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# A study to establish the reference values for two minute walk distance in school going children

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**Abstract**
**Background:** The idea to use functional scales to evaluate the prognosis of children is widely being facilitate by the International Classification of Functioning, Disabilities & Health, hence the present study was to examine responsiveness, of 2 Minute Walk Test (MWT) in school going children.
**Purpose of the Study:** This current study aims to establish the reference values for 2MWT in healthy school going children.
**Objective of study:** To establish reference values for 2 Min Walk distance in healthy Indian children of 7 to 10 years age.
**Method & material**: A total of 82 school going children participated in the study aged between 7 to 10 years. Out of which 41 were normal weight and 41 were obese students. They were divided equally into two groups based on their BMI. Group A comprised of obese and group B comprised of normal weight participants. Two-minute walk test was performed by the participants on a obstacle free 15 m distance. Distance covered by the participants was measured and documented after the test.
**Results:** The mean 2MWD was 158.268 ± 16.0209 meters in obese children whereas in normal weight children it was 185.2195 ± 13.81771. 2MWD had shown excellent correlation with weight. P=0.0001 is considered as significant.
**Conclusion:** The average distance covered by healthy children is approximately 185.2195 ± 13.81771 meters in two minute which is less in obese group 158.268 ± 16.0209 meters.

**Keywords:** 2 minute walk test, functional mobility, obesity, school going children

## 1. Introduction

Childhood obesity is a prominent & critical public health concern [1] The percentage of overweight and obesity problems in school going boys and girls increasing. This rising percentage of overweight reached 15.2% [2] Walking is an important and fundamental task, characterized by a complex interrelated task between neuromuscular, environmental factors. Overweight and obese children have a typical gait pattern which is short [3] insufficient postural control [4] the elevated impact of force on lower limbs [5], malalignments of lower extremities [6] which may interfere in their important day to day life activities i.e. Walking [7].

Low levels of physical activity associated with both physiological and biomechanical factors, which are mainly responsible for changes in gait patterns in obese and overweight children, have been observed [8]. Such a distinction not only offers quantification between obese and overweight, but also offers an important details on the variables in determining their mobility ability and physical activities. Several musculoskeletal conditions occur as a result of being overweight which greatly reduced mobility in the paediatric population [9] Gait pattern in obese children changed mainly in their temporospatial components mainly walking speed, stride time and length, step length timing, duration of the stance phase, and swing phase also typically slowed down [10] Obese children have slower walking speed, shorter strides, a large period of the support phase in the gait cycle, low stability, and narrow or reduced joint angles. Altered walking velocity prolongs the stance phase. Obese children associated with flat feet fatigued more easily than normal weighted children [11 Dynamic gait alterations in these children increase compressive forces in the medial compartment of the knee which is considered as pathological.[9] There are a lot of walk tests available which measures the distance covered in time by the individual, but most of the walk tests have drawbacks such as participants who cannot complete the tests till the end and fewer rest intervals,[12] so that is why the need of 2 min walk test has been generated for various age groups. 2 min walk test has been widely used in stroke, COPD, lower limb amputees to measure the endurance level.

In their study, Kieseier and Pozzilli suggested that 2 MWT assess walking fatigue and distance limitations and also found that compared to 6 MWT, 2 MWT is a more convenient measure of uninterrupted walking or usual walking performance.[13] As per our knowledge & literature search there are few studies available in the Indian paediatric population to measure walking speed, distance limitations in overweight, obese and normal-weight children, hence this study has been taken up to investigate the usefulness of 2MWT to measure walking speed in these children.

## Methodology

### Study Design

Cross Sectional Study**.**

### Sample Size

82

### Inclusion Criteria

Being able to walk 15 m without a walking aid. Both genders were included Age group ranges between 7-10 No orthopaedic, surgical, or neurological problems affecting the gait. BMI ranges between 18 and 25 kg/m2 according to the WHO's classification & guidelines.

**Exclusion Criteria**

Children having foot deformities such as ulcers, recent injuries. Impaired sensations in lower limbs. Had history of vascular problems which affecting their gait abilities. Any systemic illness affecting their waking abilities.

