

Establishing Age- and Sex-Specific Normative Reference Values for Dominant Hand Grip Strength Among Youth Aged 17–26 Years in Haryana

Parveen Kumar^{1*}, Parveen²

^{1,3}Research Scholar, Department of Physical Education, Chaudhary Ranbir Singh University, Jind, Haryana, India;

²Assistant Professor, Department of Physical Education, Chaudhary Ranbir Singh University, Jind, Haryana, India

*Corresponding Author: parveenhooda86@gmail.com

Abstract

The hand grip strength is a very common measure of muscular fitness and functional health and normative reference values are crucial for its interpretation. The present study was conducted to set normative reference values for arm muscle strength (dominant hand grip strength) in the age and sex groups of youth (17-26 years) of Haryana (Uttar Pradesh) in India. A quantitative cross-sectional design was used and data was gathered from 1010 participants, 564 were male and 446 were female. Hand grip strength was measured by a hand dynamometer in dominant hand and percentile values were calculated for each age group separately for males and females. Descriptive statistics and one-way ANOVA were used for data analysis. The grip strength of men (43.00 ± 7.06 kg) was significantly higher than the grip strength of women (24.41 ± 3.47 kg) ($p < 0.001$). Grip strength values were not significantly different across the age range for the percentile tables (P5 - P95) and there were significant differences between the sexes at each age. A classification system based on percentiles was also constructed for ease of interpretation. The results could be the normative parameters used in Haryana and could be helpful in clinical assessment, fitness evaluation, sports screening and future research of Indian youth. The topics covered are hand grip strength, normative reference values, muscular fitness, percentile standards, young adults, and Haryana

Keywords: Hand Grip Strength, Norms, Youth

Introduction

Hand grip strength has been identified as one of the simple and reliable measures of muscular fitness, functional capacity or overall health status. The upper-limb strength index is a commonly used clinical, sports science and public health measure of physical performance and to monitor health outcomes. Grip strength is known to be correlated with muscular activity and easy to measure, which is why it's used to assess physical fitness in diverse populations.

Hand grip strength measurements are of importance for use as normative reference values. They can help in the clinical identification of people with weaker muscles and a dysfunctional ability. In health, sport and exercise science, normative values are used to assess and monitor athletes. They are also good for physical fitness assessment, and for population health surveillance, which can lead to comparisons between age-sex groups.

There are a number of biological factors which influence hand grip strength such as age and

sex. Muscle strength is greatest during late adolescence and early adulthood and there is a known discrepancy between the strength of muscles in males and females – a greater grip, primarily because males tend to be larger and have more muscle mass, and more. So there is a need for age- and sex-specific reference standards for proper interpretation.

While there are normative values for use internationally, there are some populations in the region that are not usable for the purposes of the normatives due to their differing genetic, lifestyle, environmental and demographic features. The importance was given to assessment of muscular fitness although normative data available for the State of Haryana are limited and only exist in the context of youth. Therefore, the aim of the present study is to establish the normative values of the dominant hand grip strength of marginalized age group, youth (17-26 years) of Haryana, India to serve as a region-specific tool for clinical, fitness and research applications.

2. Literature Review

2.1 Hand Grip Strength as an Indicator of Muscular Fitness and Health

Hand grip strength is a metric that has increasingly been identified as a useful measure of health and physical functioning. The authors of the study by Vaishya et al. (2024) suggested that hand grip strength is a “vital sign” of health due to its connection to physical fitness, functional independence, and health outcomes.

The authors emphasized the fact that measurement of grip strength is a simple and low-cost way to determine the overall health status. Likewise, Quattrocchi et al. (2024) emphasized the ubiquity of grip strength assessment in clinical and rehabilitation environments, with outcomes of grip strength being affected by various physiological and demographic parameters. Quattrocchi et al. (2024) highlighted the importance of considering methodological differences in the procedures used to measure grip strength when

interpreting the strength values, while Vaishya et al. (2024) discussed the clinical relevance of grip strength.

