DOI: 10.7860/JCDR/2026/90703.24425

Original Article

Physiotherapy Section

Correlation of Sedentary Behaviours and Physical Activity with Functional Exercise Capacity in Healthy Adults of Gujarat, India: A Cross-sectional Study

ANJUMAKHTAR RAFIUDDIN SIDDIQUI[1], NIRAJ CHAWDA[2], BOSKY MEHTA[3], AMALKUMAR BHATTACHARYA[4], BHAVANA RAJESHKUMAR GADHVI[5]

(cc) BY-NC-ND

ABSTRACT

Introduction: With changing lifestyle patterns, sedentary behaviour has increased significantly, often coexisting with low levels of physical activity. While both factors are known to influence health, their combined association with functional exercise capacity has not been explored extensively, particularly in Indian populations. Understanding this relationship is important because it helps to identify lifestyle factors that can be modified to improve daily functional performance.

Aim: To examine the correlation of sedentary behaviour and physical activity with functional exercise capacity in the healthy adult population of India, with particular focus on the Gujarat region.

Materials and Methods: The present cross-sectional, multicentre observational study at various hospitals, physiotherapy colleges, Physiotherapy Outpatient Departments (OPDs), and residential societies across the Ahmedabad, Vadodara, Navsari, and Dahod regions of Gujarat, India from March 2025 to March 2026. The study included 713 apparently healthy adults (407 males and 306 females) aged 18-60 years. Sedentary behaviour and physical activity levels were assessed using the Global Physical Activity Questionnaire (GPAQ), while functional exercise capacity was evaluated using the Six-Minute Walk Test (6MWT). Pearson's correlation analysis was used to examine the relationships among physical activity, sedentary behaviour, and 6MWT distance. Additionally, a One-way Analysis of Variance (ANOVA), followed by a post-hoc Tukey's test, was used to compare the mean 6MWT distance across physical activity categories. A p-value of <0.05 was considered statistically significant for all analyses.

Results: The mean 6MWT distance of the study population was 370.88±68.47 m. Male participants achieved greater walking distances than females, and performance declined with increasing age despite gender differences. 6MWT distance increased progressively across physical activity groups (p<0.001), with significant differences observed between all groups on post-hoc analysis. Correlation analysis demonstrated that prolonged sitting time was associated with lower 6MWT performance (r=-0.517, p<0.001), whereas total physical activity was associated with better 6MWT performance (r=0.398, p<0.001). No significant correlation was observed between sitting time and total physical activity (r=-0.051, p=0.173).

Conclusion: Sedentary behaviour and physical activity both significantly influence functional exercise capacity. Increased sitting time is associated with reduced performance, while higher physical activity levels are linked to improved functional capacity. These findings highlight the importance of promoting an active lifestyle while simultaneously reducing sedentary time to maintain functional health in adults.

Keywords: Global physical activity questionnaire, Physical health, Sedentary life, Six-minute walk test, Walking

INTRODUCTION

Over the past few decades, there has been a noticeable shift in lifestyle patterns, particularly in developing countries like India. Increasing urbanisation, technological dependence, and changing occupational demands have resulted in more sedentary daily routines [1].

Sedentary behaviour has become increasingly common, with many individuals spending a substantial part of their day sitting at work, during traveling or in their leisure time often without recognising its long-term effect on health [2,3]. At the same time, levels of purposeful physical activity have not increased enough to counterbalance this growing sedentary behaviour [4].

Sedentary behaviour and physical activity, although related, represent two distinct aspects of lifestyle [5]. An individual may meet recommended physical activity guidelines and still spend prolonged hours in sedentary activities [6]. This distinction is important because sedentary behaviour itself has emerged as an independent risk factor for adverse health outcomes, including cardiovascular disease, metabolic disorders, and reduced functional capacity [3,7]. Global health recommendations, including those from the World Health Organisation, have therefore emphasised not only increasing physical activity but also reducing sedentary time as a separate public health priority [8].

Functional exercise capacity is an important indicator of an individual's ability to perform daily activities and maintain independence [6]. American Thoracic Society's guideline for the 6MWT provides a simple and practical method to assess this capacity in real-world settings [9]. Unlike laboratory-based measures, 6MWT reflects everyday functional performance and is influenced by a combination of physiological, anthropometric, and lifestyle-related factors [9]. While the beneficial role of physical activity in improving functional capacity is well recognised, the combined contribution of physical activity and sedentary behaviour remains insufficiently explored, particularly in general populations [10].

