

Original Research Article

Agility and Upper Limb Speed in Normal, Overweight and Obese Adolescents of Hyderabad

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ABSTRACT

Background: Agility and Upper limb Speed are the important motor skills that determine the Physical Status of an individual. The risk of Obesity globally is on high risk and in a developing country like India; children especially adolescent age group are more prone for Obesity due to inactive life style. Decreased Motor skills along with Health skills in adolescent's leads to early morbidity and mortality in adults as low fitness affect all the physiological and psychological status of the body. The main objective of this study is to assess the Agility and Upper limb Speed in Normal, Overweight and Obesity in adolescents of Hyderabad.

Materials and Methods: A total of 45 school children who met the inclusion criteria were divided into 3 groups based on BMI percentiles. Normal (n=15), Overweight (n=15), and Obese group (n=15). All the three groups were assessed for Agility and Upper limb Speed using 10x5m Shuttle run test and Plate Tapping test.

Results: The statistical analysis was done using ANOVA. The results showed significant difference between the 3 groups (P<0.05). Normal weight group performed better in both the tests when compared to Overweight and Obese groups. Overweight performed better in both the tests when compared to Obese groups. There was hindered performance in Obese group.

Conclusion: This Study showed decrease in Agility and Speed in Obese and Overweight individuals stating that Motor ability decreases with increase in fat mass. Lack of physical activity is the main cause for Obesity in adolescents. Physical activity is important for Cognitive and motor development in the growth phase of life. Inculcating physical education programs in school should be made compulsory for leading healthy adult life.

Key words: Obesity, Overweight, Physical Activity, Agility, Speed

INTRODUCTION

Overweight and Obesity is the current global and threatening nutritional non-communicable health disorders faced by children and adolescents leading to

morbidity and mortality in early adult life. [1]

Adolescence is a period of life where the Physical, Psychological and neurological maturation takes its root and would reach to the maximum functional stage and ends

there after before the growth phase ends. Obesity during adolescent age not only affects the cognitive capacity but also affects the motor development of children. [2]

The Prevalence of Overweight was 7.2% [3] and Obesity is 3.5% [1] among adolescents of Hyderabad. Childhood and adolescent Obesity is high among girls than boys in Hyderabad and the main reason for this is heredity, consumption of junk food and lack of physical activity in this particular age group. [1] Advanced studies have shown that 81% of Obese children and 75.4% of overweight children will have at least one cardiovascular risk factor in their life. The primary cause of this neglected and silent disease is the imbalance between energy intake and energy output. Children especially adolescent age group gets attracted to gadgets, watching television, consuming sweet beverages and junk foods making them prone for increase in fat mass during the growth phase (WHO, 2013). [4]

Studies say that Obese adolescents consume almost the same amount of calories or less than non obese individuals. The increase in weight in obese individuals is not mainly due to calorie intake but it is due to lack of energy expenditure associated with physical inactivity. The amount of energy expenditure at rest and during activity depends how well the individual is physically fit. Studies support that less physical activity in obese children is the main factor leading to obesity in adolescents and children and so does the less energy expenditure. [5] Hence physical activity is the main determinant of healthy development of children. [6]

The ability of a person to do physical activity is called Motor Fitness which denotes the physical, psychological and cognitive growth of a child. Majority of children activities are jumping, running, reaching which are otherwise called the neuromotor activities and any impairment in performing these activities may not allow the individual to lead quality life in adult hood. Motor fitness otherwise called skill

fitness consists of speed, balance, coordination, reaction time, power and agility. Evaluation of motor fitness is equally important as assessing health fitness to know the complete health status of an individual.

In this study we have assessed Agility and speed of Upper limb. Agility is the ability of the body to quickly react to change in speed or direction of movement. Agility depends on visual scanning, knowledge of situation, recognition of pattern and anticipation which means Cognition and Change of direction of movement (COD). In detail, the cognitive abilities include perception, scanning and promptly reacting to stimuli. The change of direction of movement is necessary for both agility and Speed of upper limb and is controlled by physical and technical elements. [7]

The ability of an individual to change the direction of movement during running is important for many sports and daily life activities. Thus evaluation of COD is must before participation in sports. The technical elements of COD include centre of pressure (COP), postural balance and the physical elements include core stability, linear velocity, strength and power. [7]

Speed is the amount of distance the person travelled in a given time. The velocity of movement depends on body weight, the gravitational force and the psychological status.

The studies on assessing motor fitness in children and adolescents are limited. The motor fitness evaluation was mostly done on western population and the data in India is scarce. Most of the studies have concentrated on assessing cardio respiratory fitness in adolescents in India. There are no studies that have assessed the motor fitness on Hyderabad adolescents. Probably this may be the first study to assess Agility and Upper limb speed in relation to body composition in Hyderabad adolescents.

There are studies that have documented the decrease in motor

performance with increase in adiposity in children and adolescents. There are studies stating that there is no relation between motor abilities and body composition. Hence I intended to evaluate agility and speed motor components in Normal weight, Overweight and Obese Hyderabad adolescents.