Grip strength's importance was further emphasized by Szaflik et al. (2025), who found that hand grip strength is highly correlated with general muscular strength and function. The authors noted, however, that grip strength should not be considered a "full measure" of strength, as it is just one of the factors of strength. Taken together, these studies indicate that grip strength is a good measure of health, but that methodological and population-specific considerations should be taken into account when interpreting this measure.

2.2 Influence of Age and Sex on Hand Grip Strength

Age and sex effects on grip strength have been consistently found in the literature. Nuzzo (2025) conducted a meta-analysis indicating that there is a difference in grip strength between males and females that is present at early ages and increases as we get older. The study concluded that there are biological and physiological differences that give males higher strength values on average. Likewise, Kulkamp et al. (2022) stated that normative values should be age- and sex-specific due to the wide range of grip strength across age and sex groups.

Although Nuzzo (2025) focused on the biological factors, Myles et al. (2025) pointed out that the variations in grip strength should also be explained in terms of functional and environmental factors. The systematic review revealed that their activities at work, physical functioning and lifestyle behaviours were mentioned as other factors that could be influential for strength outcomes, in addition to biological factors. This viewpoint calls into question purely physiological explanations and emphasizes the many factors involved in muscular strength. Researchers have found that age and sex are significant factors in grip strength, but there is controversy about how much of the grip strength is due to biological

factors versus functional factors.

2.3 Normative Reference Values and Population-Specific Standards

It is the development of normative reference values that has become a major area of interest in the study of grip strength. Morin et al. (2022) stated that reference values should be used to understand the results of the muscular strength measurements in clinical and research environments. The authors found that there was significant diversity between the various normative datasets available; however, with much of this difference being attributable to differences in populations assessed, protocols used, and measurement tools used. This discovery indicates that standardisation measures might not be suitable for all groups.

In the same vein, Roman-Liu et al. (2024) stated that factors like age structure, ethnicity, environmental conditions, and lifestyle patterns have significant effects on hand grip strength, which is population-specific. The authors pointed out that equations and reference values obtained from one population may have restricted applicability in another population. International normative standards are good indicators but may not accurately reflect regional populations.

Overall, the literature emphasizes the need for the development of population-specific normative reference values. There are a variety of standards for age and sex, but the evidence available from Indian populations is limited. Normative reference values of young adults in Haryana are poor. It is evident from this gap that there is a need for region-specific data to aid in the proper assessment, interpretation, and monitoring of hand grip strength in the youth of Haryana.

3. Materials and Methods

3.1 Study Design and Setting

This study was of a descriptive, cross-sectional, quantitative, and analytical type to determine age and sex specific normative hand grip

strength of youth in Haryana, India. The cross-sectional design allowed hand grip strength to be assessed at one time point in a population of ages 17-26 years, which is typically when there is maximum muscle development and functional capacity. The data was gathered from the participants of various colleges, universities, and other educational institutions in different districts of Haryana with an aim to cover a wide range of demographic groups.

3.2 Participants and Sampling

The target population consisted of the citizens of Haryana age 17-26 years. Students, skilled workers, and employed people took part. A non-probability sampling technique, namely convenience sampling, was used due to the wide geographical extent of the study area (Haryana) and due to the non-availability of a comprehensive sampling frame. An attempt was made to recruit the participants from diverse gender and residential groups to support the development of representative normative reference values.

Inclusion Criteria

- People from 17 to 26 years old.
- Residents of Haryana
- Participants willing to provide informed consent.
- Individuals capable of completing a hand grip strength assessment.

Exclusion Criteria

- Individuals reporting acute upper-limb injuries at the time of testing.
- Participants with health conditions that could substantially influence grip strength measurements.
- Individuals with incomplete records for the principal study variables.

3.3 Sample Size

For final analysis 1,010 participants were utilized. All the sample subjects (564 males and 446 females) were adequate for age and sex specific normative analysis. There were no missing values reported for the main study

variables. The larger sample size increased the stability of the percentile estimates and increased the reliability of the normative reference values produced.