In the Indian context, previous studies have primarily examined physical activity patterns and related lifestyle behaviours in different population groups [11]. A recent systematic review highlighted the heterogeneous evidences regarding the relationship between objectively measured sedentary behaviour and physical fitness in adults [12]. Despite growing evidence on physical activity and sedentary behaviour, studies examining their combined influence on objectively measured functional exercise capacity in healthy Indian adults remain limited. Exploring this relationship in a regional population may improve understanding of lifestyle factors influencing functional health and provide evidence relevant to similar populations in India [13]. Therefore, the present study aimed to evaluate this relationship in healthy adults from Gujarat, India.

Gujarat represents an important regional population for investigation because it has experienced substantial urbanisation in recent decades. Urbanisation is accompanied by changes in the built environment, transportation, and occupational patterns that may reduce opportunities for physical activity and increase sedentary behaviour, both of which influence health and functional capacity [14]. Nationwide evidence indicates that physical activity patterns vary across different regions of India. Together, these factors support the need for region-specific evidence on functional exercise capacity in healthy Gujarati adults. [15]. These changes are also accompanied by a rising burden of non communicable diseases, including diabetes, hypertension, and cardiovascular conditions in Gujarat, Western India [16]. Understanding these regional patterns may help to identify modifiable lifestyle factors such as physical activity and sedentary behaviour and subsequently to determine the association with mortality [17]. This will further assist in developing public health strategies. Another important consideration is whether functional exercise capacity improves progressively across different physical activity levels and whether prolonged sitting adversely affects performance irrespective of activity level.

Therefore, the study aimed to examine the correlation of sedentary behaviour and physical activity with functional exercise capacity in the healthy adult population of India, with particular focus on the Gujarat region.

MATERIALS AND METHODS

The present cross-sectional, multicentre observational study was conducted at various hospitals, physiotherapy colleges, Physiotherapy OPDs, and residential societies across the Ahmedabad, Vadodara, Navsari, and Dahod regions of Gujarat, India from March 2025 to March 2026. Ethical approval was obtained from the Institutional Ethics Committee (IEC No: SSPC/IEC/147/2025), and written informed consent was obtained from all participants before inclusion in the study.

A convenience sampling technique was used to recruit participants based on their accessibility, availability, and willingness to participate. Participants were recruited through community outreach and personal contact, including physiotherapy students, hospital staff, individual accompanying patients attending the OPDs, and community-dwelling adults from residential societies.

Sample size calculation: Sample size was calculated using the formula $n=Z_{1-\alpha/2}^{2}\,SD^2 / d^2$, where $Z_{1-\alpha/2}$ = Standard normal variate at 5% type 1 error ($p< 0.05$), it is 1.96. Standard Deviation (SD) of 67.91 meters obtained from Fernandez L et al., and d= allowable absolute error of precision (5 meters) [18]. Based on these assumptions, the calculated minimum sample size was 709 participants. Since 713 eligible participants fulfilled the selection criteria during the study period, all were included in the final analysis.

Inclusion and Exclusion criteria: Adults within the age range of 18 to 60 years who were apparently healthy with Body Mass Index (BMI) range from 18.5-29.9 kg/m² [19], willing to participate, Absence of any systemic or local disorders and physically active but not engaged in any competitive sports were considered eligible for inclusion. Individuals with diagnosed cardiovascular, respiratory, neurological, musculoskeletal or metabolic disorders, those with resting blood pressure ≥139/89 mmHg and heart rate ≥100 beats/min, past or current smokers, professional athletes, individual with sensory deficit, individuals with cognitive impairment, those responding 'YES' to any question set of Section 1 of Physical Activity Readiness Questionnaire (PAR-Q) [20], and individuals who reported participating in structured exercise programmes, such as gym based training, routine walking for exercise, running, cycling or competitive sports beyond their usual daily activities, were excluded from the study.

Study Procedure

Baseline assessment included demographics, anthropometric measurements and pretest vital parameter including blood pressure, heart rate, and peripheral Oxygen Saturation (SpO_2).

