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CONSTRUCTION OF NORMS OF VERTICAL JUMP, AGILITY AND ANTHROPOMETRIC PARAMETERS FOR SECONDARY SCHOOL GIRLS AND BOYS OF NASHIK

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ABSTRACT

Norms provide standardized benchmarks for comparing children's performance with peers of the same age, sex, and competitive level, thereby facilitating objective assessment, talent identification, and selection. The present study aimed to construct the normative standards for vertical jump, agility, and anthropometric variables among secondary school girls in Nashik city.: A systematic sampling technique was employed to select 940 girls from Grades 6–9 across schools in Nashik City. The participants were assessed for anthropometric parameters, lower-body explosive power using the Sargent Vertical Jump Test, and agility performance using the 4 × 10 m shuttle-run test. The data were assessed for normality using descriptive statistics. Percentile scaling (0–100) was applied to the normative data to develop age-specific normative standards and a standardized five-grade performance evaluation scale.

KEYWORDS: *Normative standards; Anthropometric parameters; Lower-body explosive power; Agility; Physical fitness; Percentile norms; Secondary school girls..*

INTRODUCTION

Growth and development are two fundamental yet distinct aspects of child health that are often used interchangeably. According to Dr. Hiramat Sagar, Growth refers to measurable physical changes, including increases in height, weight, and body dimensions, whereas development encompasses the acquisition of functional, cognitive, language, motor, and social milestones. Regular monitoring of a child's growth using standardized growth charts enables healthcare professionals to assess whether physical growth is appropriate for age and to identify deviations at an early stage. **Hiramat Sagar,2022**. Anthropometric assessment is essential for monitoring a child's growth, nutritional status, and overall development. Measurements such as weight, length/height, BMI, and head circumference help identify growth abnormalities and nutritional problems at an early stage. Regular assessment enables timely intervention, tracks growth patterns, and evaluates the effectiveness of nutritional and health interventions, thereby promoting optimal growth and development in children. **Balasundaram & Avulakunta, 2023.** Among these measurements, BMI-for-age is an important indicator used to assess thinness, overweight, and obesity in children and adolescents aged 5–19 years. **Cashin & Oot, 2018.** In the present study, anthropometric parameters were measured to assess the physical growth of the subjects. These measurements provide important information regarding status of body size, composition, and overall growth patterns.

Anthropometric characteristics and growth-related developmental changes are important determinants of children's motor development during the "Golden Age of Motor Learning." This pre-adolescent period is characterized by rapid neuromuscular and neurological maturation, which

supports the refinement of motor control, coordination, and movement efficiency. Furthermore, this stage represents a critical period for the development of running performance, with substantial improvements in speed, acceleration, and locomotor efficiency resulting from neuromuscular system maturation. Therefore, understanding children's physical development status provides valuable insight into their potential for acquiring fundamental movement skills and enhancing overall motor performance. **Türkmen & Akgül, 2025**. The present study also considered agility and explosive leg power as a study variable.

RESEARCH OBJECTIVES

Development of Normative Standards for Selected Anthropometric Characteristics, Agility, and Vertical Jump Performance of Grade Six Secondary School Boys and Girls.

METHODOLOGY

Research Design

The present study adopted a **normative survey research design** to develop norms for selected anthropometric variables, agility, and vertical jump performance among Grade VI boys and girls studying in secondary schools in Nashik City. **Fernandes et al., 2021**

Population of the Study

The population for the study consisted of all Grade VI students enrolled in secondary schools in Nashik City.

Sample and Sampling Technique

A total of 550 students, including 325 boys and 225 girls, participated in the study. The sample was selected from secondary schools of Nashik City using the systematic sampling technique. This method ensured adequate representation of students from different schools and minimized selection bias.

Variables of the Study

The study aimed to develop norms for the following variables:

- Height (cm)
- Weight (kg)
- Sitting Height (cm)
- Arm Length from Shoulder (cm)
- Vertical Jump (cm)
- Agility (seconds)

Tools and Tests Used

The following standardized instruments and field tests were used for data collection:

- **Standard Anthropometric Measurements** for assessing height, weight, sitting height, and arm length from the shoulder.
- **Sargent Vertical Jump Test** for measuring explosive leg power through vertical jump performance.
- **4 × 10 m Shuttle Run Test** for assessing agility.

All measurements and tests were administered according to standardized procedures to ensure accuracy, reliability, and consistency.

Data Collection Procedure

Prior to data collection, permission was obtained from the principals of the selected secondary schools. The purpose and procedures of the study were explained to the participants and school authorities. Anthropometric measurements were recorded first, followed by the administration of the

Sargent Vertical Jump Test and the 4 × 10 m Shuttle Run Test. The tests were conducted during school hours under standardized environmental conditions, and all participants were provided with uniform instructions before testing.