**Instruments**

**Fig 1:** Stopwatch

**Fig 2:** Inch tape

**Fig 3:** Weighing machine

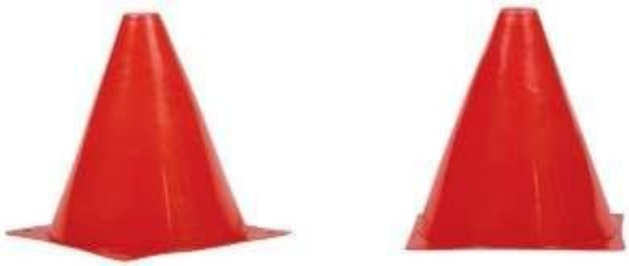

**Fig 4:** Two Cones

**Procedure**

Schools in Aurangabad were selected through simple randomization. Prior to the data collection written consent was taken from the participant's parents. After getting the consent, students were briefly demonstrated about the test. Demographic data like name, age, gender, height and weight of all the participants was documented before performing the test. Each student's BMI was calculated using the formula weight in kg divided by height in $m^2$. After obtaining the BMI participants were divided into two groups. Group A comprised of obese and Group B comprised of normal students. Each group had 41 participants in it. An obstacle free distance of 15m was used for the test. Prior to test instructions were given to the participants to walk at normal speed and pace and not to run or jump. Two trial tests were performed by the students and the best of two was considered. Individual student walked for 2 minutes, after finishing the test distance covered by the participant in 2 minutes was documented.

**Outcome measures**

**Body mass index** [17]

BMI=Weight kgs/Height $m^2$

**Table 1**

| Weight Status Category | Percentile Range |
|---|---|
| Underweight | Less Than 5th Percentile |
| Normal Or Healthy Weight | 5th Percentile To Less Than 85th Percentile |
| Overweight | 85th To Less Than 95th Percentile |
| Obese | Equal To Or Greater Than The 95th Percentile |

**2 min walk test** [18]

**Two Minute Walk Test**

Name of Partici

Date

Distance ambulated in 2 minutes:-

**Results**

**Table 1:** Comparison of Mean Age in Groups

| | | | PERCENTAGE | |
|---|---|---|---|---|
| **Age** | **Obese** | **Normal** | **Obese %** | **Normal %** |
| 7 | 8 | 6 | 19.51% | 14.63% |
| 8 | 15 | 10 | 36.58% | 24.39% |
| 9 | 11 | 18 | 26.82% | 43.90% |
| 10 | 7 | 7 | 17.07% | 17.07% |
| Total | 41 | 41 | | |
| (Mean ± SD) | 158.26 ± 16.02 | 185.21 ± 13.81 | | |