Sedentary behaviour and physical activity were assessed using the GPAQ [21]. Physical activity levels were expressed as Metabolic Equivalent (MET)-minutes/week and calculated according to the GPAQ scoring protocol by assigning MET values of 8.0, 4.0, and 4.0 to vigorous-intensity activity, moderate-intensity activity, and transport-related activity, respectively. Total MET-minutes/week was calculated by multiplying the duration and frequency of each activity domain and summing the values across all domains [21]. Based on the GPAQ scoring criteria, participants were categorised into low (<600 MET-min/week), moderate (600-2999 MET-min/week), and high (≥3000 MET-min/week) physical activity groups. Sedentary behaviour was recorded as the average sitting time in minutes/day.

Functional exercise capacity was assessed using the 6MWT on a 30-meter marked, flat, straight corridor following the American Thoracic Society (ATS) guidelines [9], with a modification to verbal instructions. Participants were instructed to walk at their own pace while covering the maximum possible distance within six minutes. To minimise the potential influence of repeated verbal encouragement on walking performance, standardised verbal prompts were provided only at the third minute (halfway through the test) and fifth minute (one minute remaining).The total distance walked over six minutes was recorded in meter with the help of measuring tape, this covered distance was considered as the measure of functional exercise capacity. Blood pressure, heart rate, peripheral SpO_2, and Modified Borg Dyspnoea Scale scores were recorded immediately after completion of the test.

STATISTICAL ANALYSIS

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 16.0. Descriptive statistics were presented as Mean±SD. One-way ANOVA followed by Tukey's post-hoc test was used to compare 6MWT distance across age group and physical activity groups. Pearson correlation coefficient was applied to examine relationships between age, sitting time, total physical activity and 6MWT distance. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 713 participants were included in the present study, comprising 407 males and 306 females. The mean age of the study population was 37.51 years. Male participants had a slightly higher mean age (39.32±12.84 years) than the female participants (35.10±12.24 years).

Compared with females, male participants had greater height and weight, lower daily sitting time, higher physical activity levels, and better functional exercise capacity, achieving a mean 6MWT distance approximately 64 m longer. The overall mean 6MWT distance of the study population was 370.88±68.47 [Table/Fig-1].

The mean 6MWT distance showed a gradual decline with increasing age and differed significantly across the age groups (F=36.218, p<0.001). Participants aged 18-30 years achieved the highest mean 6MWT distance (395.94±68.31 m),whereas those in the 51-60 years age group recorded the lowest mean distance (335.58±54.22 m) [Table/Fig-2].

Variables	Male (n=407)	Female (n=306)
	Mean±SD	
Age (years)	39.32±12.84	35.10±12.24
Height (m)	1.6719±0.10	1.5951±0.086
Weight (kg)	71.38±10.60	64.83 ±10.85
BMI (kg/m^2)	25.79±4.86	25.63±4.78
Sitting time (min/day)	755.35±154.84	832.81±150.07
Total physical activity (MET-min/week)	1582.60±1519	1446.01±1140.96
6 MWT Distance (m)	398.43±64.83	334.23±54.67

[Table/Fig-1]: Groups statistics-baseline characteristics of study participants (N=713).

The descriptive analysis of 6MWT distance across physical activity levels showed a progressive increase in walking performance from the low to the high activity group. Participants in the low activity group had the lowest mean 6MWT distance, followed by the moderate activity group, while participants in the high activity group achieved the greatest mean distance (423.53±74.68 m). The 95% confidence intervals for all three activity groups were relatively narrow, indicating good precision of the estimated mean 6MWT distances [Table/Fig-2].

Variables	Category	N	Mean±SD (m)	95 % CI (m)
Age groups (years)	18-30	233	395.94±68.31	387.13-404.76
	31-40	186	385.23±70.17	375.08-395.38
	41-50	143	348.64±56.92	339.23-358.05
	51-60	151	335.58±54.22	326.86-344.30
	Total	713	370.88±68.47	365.84-375.91
Physical activity (MET-min/week)	Low	226	343.17±59.71	335.34-351.00
	Moderate	370	371.15±61.40	364.87-377.43
	High	117	423.53±74.68	409.85-437.21
	Total	713	370.88± 68.47	365.84-375.91

[Table/Fig-2]: Descriptive statistics of the Six Minute Walk Test (6MWT) distance across different age group and physical activity level.
Data are presented as Mean±SD. CI: Confidence interval; N: Number of participants; Distance is expressed in meters (m)

A one-way ANOVA demonstrated a statistically significant difference in 6MWT distance among the three physical activity groups (F=62.218, p<0.001), indicating that functional exercise capacity varied significantly across different physical activity levels [Table/Fig-3].