3.4 Data Collection Procedure

Data were gathered using a structured data report card, which included demographic data and hand grip strength data. Participants were selected from educational institutes all over Haryana. Prior to the study, the participants were informed of the study's purpose and informed consent was obtained. This study was done on a voluntary basis and confidentiality and anonymity was maintained during the study. Grip strength was measured using standardised procedures.

3.5 Measurement of Hand Grip Strength

Hand Dynamometer

Hand grip strength was assessed using a hand dynamometer. Data was collected in kg and separately for each hand (left and right hands). All were measured using a standardised instrument, which made for consistency and reliability of measurement. The dynamometer was the primary evaluation tool for muscular strength and the normative value was determined.

Dominant Hand Assessment

Participants were requested to say which hand they were right-handed in, i.e. the hand that they use most in their daily activities. Grip strength was measured in both hands but the dominant hand grip strength was selected as the primary outcome measure as it is believed this is the most valid measure of maximal voluntary muscular strength. All descriptive, comparative and normative analyses that were carried out in this study were therefore made with reference to the dominant hand values.

3.6 Statistical Analysis

IBM SPSS Statistics was used for all statistical analyses. The characteristics of the participants and the dominant hand grip strength values were

summarised in terms of means, standard deviations, frequencies, es and percentages.

Descriptive Statistics

Descriptive analyses were done to describe the study sample and to summarise the dominant hand grip strength across the categorical age and sex groups. Descriptive statistics like mean and standard deviation were obtained to give an idea of the distribution of grip strength among the population.

Percentile Analysis

Percentile analysis was used to generate the normative reference values. The score for males and females were analysed separately in each age group (17-26) and percentile scores were computed in each age group. Dominant hand grip strength, age and sex normative values were determined using the calculations of 5th, 10th, 25th, 50th, 75th and 95th percentiles.

One-Way ANOVA

The dominant hand grip strength is compared between males and females using one way analysis of variance (ANOVA). Before inferential analysis, normality and homogeneity of variance assumptions were assessed. Though there were deviations from normality, ANOVA was retained due to its robustness in large samples. All tests were two tailed and the p value < 0.05 was considered statistically significant.

4. Results

4.1 Participant Characteristics

A sample of 1,010 participants (17–26 years) were used. The sample consisted of 564 males (55.8%) and 446 females (44.2%) who were found to be representative of both sexes for the purposes of developing the normative reference values. Participants' mean (SD) age was 20.53 (2.39) years, indicating that most of the participants were late adolescents and young adults. The mean height was 169.22 cm (SD = 7.99 cm), while the mean body weight was

66.99 kg (SD = 10.53 kg). The mean BMI was 23.28 kg/m² (SD 2.44 kg/m²) which meant that the whole sample was in the normal weight range. Dominant hand grip strength was the primary outcome variable and had a mean of 34.79 kg (SD = 10.89 kg) and range between 13.40 kg and 67.10 kg. The results suggest there is a high level of variation in the muscular strength of youth in the State of Haryana and can serve as an appropriate basis to develop age and sex-specific normative reference values.

Table 1 Descriptive Statistics of Continuous Variables

Variable	N	Min.	Max.	Mean	SD	Skewness	Kurtosis
Age (years)	1010	17	26	20.53	2.393	0.379	-0.680
Height (cm)	1010	142.00	196.00	169.22	7.995	-0.089	-0.198
Weight (kg)	1010	36.20	106.00	66.99	10.531	0.109	-0.291
Body Fat (%)	1010	11.40	42.60	22.79	5.648	-0.144	-0.944
BMI (kg/m ²)	1010	14.36	34.61	23.28	2.439	0.277	0.420
Dominant Grip Strength (kg)	1010	13.40	67.10	34.79	10.885	0.369	-0.981

Note: SD = Standard Deviation; Skewness and Kurtosis values are standardized

4.2 Dominant Hand Grip Strength by Sex

Dominant hand grip strength descriptive statistics by sex are shown in Table 2. There was reported to be a significant difference in gender of the participants. The 95% confidence interval for females was equal to (24.08 kg, 24.73 kg) and for males (42.42 kg, 43.59 kg). The width of the confidence intervals for the population means are relatively small; that is, they are relatively precise.