METHODOLOGY

60 Subjects were selected from four public and private schools of Hyderabad. Permission to conduct the study was taken from the institutional head. Physical examination was done by the Physician and subjects who met the inclusion criteria were certified and those willing to participate in the study were taken. International Physical Activity Questionnaire (IPAQ) was filled by the subjects and countersigned by the physician, researcher and the parent of the subject. Parental permission letter and Informed consent from the subject was obtained. The study was conducted during the leisure period of the subjects.

INCLUSION CRITERIA:

- Both Boys and Girls
- Age: 13-16 years
- IPAQ Score: Category 1 was taken (Subjects with very low level of physical Activity)
- BMI < 85th percentile- Normal weight group
- BMI between 85th to 95th percentile- Overweight group
- BMI > 95th percentile- Obese group.
- Stable haemodynamically

EXCLUSION CRITERIA:

- Menstrual period
- Musculoskeletal problems
- Genetic or Hereditary problems
- Metabolic problems
- Cardiovascular and Psychological problems

The subjects who met the inclusion criteria were divided into 3 groups based on the BMI percentiles into Normal, Overweight and Obese group. Each group consists of 15 subjects. All the subjects underwent Agility test using 10x5 m Shuttle Run Test and Upper limb Speed using Plate Tapping Test. Both the tests have high reliability and validity and are taken from Eurofit test battery especially designed to assess adolescent and children fitness.

10x5 Shuttle Run Test:

It measures Agility and Speed of an individual. The cones are placed on either end which are 5 meters apart. The subject has to start at one end of cone and run to the other end of the cone and return back to the starting point. This procedure is done repeatedly for 5 times covering 50 meters. The total time taken to complete the task is noted by stop watch measured in seconds.

Plate Tapping Test:

It measures the upper limb speed of an individual. Two rounded 20cm diameter plates are placed on a table 60 cms apart at an equal distance from the centre point. The table is adjusted to the height of the subject. The subject stands at the centre of the two plates and taps the two plates alternatively with the dominant hand as quickly as possible. One tap of the two plates is equal to one cycle (lap) and the subject should complete 50 taps that is 25 cycles. The total time taken to complete the task is noted in seconds.

The scores obtained in 10x5 shuttle run test and Plate tapping test was analyzed to compare the agility and speed between Normal, Overweight and Obese groups.

STATISTICAL ANALYSIS:

The results obtained were analyzed using SPSS package 20.0 version. The test used is ANOVA.

RESULTS

TABLE 1: ANOVA

	Sum of squares	df	Mean Square	F	Sig.
Between Groups	.533	2	.267	.214	.808
AGE Within Groups	52.267	42	1.244		
Total	52.800	44			
Between Groups	10367.049	2	5183.525	23.049	.000
BMI Within Groups	9445.351	42	224.889		
Total	19812.400	44			

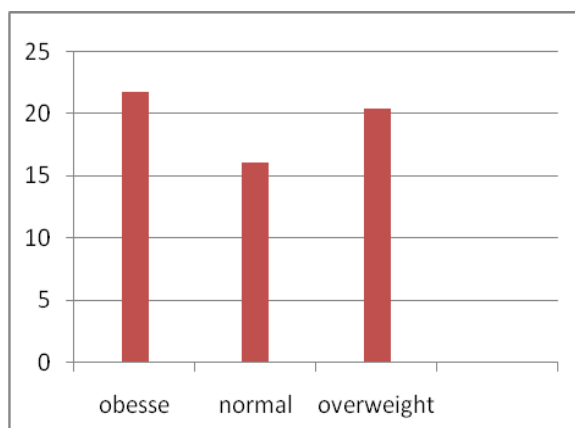
Table 1 shows the quantitative data of Age and BMI. The F value of Age is .214 which is less than the table value and P value is greater than 0.05 which means that there is no significant difference of age between the three groups. The F value of BMI is 23.049 which is greater than table value and P value is less than 0.05 denoting significant difference between the three groups.

TABLE 2: ANOVA (PLATE TAPPING TEST(PLT) & 10X5m SHUTTLE RUN TEST (SRT))

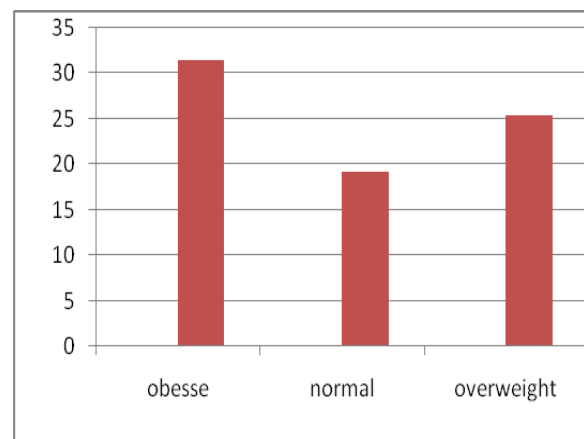
	Sum of squares	df	Mean Square	F	Sig.
Between Groups	267.213	2	133.607	36.151	.000
PLT Within Groups	155.223	42	3.696		
Total	422.436	44			
Between Groups	1125.669	2	562.835	54.323	.000
SRT Within Groups	435.156	42	10.361		
Total	1560.826	44			

Table 2 represent variation of plate tapping test and 10x5m shuttle run test scores between the groups and within the groups. The F value of Plate Tapping Test is 36.151 which is greater than the table value and P value <0.05 which shows that there is significant difference of Agility between the 3 groups. The F value of 10x5 m Shuttle run test is 54.323 which is greater than the table value and P value <0.05 showing significant difference within and between the 3 groups.