Source of the variance	Sum of squares	Df	Mean square	F	p-value
Between groups	497852.899	2	248926.45	62.218	<0.001
Within groups	2840642.240	710	4000.905		
Total	3338495.139	712	-		

[Table/Fig-3]: One-way ANOVA comparing Six Minute Walk Test (6 MWT) distance across physical activity levels.
ANOVA: Analysis of Variance; DF: Degree of Freedom; F=F – Statistics, p <0.05 was considered Statistically significant

Tukey's HSD post-hoc analysis confirmed significant pairwise differences between all physical activity groups (all p<0.001). Compared with the low physical activity group, participants in the high physical activity group walked approximately 80 meter farther (95 % CI: 63.44-97.28), while the moderate physical activity group demonstrated intermediate performance [Table/Fig-4].

Pearson's correlation analysis shows that 6MWT distance was significantly associated with age, sedentary behaviour, and total physical activity. Among these variables, sitting time demonstrated the strongest correlation with 6MWT distance (r=-0.517, p<0.001), followed by total physical activity (r=0.398, p<0.001) and age (r=-0.354, p<0.001). In contrast, no significant correlation was observed between sitting time and total physical activity (r=-0.051, p=0.173) [Table/Fig-5].

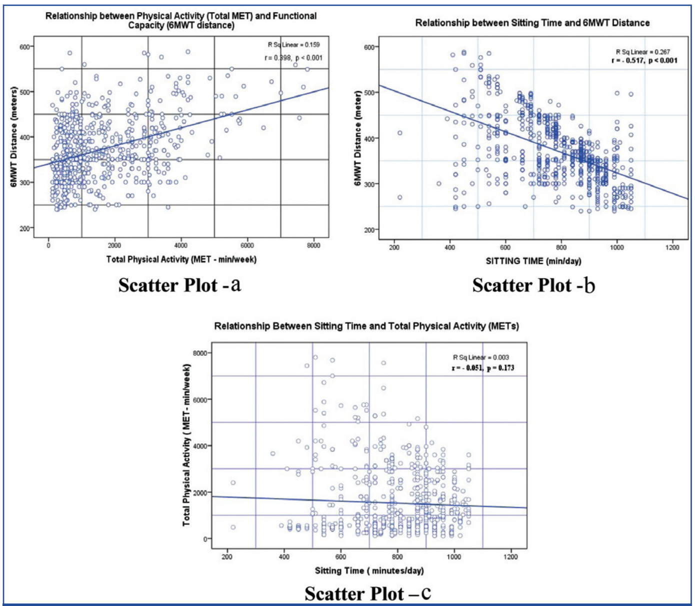
Activity group comparison	Mean difference (m)	95% CI (m)	p-value
Low vs. Moderate	-27.98*	-40.52 to -15.43	<0.001
Low vs. High	-80.36*	-97.28 to -63.44	<0.001
Moderate vs. High	-52.38*	-68.14 to -36.62	<0.001

[Table/Fig-4]: Tukey's HSD post-hoc comparison of Six-Minute Walk Test (6MWT) distance between physical activity groups.
Tukey's HSD = Tukey's honestly significant difference test. Mean difference is expressed in meters (m). A p-value <0.05 indicates a statistically significant difference between groups

Variables	Age (years)	6MWT distance (m)	Sitting time (min/day)	Total physical activity (MET-min/week)
Age (years)	1	-0.354 (<0.001)	0.130 (<0.001)	-0.380 (<0.001)
6MWT distance (m)	-	1	-0.517 (<0.001)	0.398 (<0.001)
Sitting time (min/day)	-	-	1	-0.051 (0.173)
Total physical activity (MET-min/week)	-	-	-	1

[Table/Fig-5]: Pearson's correlation coefficients between age, Six-Minute Walk Test (6MWT) distance, sitting time, and total physical activity (MET-min/week).
Values represent Pearson's correlation coefficients (r), and the corresponding p-values are shown alongside each coefficient, 6MWT: Six-Minute Walk Test; MET: Metabolic Equivalent of Task. Statistical significance was considered at p<0.05

Scatter plots demonstrated positive linear relationships between total physical activity and 6MWT distance, whereas 6MWT distance and sitting time showed negative linear relationships. No apparent linear association was observed between sitting time and total physical activity [Table/Fig-6].