The mean value of the dominant hand grip strength of the girls was 24.41 kg, SD = 3.47 kg while the boys mean value of dominant hand grip was very high, 43.00 kg, SD = 7.06 kg. The overall sample mean was 34.79 kg (SD = 10.88 kg).

Table 2: Descriptive Statistics for Dominant Grip Strength by Gender

Group	N	Mean (kg)	SD (kg)	Min	Max	95% CI
Female	446	24.41	3.47	13.40	60.00	24.08 – 24.73
Male	564	43.00	7.06	28.50	67.10	42.42 – 43.59
Total	1010	34.79	10.88	13.40	67.10	34.12 – 35.46

To see whether there was any statistically significant difference between the observed sex difference, a one-way Analysis of Variance (ANOVA) was used. There was a highly

significant difference between the strength of the dominant hand grip of male and female students ($F(1,1008) = 2595.57, p < 0.001$). These differences between the groups were a significant portion of the overall variation for grip strength, suggesting that sex explained a substantial amount of the variance in grip strength among the study's participants.

Table 3: One-Way ANOVA Results for Gender

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	86,103.85	1	86,103.85	2595.57	< 0.001
Within Groups	33,438.81	1008	33.17		
Total	1,19,542.66	1009			

Sex difference, male – female, was approximately 18.59 kg, that is, it was found that there were significant sex differences in grip strength. The superiority of the grip strength values of males is consistent with the differences in muscle mass and strength development between the sexes.

The results show the need for separate normative reference standards for the male and female populations.

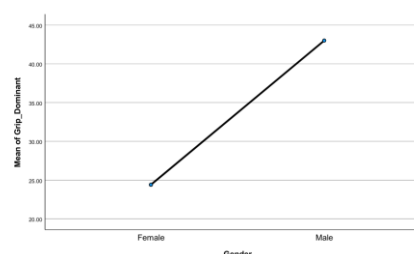


Figure 1: Mean Dominant Grip Strength by Gender

The mean grip strength of the dominant hand was found to be significantly different ($p < 0.001$) between males and females as seen in Figure 1. The results from the graphical presentations clearly show that the male participants had higher grip strength values.

4.3 Distribution of Dominant Hand Grip Strength by Sex

The distribution of dominant hand grip strength was also analyzed separately for male and female participants, as well as descriptive and

inferential analyses . If norms are set, it is important to have some understanding of the distribution of the grip strength values, since the classifications will be based on what is seen in the population.

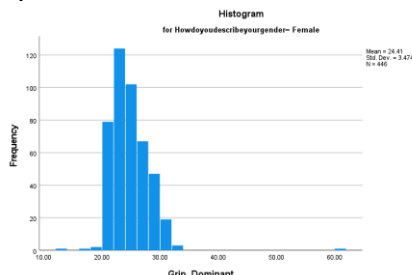


Figure 2: Distribution of Dominant Hand Grip Strength Among Female Participants (N = 446)

A histogram is used to display the data for the strength of the dominant hand grip for the female participants shown in figure 2. The greatest number of observations was made in the range 20 to 30 kg, with the maximum number of observations around 24.41 kg. There is moderate variability in the distribution, and this underpins the provision of female-specific percentile reference values.

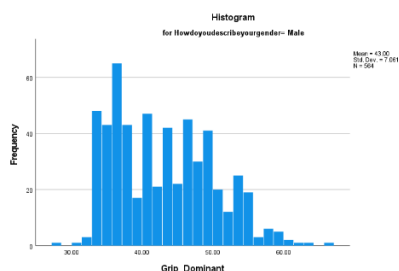


Figure 3: Distribution of Dominant Hand Grip Strength Among Male Participants (N = 564)

The distribution of dominant hand grip strength for males is shown in Figure 3. Grip strength values were significantly higher in the male participants than in females, and the distribution of values was wider.

Additionally, the observed differences in the distribution of grip strength among male and female participants confirm the need for separate normative reference standards. As a result, age-specific percentile values were

generated separately for female and male participants and appear in the following sections.