RESULTS AND FINDINGS

To construct norms for anthropometric parameters, agility, and vertical jump performance among Grade 6 boys and girls in Nashik City, descriptive statistics and percentile-based analysis were applied. The results of the study are presented below in tabular and graphical formats.

Table 1 presents the mean score, standard deviation, skewness, kurtosis, and range for the sixth-grade school girls students

Table 1
Descriptive Statistics of Anthropometric Parameters, Vertical Jump, and Agility for Sixth-Grade Girls

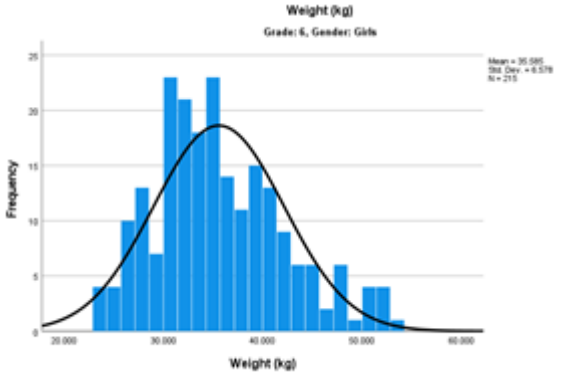
		Weight (kg)	Shuttle Run (sec)	Height (cm)	Sitting Height (cm)	Hand Length from Shoulder (cm)	Vertical Jump (cm)
N	Valid	215	217	220	210	203	220
	Missing	10	8	5	15	22	5
Mean		35.58479	13.44419	145.1177	71.8757	63.1036	22.248
Std. Error of Mean		.448644	.052362	.42178	.25229	.23666	.2511
Median		34.85000	13.48000	144.8500	71.5000	63.0000	23.000
Mode		35.000	13.780	140.00	71.00	65.00	25.0
Std. Deviation		6.578412	.771344	6.25607	3.65600	3.37183	3.7241
Variance		43.276	.595	39.138	13.366	11.369	13.869
Skewness		.561	-.184	.439	.219	.056	-.509
Std. Error of Skewness		.166	.165	.164	.168	.171	.164
Kurtosis		-.114	-.193	-.335	-.318	-.549	-.129
Std. Error of Kurtosis		.330	.329	.327	.334	.340	.327
Range		29.850	4.120	27.00	16.00	15.00	17.0
Minimum		23.150	11.280	133.00	64.00	56.00	13.0
Maximum		53.000	15.400	160.00	80.00	71.00	30.0

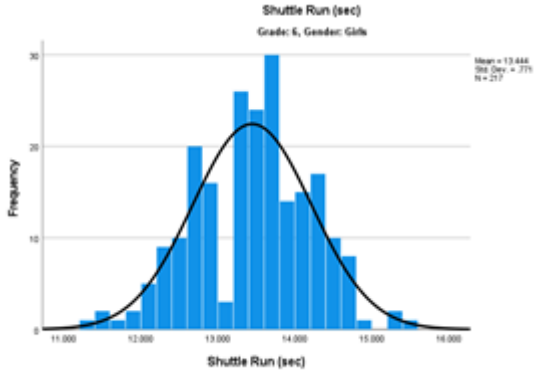
Anthropometric Parameters: **Weight** - The Mean (X) & Standard Deviation (SD) counts were 35.58479 and 6.578412 respectively, whereas the maximum and minimum counts was 53.0000 and 23.150 respectively. **Height** - The Mean (X) & Standard Deviation (SD) counts was 145.1177 and 6.25607 respectively, whereas the maximum and minimum counts was 160.00 and 133.00 respectively. **Sitting Height** - The Mean (X) & Standard Deviation (SD) counts was 71.8757 and 3.65600 respectively, whereas the maximum and minimum counts was 80.00 and 64.00 respectively. **Hand Length from Shoulder** - The Mean (X) & Standard Deviation (SD) counts were 63.1036 and 3.37183 respectively, whereas the maximum and minimum counts was 71.00 and 56.00 respectively

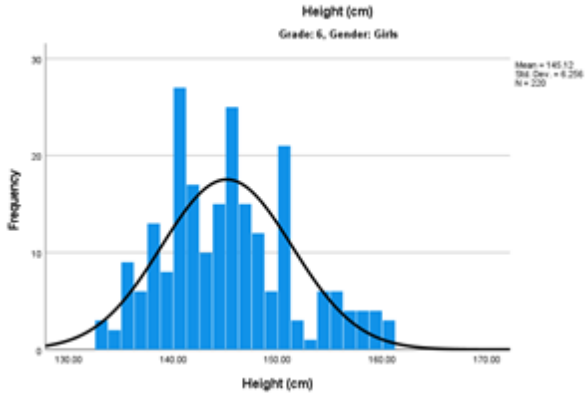
Agility: The Mean score (X) & Standard Deviation (SD) counts were 13.4419 and .771344 respectively, whereas the maximum and minimum counts was 15.400 and 11.280 respectively.