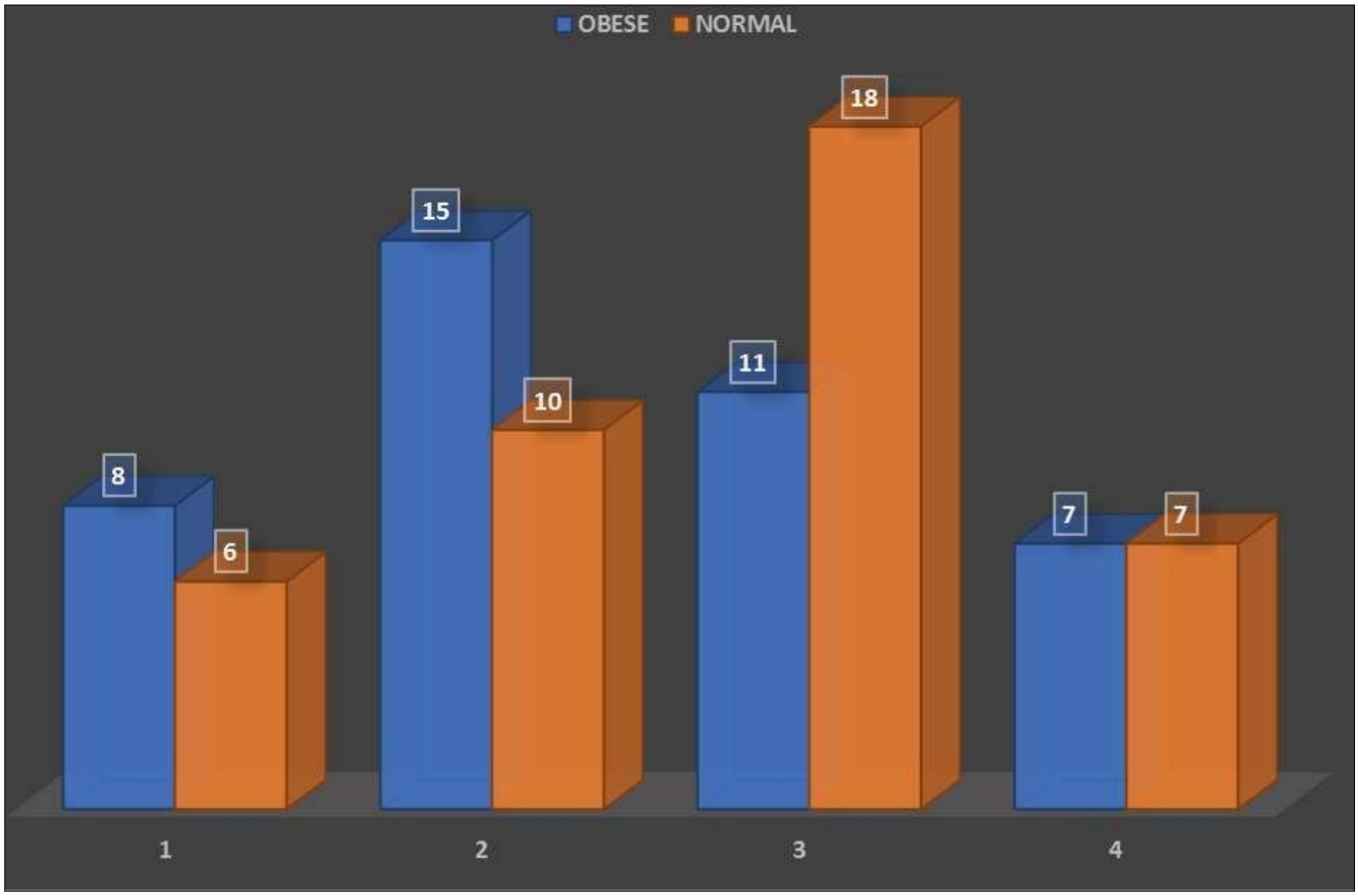


**Fig 5:** Comparison of Mean Age in Groups

**Table 2:** Comparison of Gender in Groups

| Gender | | | Percentage | |
|---|---|---|---|---|
| | Obese | Normal | Obese % | Normal % |
| Male | 15 | 22 | 36.58 | 53.65 |
| Female | 26 | 19 | 63.41 | 46.34 |
| Total | 41 | 41 | | |

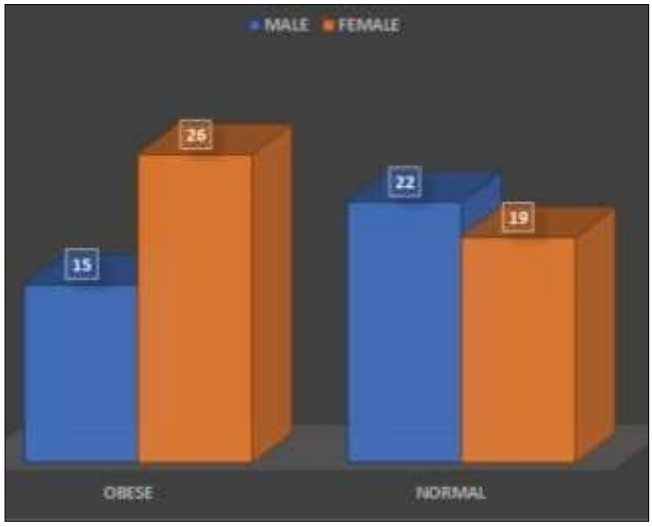


**Fig 6:** Comparison of Gender in Groups

**Table 3:** Comparison of mean distance in groups

| | Obese (mean ± sd) | Normal (mean ± sd) | T value | P value |
|---|---|---|---|---|
| Distance | 158.268 ± 16.0209 | 185.2195 ± 13.81771 | 7.96 | <0.0001 |

