat surface, aiming to cover the maximum possible distance. The total distance covered was measured and recorded.

VO_2 max was calculated using the Cooper test formula and categorized into fitness levels (excellent, good, fair, and poor) based on established normative values. The collected data were analyzed using appropriate statistical methods to examine differences in aerobic endurance based on gender and age. This methodological approach allowed for systematic evaluation of cardiovascular endurance and provided objective data to address the research objectives effectively.

4. Results / Discussion

The results of the present study indicate that the majority of NCC cadets demonstrated good to excellent levels of cardiovascular endurance as assessed by the 12-minute Cooper test. The mean VO_2 max value of the participants reflects an overall healthy level of aerobic fitness, suggesting that newly enrolled NCC cadets possess adequate cardiorespiratory capacity to meet the physical demands of routine training activities. Only a very small proportion of cadets were classified under the poor fitness category, indicating a low prevalence of reduced aerobic endurance within the study population.

Gender-wise analysis revealed that male cadets had significantly higher VO_2 max values compared to female cadets. This finding is consistent with previous studies that have reported higher aerobic capacity in males due to physiological differences such as greater hemoglobin concentration, higher stroke volume, and increased lean muscle mass. Similar gender-related differences in cardiovascular endurance have been reported among NCC cadets, college students, and athletic populations in earlier research.

The correlation analysis showed a very strong positive relationship between distance covered during the Cooper test and VO_2 max, which is expected since VO_2 max was calculated directly from the distance covered. In contrast, age did not show a significant association with VO_2 max, likely due to the narrow age range of the participants. This finding aligns with earlier studies that reported minimal age-related variation in aerobic fitness among young adults.

5. Conclusion

The present study concludes that the majority of NCC cadets possess adequate to high levels of cardiovascular endurance, as evidenced by good to excellent VO_2 max values obtained through the 12-minute Cooper test. The findings indicate a significant difference in aerobic capacity between male and female cadets, with males demonstrating higher VO_2 max levels. However, age did not significantly influence cardiovascular endurance within the studied age range of 17–23 years. The strong association between distance covered and VO_2 max confirms the reliability of the Cooper test as a practical field-based assessment tool. Overall, the study highlights that newly enrolled NCC cadets generally have satisfactory aerobic fitness, although gender-specific variations warrant consideration while planning physical training programs.

6. Future Scope

Future research may incorporate direct measurement of VO_2 max using laboratory-based cardiopulmonary exercise testing to enhance the accuracy of aerobic capacity assessment. Longitudinal studies can be undertaken to evaluate changes in cardiovascular endurance following structured NCC training programs or aerobic conditioning interventions. Expanding the sample size and including NCC cadets from different regions can improve the generalizability of findings. Further studies may also examine the influence of factors such as body mass index, nutritional status, training duration, and lifestyle habits on aerobic endurance. Additionally, assessing other components of physical fitness alongside cardiovascular endurance may provide a more comprehensive understanding of overall fitness and help refine training strategies for NCC cadets.

References

[1] Geetha J, Sarkar R. National Cadet Corps (NCC) and its role in national human capital development. *Cuestiones de Fisioterapia*. 2025;54(2):4837–4847.
[2] Singh B, Shejwal BR. Role of mental image and personality in emotions and affect among NCC cadets. *J Indian Acad Appl Psychol*. 2017;43(2):286–295.
[3] Nabi S, Mir SA, Basit R. Role of NCC and NSS as effective tools for nation building: A review. *Int J Multidiscip Res*. 2018;4(1):45–50.

[4] Hussain B, Mughal AW, Hussain F. Investigating aerobic endurance in municipality and countryside undergraduate students. *Res J Soc Sci Econ Rev*. 2020;1(3):280–284.
[5] Malshe R, Gunjal SB. Assessment of cardiovascular fitness among college students involved in sports activities and dance. *Int J Sci Healthc Res*. 2021;6(2):302–307.
[6] Callahan D. The WHO definition of health. *Hastings Cent Stud*. 1973;1(3):77–87.
[7] Kamyan D, Labania L, Kamyan A, Rahman M, Bagchi S. Assessment of cardiorespiratory endurance in terms of physical fitness index and VO_2 max among young adults. *Assessment*. 2020;25(4):1–8.
[8] Cooper KH. A means of assessing maximal oxygen intake: Correlation between field and treadmill testing. *JAMA*. 1968;203(3):201–204.
[9] Agrawal S, Gunjal S. Assessment of cardiorespiratory endurance in obese college students using Cooper's 12-minute run test. *Natl J Physiol Pharm Pharmacol*. 2023;7(10):1–5.
[10] Tiku R, Sharma P, Kaul B. Assessment of cardiorespiratory fitness in young college-going adults by 1-mile walk test. *Int J Health Sci Res*. 2015;5(9):338–345.
[11] Rengasamy S, Raju S, Lee WA, Rao R. Effect of physical education fitness intervention on cardiovascular endurance among secondary school students. *Malays Online J Educ Sci*. 2018;2(1):1–8.
[12] Budhe AA. Comparative study of aerobic endurance among basketball and volleyball players. *Int J Phys Educ Sports Health*. 2020;7(2):154–156.
[13] Alvarez-Ramirez J, Rodriguez E. Theoretical analysis of the 12-minute Cooper test to estimate maximal oxygen uptake. *Biomed Signal Process Control*. 2021; 69: 102885.

Author Profile

Shahereem Shaikh is an undergraduate intern pursuing a **Bachelor of Physiotherapy** at **Royal College of Physiotherapy, Malegaon, Nashik**, affiliated with the **Maharashtra University of Health Sciences (MUHS)**. Her academic interests include **cardiovascular fitness, exercise physiology, and physiotherapy-based assessment of physical performance**. She has actively participated in academic research focused on evaluating aerobic endurance among National Cadet Corps (NCC) cadets using standardized field tests. This research reflects her interest in evidence-based practice and preventive physiotherapy.

Bhagyasha Nandre is a qualified **Physiotherapist and academic guide** at **Royal College of Physiotherapy, Malegaon, Nashik**. She has extensive experience in undergraduate teaching and clinical supervision. Her areas of interest include **cardiorespiratory physiotherapy, exercise testing, and rehabilitation sciences**. She has guided several undergraduate research projects and is actively involved in promoting research-based learning among physiotherapy students.