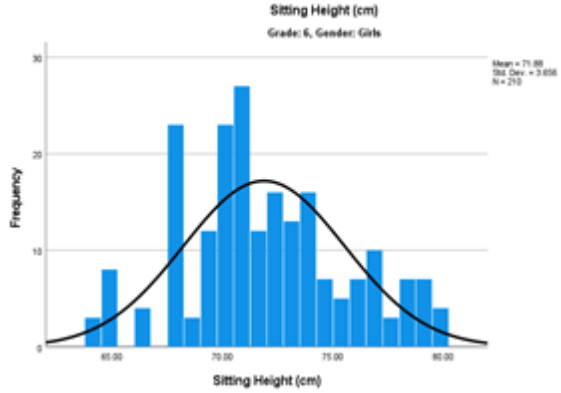
Vertical Jump: The Mean score (X) & Standard Deviation (SD) counts were 22.248 and 3.7241 respectively, whereas the maximum and minimum counts was 30.0 and 13.0 respectively.

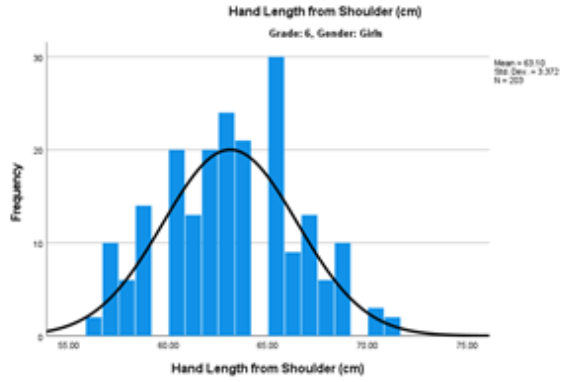
The following graph presents the descriptive statistics of anthropometric parameters, agility, and vertical jump performance among Grade 6 girls.











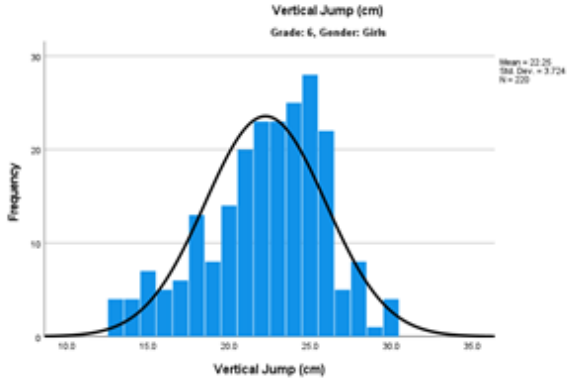


Table 2 presents the mean score, standard deviation, skewness, kurtosis, and range for the sixth-grade school boys students

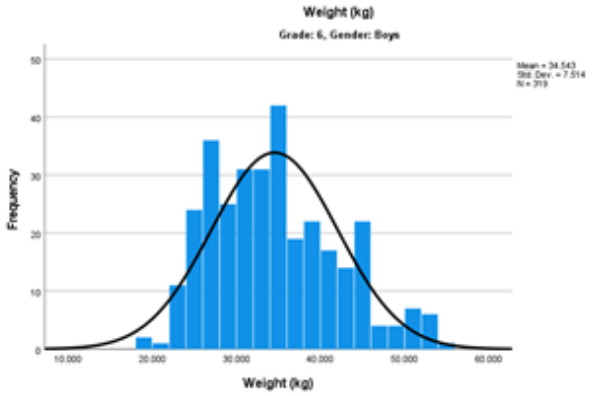
Table 2
Descriptive Statistics of Anthropometric Parameters, Vertical Jump, and Agility for Sixth-Grade Boys

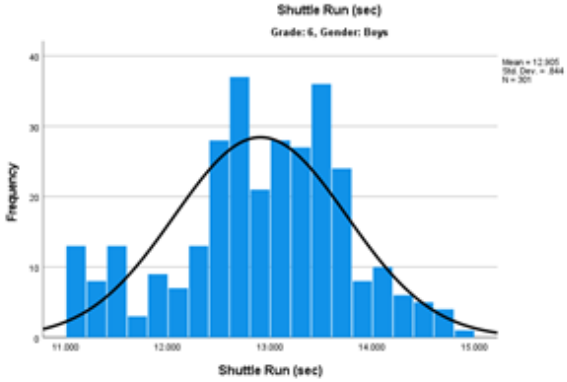
		Weight (kg)	Shuttle Run (sec)	Height (cm)	Sitting Height (cm)	Hand Length from Shoulder (cm)	Vertical Jump (cm)
N	Valid	319	301	320	307	325	322
	Missing	6	24	5	18	0	3
Mean		34.54320	12.90522	143.5306	70.2658	63.0018	24.072
Std. Error of Mean		.420676	.048673	.42390	.28359	.31760	.2306
Median		33.90000	12.98000	143.0000	70.0000	63.0000	24.000
Mode		35.000	13.480	140.00	71.00	65.00	22.0
Std. Deviation		7.513520	.844438	7.58299	4.96889	5.72559	4.1375
Variance		56.453	.713	57.502	24.690	32.782	17.119
Skewness		.524	-.349	.157	-.235	-.419	.214
Std. Error of Skewness		.137	.140	.136	.139	.135	.136
Kurtosis		-.337	-.181	-.428	.379	.066	-.433
Std. Error of Kurtosis		.272	.280	.272	.277	.270	.271
Range		35.250	3.850	36.40	24.00	26.98	19.0
Minimum		19.750	11.030	125.60	58.00	50.02	15.0
Maximum		55.000	14.880	162.00	82.00	77.00	34.0