[Table/Fig-6]: Scatter plots illustrating the relationship between: a) Total physical activity and 6 mwt distance; b) Sitting time and 6 mwt distance; c) Sitting time and total physical activity.
Each point represents one participant
(Total Physical Activity in MET- Min/Week), Sitting Time in Min/Day, 6 MWT Distance in Meter)

DISCUSSION

The present study investigated the relationship between sedentary behaviour, physical activity, and functional exercise capacity among healthy Indian adults. The findings showed that functional exercise capacity was significantly associated with both lifestyle behaviours. Participants with higher physical activity levels achieved greater 6MWT distances, whereas prolonged sitting time was associated with lower functional exercise capacity. Although both physical activity and sitting time were associated with functional exercise capacity, no significant association was observed between sitting time and total physical activity, suggesting that these behaviours may represent different aspects of lifestyle.

In addition to the primary findings, age and gender were also associated with functional exercise capacity. Age showed a moderate negative correlation with 6MWT distance (r=-0.354, p<0.001). 6MWT performance was lower with increasing age, and male participants covered greater distances than females. These findings are consistent with previous studies, including those by Fernandes L et al., which have reported age-related declines in 6MWT performance and higher walking distances among males, largely attributed to differences in height, muscle mass, stride length, and cardiorespiratory capacity [18]. In the present study, as participants engaged in structured physical training were excluded, the observed age-related decline reflects the functional changes associated with normal ageing in a healthy adult population.

A moderate positive correlation was observed between physical activity and 6MWT distance (r=0.398, p<0.001), with a progressive increase in distance walked from low to high physical activity group. A similar pattern was reported by Arjunan P et al., who found that only 17% of older adults were physically active, while 35% were underactive for regular light physical activity [13]. The authors reported that limited physical activity was accompanied by poorer functional status and quality of life. Despite differences in the study population, both studies suggest a positive relationship between habitual physical activity and functional performance. Tudor-Locke C et al., also highlighted the importance of habitual physical activity, reporting that healthy adults generally accumulate about 7,100-11,000 steps/day to achieve recommended activity levels [22]. Although their review focused on daily step counts rather than functional exercise capacity, it supports the role of habitual physical activity in maintaining physical function.

Comparable findings have also been reported in the Indian population. Anjana RM et al., observed low physical activity levels among a large proportion of adults [5]. While their study described physical activity patterns, the present study further demonstrates their association with functional exercise capacity.

Another important finding of the present study was the significant inverse association between sedentary behaviour and functional exercise capacity. A moderate negative correlation was observed between daily sitting time and 6MWT distance (r=-0.517, p<0.001), indicating that participants who spent more time sitting generally demonstrated poorer functional exercise capacity. Notably, the strength of this association was greater than that observed between physical activity and 6MWT performance, suggesting that prolonged sedentary behaviour may be more strongly associated with functional exercise capacity than overall physical activity. Joshi BP et al., reported an overall mean sedentary time of 10.83±2.56 hours/day and observed that 43.72% of participants spent 12 hours or more per day in sedentary activities [23]. Consistent with these findings, prolonged sitting time was also observed in the present study, with mean sitting durations of 12.58±2.58 hours/day in males and 13.88±2.51 hours/day in females. Although the average sitting time in the present study population was higher than that reported by Joshi BP et al., both studies indicate a high burden of sedentary behaviour among healthy adults [23]. These findings further emphasise the importance of reducing prolonged sitting time as part of strategies aimed at improving functional exercise capacity and overall health.

A previous study has also concluded that prolonged sedentary behaviour is associated with poorer physical performance and adverse health outcomes [24]. Biddle SJ et al., identified sedentary behaviour as an independent risk factor for reduced physical function and increased all-cause mortality [2]. A recent systematic review and meta-analysis by Wu J et al., further confirmed that greater sedentary behaviour is associated with an increased risk of chronic diseases and poorer health outcomes [4].

The present findings indicate that prolonged sitting may adversely influence functional exercise capacity even among healthy Indian adults. From a clinical perspective, these findings suggest that reducing sedentary time may be as important as promoting regular physical activity for preserving functional exercise capacity.

A noteworthy finding of the present study was the absence of a significant correlation between sitting time and total physical activity (r=-0.051, p=0.173), although both were significantly associated with functional exercise capacity. This suggests that sedentary behaviour and physical activity are distinct lifestyle behaviours rather than opposite ends of the same continuum. Individuals may achieve the recommended level of physical activity while still spending prolonged periods sitting. Therefore, reducing prolonged sitting should complement, rather than replace, efforts to promote regular physical activity. Interventions targeting both behaviours may be more effective for maintaining functional exercise capacity.