**Discussion**

This era of technology where the deskbound lifestyle such as surplus use of Mobiles, computer, video gaming and other electronic gadgets along with the dietary changes such as excess consumption of high-energy, high fat diets mainly fast food, snacks, soft drinks. Deterioration in dietary quality associated with inactive behaviour plays a crucial role in the mounting obesity in children, which further precedes to risks of non-communicable diseases like Diabetes, cardiovascular conditions, insulin resistance, low-grade inflammation, increased risk of cardio-metabolic abnormalities [19] Cancer, Depression, Anxiety [20] Asthma along with various other Musculoskeletal issues etc [21] The demand for clinical assessment to bench mark the functional capacity of such overweight or obese children is increasing. The 6-minute walk test (6MWT) is a straightforward, practical, reliable and valid test for evaluating sub maximal exercise capacity in healthy kids but it requires more time, training and instrumentation to perform. Children even drop out before they could complete 6 minutes as they are fatigued or due to Cardiovascular and musculoskeletal issues that often arise during the performance of this test. Therefore 6MWT might not function as an efficient measure for observance of practical ability and illness progression in the children. However, the 2-Minute walk Test (2MWT) is of shorter duration, objective, easy to administer in paediatric populations, [22] which provides a uniformity in analysis of functional capacities in paediatric participants and it highly co-relates with 6MWT [23] The 2MWT could effectively replace the 6MWT in this population and predict

the same as there is an increase in prevalence of adiposity between the ages 7-11 years [24]. The mid–late childhood which is around age group between 7–11 years could get benefit and larger attention in future obesity bar interventions [25, 26]. So To evaluate the functional mobility the total distance covered by the children's aging in this age group was measured and evaluated with the assistance of two min walk test. Students were categorized and selected as normal weighing (NW) or overweight and obese (OW) on the basis of BMI as per the guidelines by CDC [17]. Overweight is defined clinically as body mass index (BMI) ≥ 85th percentile and < 95th percentile with obesity classified as ≥ 95th percentile. Students were explained and demonstrated 2 min walk test properly. To avoid any mishap safety precautions were taken. The walkways employed in our study measured 15m with 2 cones placed on the both the ends as a turning point. Due to a variety of constraints involved during the testing in school setting, the test was performed with every student on an individual basis to avoid students matching pace with their peers. Each student was allotted a physiotherapist to document and evaluate individually thus competition among students were eliminated and findings taken into considerations. Two trials were performed by each student with a time frame of 20 second gap in between two trials, the best of two was selected. The Normal Weight and Obese children's were segregated with 41 students in each group, in group A there were 15 males and 26 females and in group B there were 22 males and 19 females as participants. The mean distance covered by the Obese children i.e. group A was 158.268 ± 16.0209 while the Normal Weight i.e. group B covered mean distance of 185.2195 ± 13.81771 with p value <0.0001 thus indicating significance. In this trail, it was observed that Obese children walked less distance with a speed that decreased over a period of time as compared to Normal Weight children. We have also found the prevalence rate of obesity in girl was more as compared to boys. Results of this research suggested a direct correlation between weight status and functional capacity. The walking speed might be affected resulting from altered biomechanics, kinematic and gait parameters that were altered by changes in anthropometric measures [28] or due to decrease in cardiovascular capacity thereby minimizing the efficiency to perform but the root cause couldn't be specified. Roya Kelishadi et. Al. reported that BMI and physical activity are co-related. It was found that children's with insufficient physical activity had higher BMI and weight compared to more physically active children's. The government should introduce a national strategy to encourage physical activity, as the classroom is the location where children spend most of their time. Addition to this, parents can encourage more physical activity by reducing the screen time and by making physical activity more helpful and enjoyable [30].

## Conclusion

The present study has concludes that the 2MWT is a useful tool to measure the walking speed in obese and normal weight children.

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## Conflict Of Interest

None

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None.

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