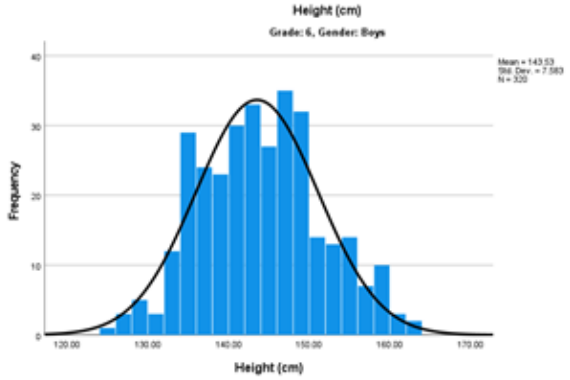
Anthropometric Parameters: **Weight** - The Mean (X) & Standard Deviation (SD) counts were 34.54320 and 7.513520 respectively, whereas the maximum and minimum counts was 55.0000 and 19.750 respectively. **Height** - The Mean (X) & Standard Deviation (SD) counts was 143.5306 and 7.58299 respectively, whereas the maximum and minimum counts was 162.00 and 125.00 respectively. **Sitting Height** - The Mean (X) & Standard Deviation (SD) counts was 70.2658 and 4.96889 respectively, whereas the maximum and minimum counts was 82.00 and 58.00 respectively. **Hand Length from Shoulder** - The Mean (X) & Standard Deviation (SD) counts were 63.0018 and 5.72559 respectively, whereas the maximum and minimum counts was 77.00 and 50.02 respectively

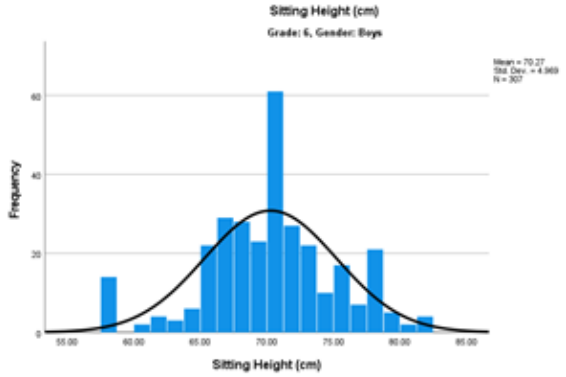
Agility: The Mean score (X) & Standard Deviation (SD) counts were 12.90522 and .844438 respectively, whereas the maximum and minimum counts was 14.880 and 11.030 respectively.
Vertical Jump: The Mean score (X) & Standard Deviation (SD) counts were 24.072 and 4.1375 respectively, whereas the maximum and minimum counts was 34.0 and 15.0 respectively.

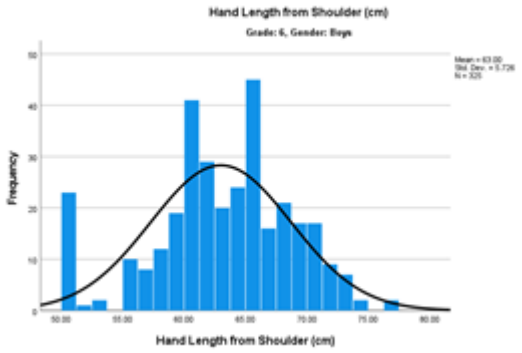
The following graph presents the descriptive statistics of anthropometric parameters, agility, and vertical jump performance among Grade 6 Boys


Weight (kg)
Grade: 6, Gender: Boys
Frequency
Weight (kg)


Shuttle Run (sec)
Grade: 6, Gender: Boys
Frequency
Shuttle Run (sec)


Height (cm)
Grade: 6, Gender: Boys
Frequency
Height (cm)


Sitting Height (cm)
Grade: 6, Gender: Boys
Frequency
Sitting Height (cm)


Hand Length from Shoulder (cm)
Grade: 6, Gender: Boys
Frequency
Hand Length from Shoulder (cm)