Plate Tapping Test: in seconds 10x5m shuttle run test: in sec
10x5 Shuttle Run Test: in seconds



Obese mean value: 21.74
Normal group mean: 16.04
Overweight mean: 20.44



Obese group mean: 31.43
Normal group mean :19.18
Over weight mean: 25.45

TABLE 3: PLATE TAPPING TEST

	N	Mean	Std.Deviation
OBESSE	15	21.74	1.758
NORMAL	15	16.04	2.413
OVERWEIGHT	15	20.44	1.475
TOTAL	45	19.41	3.099

Table 3 shows the Mean and Standard deviation of all the three groups with regard to Plate tapping test to measure upper limb speed. The Mean value of Obese is 21.74 and Std. deviation is 1.758. The Mean value of Normal group is 16.04 and Std. deviation

is 2.413. The mean value of Overweight group is 19.41 and Std. deviation is 1.475. The upper limb speed is more in Normal group when compared to Overweight and Obese group and Overweight group scored well than Obese group.

TABLE 4: 10x5 SHUTTLE RUN TEST

	N	Mean	Std.Deviation
OBESSE	15	31.43	3.579
NORMAL	15	19.18	1.779
OVERWEIGHT	15	25.45	3.887
TOTAL	45	25.36	5.956

Table 4 represents the Mean, Std.Deviation of Shuttle Run test which is a measure of Agility in all the 3 groups. The mean value is high (31.43) in Obese when compared to overweight and Normal group. Normal group mean value is less (19.18) showing statistically better agility when compared to Overweight and Overweight group better than Obese group.

DISCUSSION

Results have shown that there is a significant negative relationship between BMI and Motor Fitness in terms of Agility and Upper limb Speed in Adolescent age group of 13-16 years who are studying 7th to 10th class. We have measured 10x5m Shuttle Run Test for measuring Agility in seconds and Plate Tapping Test for measuring Upper limb Speed measured in seconds among three groups- Normal, Overweight and Obese adolescents.

The Agility is more in Normal when compared to Overweight and Obese groups in my study. Agility in lay man terms means “acting fast”. It is the ability of the person to quickly react to the stimuli irrespective of change of direction of movement which requires balance, Cognition, observation, speed, spatial coherence, reflex and proper timing (Baechle 2008). It is also stated that there is poor stability and increased dependency on vision associated with poor cognition and motor performance in Obese children which were not observed in normal weight children. [8,9] Good amount of postural stability is important for optimal motor development and quality of life. [10]

The impact of Obesity on altered brain structure and function, leptin and insulin resistance, pro inflammatory cytokines ,decreased muscle strength, blood brain barrier, decrease in oxidative capacity, decreased mitochondrial enzymes causes impairment in motor and cognitive abilities of Obese children and Agility is a determinant of cognition in children and Adolescents. [9]

The Obese and Overweight subjects were finding difficulty to move fast when compared to Normal weight children in case of 10x5m shuttle run test may be due to their excessive body weight that have caused extra demand on the working muscles to propulse forward and backward against gravity apart from poor cognition and balance. The result of increase in body mass is mainly due to decrease in physical activity in Obese and Overweight children. [11]

My study is supportive of other few studies that motor tests that require weight bearing activities such as 20m shuttle agility tests, 10x5 m agility shuttle run tests, bent arm hang test, standing long jump tests have shown hindered performance in Obese and Overweight adolescents and children of different age groups and concluded that lack of physical activity in obese children is the main reason for decreased motor performance when compared to Normal weight children. [12-18, 19]

In case of Plate Tapping test Obese and Overweight subjects showed decreased performance when compared to Normal weight group. Plate Tapping is a motor activity that requires balance, upper limb speed and coordination which require good cognitive and musculo-skeletal involvement which is lacking in individuals with increased adiposity. This study is in concordance with few other studies stating that Plate tapping test is better in Normal weight adolescents when compared to Overweight and Obese adolescents as the muscle quality ratio depends on the tapping speed and motor conduction velocity. [4,20] While few studies are against my study

concluding that Plate tapping test does not show any significance with the change in body mass. [21,22]

The Limitation of this study is a small sample size and further studies can be explored taking a large sample size, can be assessed on different age groups with other motor skill parameters. Finally we conclude that physical activity is important in children and adolescents to prevent increase in obesity and its associated complications. Physical activity not only develops the motor fitness in children but also improves cognitive capacity indirectly which is more important for academic performance. Hence evaluating motor skills in adolescents is important to determine health risks in adult life.

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