Limitation(s)

The cross-sectional design precludes causal inferences, and physical activity and sitting time were assessed using self-reported data, which may be subject to recall bias. In addition, occupational factors were not analysed separately, and although participants represented different regions of Gujarat, the findings may not be fully generalisable to the diverse population of India. Future multicentre longitudinal studies incorporating objective measures of physical activity and sedentary behaviour are warranted to validate and extend these findings.

CONCLUSION(S)

The present study indicates that both sedentary behaviour and physical activity play significant roles in determining functional exercise capacity. While increasing physical activity appears to improve functional performance, reducing sitting time is equally important. These findings emphasise that lifestyle modification strategies should address both physical inactivity and prolonged sedentary behaviour simultaneously rather than considering them in isolation.

Acknowledgement

The authors are grateful to the GPAQ team at the World Health Organisation for granting permission to use and translate the questionnaire into the Gujarati language. Authors are also thankful to Dr. Kunjan Shah, Director, Care and Cure multispecialty hospital, MGP College, KIP College & SS Agraval College for their support.

REFERENCES

[1] Patil RR. Urbanization as a determinant of health: A socio epidemiological perspective. Soc Work Public Health. 2014;29(4):335-41
[2] Biddle SJ, Bennie JA, Bauman AE, Chau JY, Dunstan D, Owen N, et al. Too much sitting and all-cause mortality: Is there a causal link? BMC Public Health. 2016;16. Available from: https://doi.org/10.1186/s12889-016-3307-3.
[3] Thorp AA, Owen N, Neuhaus M, Dunstan DW. Sedentary behaviours and subsequent health outcomes in adults a systematic review of longitudinal studies, 1996-2011. Am J Prev Med. 2011;41(2):207-15. Doi: 10.1016/j.amepre.2011.05.004.
[4] Wu J, Fu Y, Chen D, Zhang H, Xue E, Shao J, et al. Sedentary behaviour patterns and the risk of non-communicable diseases and all-cause mortality: A systematic review and meta-analysis. Int J Nurs Stud. 2023;146:104563. Doi: 10.1016/j.ijnurstu.2023.104563.
[5] Anjana RM, Pradeepa R, Das AK, Deepa M, Bhansali A, Joshi SR, et al. Physical activity and inactivity patterns in India – results from the ICMR-INDIAB study (Phase-1) [ICMR-INDIAB-5]. Int J Behav Nutr Phys Act. 2014;11(1):26. Available from: https://doi.org/10.1186/1479-5868-11-26.
[6] Van Uffelen JG, Wong J, Chau JY, Van der Ploeg HP, Riphagen I, Gilson ND, et al. Occupational sitting and health risks: A systematic review. Am J Prev Med. 2010;39(4):379-88. Available from: https://doi.org/10.1016/j.amepre.2010.05.024.
[7] Modi B, Jadav P, Vasoya N. Evaluation of National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular disease and Stroke (NPCDCS) in Gandhinagar district, Gujarat. Healthline J Indian Assoc Prev Soc Med. 2019;10(1):33-38.
[8] World Health Organization. WHO guidelines on physical activity and sedentary behaviour [Internet]. Geneva: World Health Organization; 2020 [cited 2026 Jul 30]. Available from: https://www.who.int/publications/i/item/9789240015128.

[9] ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: Guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002;166(1):111-17. Doi: 10.1164/ajrccm.166.1.at1102.

[10] Ramamoorthy T, Kulothungan V, Mathur P. Prevalence and correlates of insufficient physical activity among adults aged 18-69 years in india: Findings from the national noncommunicable disease monitoring survey. J Phys Act Health. 2022;19(3):150-59. Doi: 10.1123/jpah.2021-0688.

[11] Tripathy JP, Thakur JS, Jeet G, Chawla S, Jain S, Prasad R. Urban rural differences in diet, physical activity and obesity in India: Are we witnessing the great Indian equalisation? Results from a cross-sectional STEPS survey. BMC Public Health. 2016;16(1):816. Available from: https://doi.org/10.1186/s12889-016-3489-8.