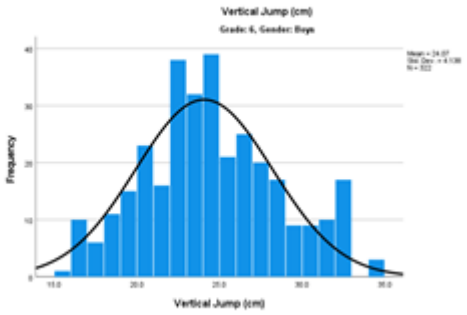

Vertical Jump (cm)
Grade: 6, Gender: Boys
Frequency
Vertical Jump (cm)

Table 3 presents the percentile norms for Grade 6 girls in secondary schools for Anthropometric Parameters, Agility, and Vertical Jump performance.

Table 3:
Percentile scores of Grades 6 Girls on Vertical Jump, Shuttle Run and Anthropometric Parameter

		Weight (kg)	Shuttle Run (sec)	Height (cm)	Sitting Height (cm)	Hand Length from Shoulder (cm)	Vertical Jump (cm)
Percentiles	10th	27.50000	12.40800	137.7300	67.6000	59.0000	17.000
	20th	30.00000	12.70000	140.0000	69.0000	60.0000	19.000
	30th	31.94000	12.97200	141.0000	70.0000	61.0000	21.000
	40th	33.12000	13.33000	143.0000	71.0000	62.0000	22.000
	50th	34.85000	13.48000	144.8500	71.5000	63.0000	23.000
	60th	36.00000	13.71800	146.0000	72.5000	64.0000	24.000
	70th	38.75600	13.85000	148.0000	73.5000	65.0000	25.000
	80th	40.60000	14.13200	150.9600	75.0000	66.0000	25.000
	90th	45.00000	14.40000	154.4500	77.4500	68.0000	26.000

ANTHROPOMETRIC PARAMETER

The percentile distribution of body weight among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 27.50 kg, 30.00 kg, 31.94 kg, 33.12 kg, 34.85 kg, 36.00 kg, 38.75 kg, 40.60 kg, and 45.00 kg, respectively.

The percentile distribution of height among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 137.73 cm, 140.00 cm, 141.00 cm, 143.00 cm, 144.85 cm, 146.00 cm, 148.00 cm, 150.96 cm, and 154.45 cm, respectively.

The percentile distribution of sitting height among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 67.60 cm, 69.00 cm, 70.00 cm, 71.00 cm, 71.50 cm, 72.50 cm, 73.50 cm, 75.00 cm, and 77.45 cm, respectively.

The percentile distribution of hand length from shoulder among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 59.00 cm, 60.00 cm, 61.00 cm, 62.00 cm, 63.00 cm, 64.00 cm, 65.00 cm, 66.00 cm, and 68.00 cm, respectively.

The percentile distribution of Shuttle Run among Grade 6 girls demonstrated a progressive increase in time across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 12.408 sec, 12.700 sec, 12.972 sec, 13.330 sec, 13.480 sec, 13.718 sec, 13.850 sec, 14.132 sec, and 14.400 sec, respectively.

The percentile distribution of vertical jump performance among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 17.00 cm, 19.00 cm, 21.00 cm, 22.00 cm, 23.00 cm, 24.00 cm, 25.00 cm, 25.00 cm, and 26.00 cm, respectively.

Table 4 presents the percentile norms for Grade 6 boys in secondary schools for Anthropometric Parameters, Agility, and Vertical Jump performance.

Table 4
Percentile scores of Grades 6 Boys on Vertical Jump, Shuttle Run and Anthropometric Parameter

		Weight (kg)	Shuttle Run (sec)	Height (cm)	Sitting Height (cm)	Hand Length from Shoulder (cm)	Vertical Jump (cm)
Percentiles	10th	25.33000	11.55000	134.0000	65.0000	56.0000	19.000
	20th	27.60000	12.29000	136.0000	67.0000	59.0000	20.000
	30th	29.70000	12.50000	139.0000	68.0000	60.0000	22.000
	40th	31.34000	12.73000	141.0000	69.0000	62.0000	23.000
	50th	33.90000	12.98000	143.0000	70.0000	63.0000	24.000
	60th	35.40000	13.20000	146.0000	71.0000	65.0000	25.000
	70th	38.10000	13.40000	147.5350	72.0000	66.0000	26.000
	80th	41.45000	13.55000	149.4000	74.0000	68.0000	28.000
	90th	45.05000	13.91800	154.0000	77.5000	70.0000	30.000

ANTHROPOMETRIC PARAMETER

The percentile distribution of body weight among Grade 6 body demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values 25.33 kg, 27.60 kg, 29.70 kg, 31.34 kg, 33.90 kg, 35.40 kg, 38.10 kg, 41.45 kg, and 45.05 kg, respectively.