[12] Silva FM, Duarte-Mendes P, Rusenhack MC, Furmann M, Nobre PR, Fachada MÂ, et al. Objectively measured sedentary behaviour and physical fitness in adults: A systematic review and meta-analysis. Int J Environ Res Public Health. 2020;17(22):8660. Doi: 10.3390/ijerph17228660.

[13] Arjunan P, Annamalai M, Subramaniam A, Arulappan J. Physical activity, functional status, and quality of life among older adults in India. SAGE Open Nursing. 2024;10:23779608241290384.

[14] Angkurawaranon C, Jiraporncharoen W, Chenthanakij B, Doyle P, Nitsch D. Urbanization and non-communicable disease in Southeast Asia: A review of current evidence. Public Health. 2014;128(10):886-95. Available from: https://doi.org/10.1016/j.puhe.2014.08.003.

[15] Podder V, Nagarathna R, Anand A, Patil SS, Singh AK, Nagendra HR. Physical activity patterns in India stratified by zones, age, region, BMI and implications for COVID-19: A nationwide study. Ann Neurosci. 2020;27(3-4):193-203.

[16] Bhagyalaxmi A, Atul T, Shikha J. Prevalence of risk factors of non-communicable diseases in a district of Gujarat, India. J Health Popul Nutr. 2013;31(1):78-85. Available from: https://doi.org/10.3329/jhpn.v31i1.14752.

[17] Ekelund U, Steene-Johannessen J, Brown WJ, Fagerland MW, Owen N, Powell KE, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. Lancet. 2016;388(10051):1302-10. Doi: 10.1016/S0140-6736(16)30370-1.

[18] Fernandes L, Mesquita AM, Vadala R, Dias A. Reference Equation for Six Minute Walk Test in Healthy Western India Population. J Clin Diagn Res. 2016;10(5):CC01-CC04.

[19] Obesity: Preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser. 2000;894:i-xii,1-253.

[20] Warburton DER, Jamnik VK, Bredin SSD, Gledhill N. The physical activity readiness questionnaire for everyone (PAR-Q+) and electronic physical activity readiness medical examination (ePARmed-X+). Health & Fitness Journal of Canada. 2011;4(2):3-17. Doi: 10.14288/hfjc.v4i2.103.

[21] World Health Organization. Global Physical Activity Questionnaire (GPAQ) Analysis Guide [Internet]. Geneva: World Health Organization; 2006 [cited 2026 Jul 2]. Available from: https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/gpaq-analysis-guide.pdf?sfvrsn=1.

[22] Tudor-Locke C, Craig CL, Brown WJ, Clemes SA, De Cocker K, Giles-Corti B, et al. How many steps/day are enough? For adults. Int J Behav Nutr Phys Act. 2011;8:79. Available from: https://doi. org/10.1186/1479-5868-8-79.

[23] Joshi BP, Mahajan SM, Tayade DN. Physical activity and its correlation with various measures of obesity among medical students and young faculty. Clin Epidemiol Glob Health. 2023;23:101363. https://doi.org/10.1016/j.cegh.2023.101363.

[24] World Health Organization. Global status report on physical activity 2022 [Internet]. Geneva: World Health Organization; 2022 [cited 2026 Jul 30]. Available from: https://www.who.int/publications/i/item/9789240059153.

PARTICULARS OF CONTRIBUTORS:

1. PhD Scholar, Department of Medicine, Faculty of Physiotherapy, Parul University, Vadodara, Gujarat, India.
2. Associate Professor, Department of Medicine, SBKS MI & RC, Sumandeep Vidyapeeth, Vadodara, Gujarat, India.
3. Associate Professor, Shree MM Shah Physiotherapy College, Mehmdabad, Gujarat, India.
4. Ex. Professor, Department of Medicine, Parul University, Vadodara, Gujarat, India.
5. Dean, Department of Medicine, Faculty of Physiotherapy, Parul University, Vadodara, Gujarat, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Anjumakhtar Rafiuddin Siddiqui,
Principal Office, Mahatma Gandhi Physiotherapy College, Memco-Naroda Road,
Ahmedabad-382345, Gujarat, India.
E-mail: dr.anjum.akhtar10@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: May 27, 2026
- Manual Googling: Aug 08, 2026
- iThenticate Software: Aug 10, 2026 (11%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **May 23, 2026**
Date of Peer Review: **Jun 24, 2026**
Date of Acceptance: **Aug 12, 2026**
Date of Publishing: **Oct 01, 2026**