The percentile distribution of height among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 134.00 cm, 136.00 cm, 139.00 cm, 141.00 cm, 143.00 cm, 146.00 cm, 147.54 cm, 149.40 cm, and 154.00 cm, respectively.

The percentile distribution of sitting height among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 65.00 cm, 67.00 cm, 68.00 cm, 69.00 cm, 70.00 cm, 71.00 cm, 72.00 cm, 74.00 cm, and 77.50 cm, respectively.

The percentile distribution of hand length from shoulder among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 56.00 cm, 59.00 cm, 60.00 cm, 62.00 cm, 63.00 cm, 65.00 cm, 66.00 cm, 68.00 cm, and 70.00 cm, respectively.

The percentile distribution of Shuttle Run among Grade 6 girls demonstrated a progressive increase in time across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were 11.55 sec, 12.29 sec, 12.50 sec, 12.73 sec, 12.98 sec, 13.20 sec, 13.40 sec, 13.55 sec, and 13.918 sec, respectively.

The percentile distribution of vertical jump performance among Grade 6 girls demonstrated a progressive increase across the percentile ranks. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentile values were were 19.00 cm, 20.00 cm, 22.00 cm, 23.00 cm, 24.00 cm, 25.00 cm, 26.00 cm, 28.00 cm, and 30.00 cm, respectively.

Five-point grading scale:

The table 5 presents the performance scores and their corresponding grades based on a five-point grading scale, ranging from Excellent to Poor. The performance scores for Grade 6 girls are presented in the score column, while the corresponding performance levels are classified according to the grades indicated in the grade column.

Table 5
Five-Point Grading Scale for Anthropometric Parameters, Vertical Jump, and Shuttle Run Among Grade 6 Girls

Grade / Variables	Performance Score					
	Weight (kg)	Shuttle Run (sec)	Height (cm)	Sitting Height (cm)	Hand Length from Shoulder (cm)	Vertical Jump (cm)
Excellent	40.99 and above	12.70 and below	151 and above	75.47 and above	66 and above	25 and above
Good	36.37 to 40.60	12.73 to 13.33	146 to 150	72.5 to 75	64 to 66	24 to 25
Average	33.23 to 36.00	13.34 to 13.71	143.30 to 146	71 to72.5	62 to 64	22 to 24
Fair	30.00 to 33.12	13.74 to 14.13	140 to 143	69 to 71	60.06 to 62	19 to 22
Poor	30 and Below	14.16 and above	140 and below	69 and below	60 and below	19 and below

ANTHROPOMETRIC PARAMETERS

Weight: The performance scores for body weight among Grade 6 girls were classified into five categories. A score of 40.99 kg and above was classified as Excellent, 36.37 to 40.60 kg as Good, 33.23 to 36.00 kg as Average, 30.00 to 33.12 kg as Fair, and 30.00 kg and below as Poor.

Height: A height of 151 cm and above was categorized as Excellent, 146–150 cm as Good, 143.30–146 cm as Average, 140–143 cm as Fair, and 140 cm and below as Poor.

Sitting Height: A sitting height of 75.47 cm and above was categorized as Excellent, 72.5–75 cm as Good, 71–72.5 cm as Average, 69–71 cm as Fair, and 69 cm and below as Poor.

Hand Length from Shoulder: A hand length of 66 cm and above was categorized as Excellent, 64–66 cm as Good, 62–64 cm as Average, 60.06–62 cm as Fair, and 60 cm and below as Poor.

Shuttle Run: A performance time of 12.70 seconds and below was categorized as Excellent, 12.73–13.33 seconds as Good, 13.34–13.71 seconds as Average, 13.74–14.13 seconds as Fair, and 14.16 seconds and above as Poor. The classification indicates that lower shuttle run times correspond to higher levels of agility performance.

Vertical Jump: A vertical jump score of 25 cm and above was categorized as Excellent, 24–25 cm as Good, 22–24 cm as Average, 19–22 cm as Fair, and 19 cm and below as Poor. The classification indicates that higher vertical jump scores represent better lower-body explosive power performance.

Table 6 presents the performance scores and their corresponding grades based on a five-point grading scale ranging from Excellent to Poor. The performance scores for Grade 6 boys are presented in the score column, while the corresponding performance levels are classified according to the grades indicated in the grade column.

Table 6
Five-Point Grading Scale for Anthropometric Parameters, Vertical Jump, and Shuttle Run Among Grade 6 Boys

Grade / Variables	Weight (kg)	Shuttle Run (sec)	Height (cm)	Sitting Height (cm)	Hand Length from Shoulder (cm)	Vertical Jump (cm)
Excellent	41.50000 and Above	12.29000 and Below	150.0000 and Above	74.5000 and Above	68.0000 and Above	28.000 and Above
Good	35.7600 to 41.45000	12.35000 to 12.73000	146.000 to 149.4000	71.000 to 74.0000	65.000 to 68.0000	25.000 to 28.000
Average	32.06000 to 35.40000	12.74640 to 13.20000	142.000 to 146.0000	69.000 to 71.0000	62.000 to 65.0000	23.000 to 25.000
Fair	27.67600 to 31.34000	13.2000 to 13.55000	137.0000 to 141.0000	67.0000 to 69.0000	59.0000 to 62.0000	21.000 to 23.000
Poor	27.60000 and Below	13.62860 and Above	136.0000 and Below	67.0000 and Below	59.0000 and Below	20.000 and Below

ANTHROPOMETRIC PARAMETERS

Weight: The performance scores for body weight among Grade 6 boys were classified into five categories. A body weight of 41.50 kg and above was categorized as Excellent, 35.76–41.45 kg as Good, 32.06–35.40 kg as Average, 27.68–31.34 kg as Fair, and 27.60 kg and below as Poor.

Height: A height of 150.00 cm and above was categorized as Excellent, 146.00–149.40 cm as Good, 142.00–146.00 cm as Average, 137.00–141.00 cm as Fair, and 136.00 cm and below as Poor.

Sitting Height: A sitting height of 74.50 cm and above was categorized as Excellent, 71.00–74.00 cm as Good, 69.00–71.00 cm as Average, 67.00–69.00 cm as Fair, and 67.00 cm and below as Poor.

Hand Length from Shoulder: A hand length of 68.00 cm and above was categorized as Excellent, 65.00–68.00 cm as Good, 62.00–65.00 cm as Average, 59.00–62.00 cm as Fair, and 59.00 cm and below as Poor.

Shuttle Run: : A completion time of 12.29 seconds and below was categorized as Excellent, 12.35–12.73 seconds as Good, 12.75–13.20 seconds as Average, 13.20–13.55 seconds as Fair, and 13.63 seconds and above as Poor. As the shuttle run is a timed agility test, lower completion time indicates better performance.

Vertical Jump: A vertical jump score of 28.00 cm and above was categorized as Excellent, 25.00–28.00 cm as Good, 23.00–25.00 cm as Average, 21.00–23.00 cm as Fair, and 20.00 cm and below as Poor. The classification indicates that higher vertical jump scores represent better lower-body explosive power performance.

FINDINGS AND DISCUSSION

The present study was undertaken to construct normative standards for selected anthropometric parameters, agility, and vertical jump performance among Grade 6 boys and girls in Nashik City. Descriptive statistics and percentile-based analysis were employed to examine the distribution of the data and to develop percentile norms and a standardized five- point grading scale. The findings are presented separately for Grade 6 girls and boys to provide sex-specific reference standards.

Descriptive Statistics of Grade 6 Girls

The descriptive analysis of Grade 6 girls indicated that the mean body weight was 35.58 ± 6.58 kg, with observed values ranging from 23.15 to 53.00 kg. The mean height was 145.12 ± 6.26 cm, with a range of 133.00 to 160.00 cm. The mean sitting height was 71.88 ± 3.66 cm, ranging from 64.00 to 80.00 cm, while the mean hand length from the shoulder was 63.10 ± 3.37 cm, with values ranging from 56.00 to 71.00 cm. For agility, assessed through the shuttle run, the mean performance time was 13.44 ± 0.77 seconds, with observed values ranging from 11.28 to 15.40 seconds. The mean vertical jump performance was 22.25 ± 3.72 cm, with scores ranging from 13.00 to 30.00 cm. The skewness and kurtosis values indicated that the variables showed an approximately normal distribution, in normal range of normal probability curve.

Descriptive Statistics of Grade 6 Boys

Among Grade 6 boys, the mean body weight was 34.54 ± 7.51 kg, with observed values ranging from 19.75 to 55.00 kg. The mean height was 143.53 ± 7.58 cm, ranging from 125.60 to 162.00 cm. The mean sitting height was 70.27 ± 4.97 cm, with values ranging from 58.00 to 82.00 cm, whereas the mean hand length from the shoulder was 63.00 ± 5.73 cm, ranging from 50.02 to 77.00 cm. The mean shuttle run performance was 12.91 ± 0.84 seconds, with observed values ranging from 11.03 to 14.88 seconds. The mean vertical jump performance was 24.07 ± 4.14 cm, with scores ranging from 15.00 to 34.00 cm. The distributional statistics indicated an approximately normal distribution across the selected variables, thereby supporting the application of percentile analysis for the construction of normative standards.

Percentile Norms for Grade 6 Girls

Percentile analysis provided reference values for the selected anthropometric parameters, agility, and vertical jump across the 1st to the 99th percentiles. However, only the 10th to the 90th percentile values are presented, as they represent the central reference interval of the study population. Observations below the 10th percentile and above the 90th percentile were classified separately according to the predefined study criteria.

For body weight, the percentile values increased progressively from 27.50 kg at the 10th percentile to 45.00 kg at the 90th percentile. Similarly, height increased from 137.73 cm to 154.45 cm, sitting height from 67.60 cm to 77.45 cm, and hand length from the shoulder from 59.00 cm to 68.00 cm across the 10th to 90th percentiles.

For shuttle run performance, the percentile values increased from 12.408 seconds at the 10th percentile to 14.400 seconds at the 90th percentile. Since the shuttle run is a timed agility test, a lower completion time indicates better agility performance. In contrast, vertical jump performance increased from 17.00 cm at the 10th percentile to 26.00 cm at the 90th percentile, indicating progressively higher levels of lower-body explosive power across the percentile distribution.

Percentile Norms for Grade 6 Boys

For Grade 6 boys, the percentile norms also demonstrated progressive variation across the selected anthropometric and physical fitness variables. Body weight increased from 25.33 kg at the 10th percentile to 45.05 kg at the 90th percentile, while height increased from 134.00 cm to 154.00 cm. Sitting height increased from 65.00 cm to 77.50 cm, and hand length from the shoulder increased from 56.00 cm to 70.00 cm across the 10th to 90th percentile levels.

The shuttle run performance ranged from 11.55 seconds at the 10th percentile to 13.918 seconds at the 90th percentile. As a time-based measure of agility, lower shuttle run times represent better performance. Vertical jump scores increased progressively from 19.00 cm at the 10th percentile to 30.00 cm at the 90th percentile, indicating variation in lower-body explosive power among Grade 6 boys.

Construction of Five-Point Grading Scale for Grade 6 Girls

The percentile-derived scores were further converted into a five-point grading scale consisting of Excellent, Good, Average, Fair, and Poor. For Grade 6 girls, the grading criteria were established separately for each anthropometric and physical fitness variable. In the case of body weight, height, sitting height, hand length from the shoulder, and vertical jump, the higher score ranges were assigned to the higher grading categories. For shuttle run performance, the grading was interpreted inversely because lower completion times indicate superior agility performance.

The grading scale therefore provides a standardized framework for interpreting individual performance scores in relation to the percentile distribution of Grade 6 girls. The scale enables individual scores to be classified into five clearly defined performance levels, facilitating systematic evaluation and comparison within the reference population.

Construction of Five-Point Grading Scale for Grade 6 Boys

Similarly, a five-point grading scale was developed for Grade 6 boys using the percentile-derived performance scores. The selected variables were classified into five categories: Excellent, Good, Average, Fair, and Poor. The grading criteria were established separately for body weight, height, sitting height, hand length from the shoulder, shuttle run, and vertical jump.

For the anthropometric parameters and vertical jump, higher score ranges were generally assigned to the higher performance categories. In the shuttle run, the grading was based on completion time, with lower times representing better agility performance. The resulting five-point grading scale provides a standardized reference for classifying the performance of Grade 6 boys according to their position within the normative distribution..

Overall Findings and Discussion

The findings demonstrate that the study successfully established sex-specific percentile-based normative standards for selected anthropometric parameters, agility, and vertical jump performance among Grade 6 students in Nashik City. The descriptive analysis provided the central tendency and variability of the selected variables, while the percentile analysis enabled the development of reference values representing different levels of performance within the studied population.

The percentile norms demonstrated progressive changes across the 10th to 90th percentile levels for the selected anthropometric parameters. This indicates considerable individual variation in body weight, height, sitting height, and hand length from the shoulder among Grade 6 students. Similarly, the percentile distribution of vertical jump performance reflected differences in lower-body explosive power. The shuttle run results demonstrated variation in agility performance, with lower completion times representing superior performance.

A major outcome of the study was the transformation of percentile-derived values into a standardized five-point grading scale ranging from Excellent to Poor. This classification converts the continuous percentile scores into practical performance categories that can be readily interpreted by physical education teachers, coaches, and researchers. The sex-specific and grade-specific nature of the norms also provides a more relevant basis for individual assessment than generalized reference standards.

The developed normative standards may be used to evaluate the relative anthropometric and physical fitness status of individual students, identify students demonstrating comparatively higher or lower levels of performance, and monitor changes in physical development and fitness over time. The norms may also assist physical education professionals in planning appropriate physical fitness programmes, identifying areas requiring improvement, and supporting the systematic assessment of students' physical characteristics and fitness performance.

CONCLUSION

The study established percentile-based normative values and five-point grading scales for Grade 6 boys and girls in Nashik City, providing standardized reference criteria for assessing anthropometric characteristics, agility, and lower-body explosive power. These developed norms offer a structured framework for evaluating physical performance levels among school-aged children and may support physical education assessment, monitoring of physical development, talent identification, and future research involving similar populations.

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