4.4 Age-Specific Normative Reference Values for Female Participants

The female participants are 17-26 years old, and percentile-based normative reference values are provided in Table 4. In an individual, grip strength can be compared to that of their peers of the same sex and age using the percentile approach.

Table 4: Percentile-Based Normative Reference Values for Dominant Hand Grip Strength – Female Participants (Values in kg)

Age	N	$\bar{X}$	SD	P5	P10	P25	P50	P75	P95
17	73	23.22	4.81	20.00	20.36	21.10	22.30	24.00	27.30
18	18	22.13	2.99	13.40	16.55	21.08	23.00	24.08	—
19	5	25.40	1.34	23.00	23.00	24.50	26.00	26.00	—
20	45	24.16	2.63	20.00	20.60	22.00	24.90	26.30	28.00
21	45	24.23	2.45	21.00	21.00	22.00	24.00	26.65	27.74
22	119	24.91	2.86	21.00	21.00	23.00	24.00	27.70	29.10
23	57	25.02	2.99	21.00	21.00	22.50	24.00	28.30	30.12
24	30	25.69	3.74	20.00	22.00	22.75	24.50	29.93	31.45
25	33	24.99	3.95	21.00	21.00	22.00	24.00	28.70	32.62
26	21	23.91	3.74	20.00	20.20	21.00	24.00	24.00	32.70

Note: P = Percentile; SD = Standard Deviation; '—' indicates insufficient data for estimation at that percentile level.

Females' grip strength showed little variation with age with all median P50 values in each age group within a narrow range. . The pattern of grip strength across age groups was generally stable around the median of 24 kg. Likewise, the interquartile ranges (25th percentile and 75th percentile) were not significantly different by age group, indicating a uniformity of strength distribution in female participants.

The percentile distributions are clinically relevant reference levels for defining those who have low or high levels of muscular strength. . The lower percentile values represent low levels of muscular activity and the higher percentile values represent higher levels of muscular activity in children compared to children of similar age.

4.5 Age-Specific Normative Reference Values for Male Participants

The normative reference values in Table 5 are percentile-based for the age group of male participants, 17- 26 years. The grip strength value of the male participants was found to be higher than that of female participants in all

percentile categories, as observed in sex comparison analysis.

Table 5: Percentile-Based Normative Reference Values for Dominant Hand Grip Strength – Male Participants (Values in kg)

Age	N	Mean	SD	P5	P10	P25	P50	P75	P95
17	31	42.48	3.55	34.00	38.00	39.00	43.70	44.70	47.00
18	113	40.91	5.21	34.00	34.00	36.00	41.00	45.05	49.09
19	156	45.65	5.68	36.00	37.40	40.25	47.10	49.00	54.15
20	86	39.35	6.18	34.00	34.00	35.00	37.00	44.00	52.40
21	87	44.41	7.65	33.00	35.80	38.00	42.00	52.90	55.28
22	27	43.00	8.04	34.00	34.00	36.00	42.00	50.00	57.12
23	14	45.01	10.14	34.00	34.00	37.00	40.00	57.68	—
24	31	44.33	9.91	32.00	32.60	35.00	42.00	58.10	60.40
25	14	36.32	5.04	34.00	34.00	34.00	34.00	35.75	—
26	5	53.80	14.53	38.00	38.00	38.00	62.40	65.30	—

Note: P = Percentile; SD = Standard Deviation; '—' indicates insufficient data for estimation; small cell sizes at ages 23, 25, and 26 limit the precision of extreme percentile estimates.

The median values of the males were generally above 40 kg in most age groups, indicating that males generally have significantly greater muscular strength in their young adult life. There is more variability in males than females, as suggested by higher percentile values, especially the 75th and 95th percentile points. This increased variation could possibly be due to variations in physical maturity, training level, workloads, and lifestyle factors.

The age norms obtained in this study can be used as reference values for assessment, screening, and monitoring of muscular strength in the young male population of Haryana.

4.6 Comparative Age Trends in Grip Strength

The normative age-specific values listed in Tables 4 and 5 are intended to give an idea of the distribution of the dominant hand grip strength of female and male participants ages 17-26 years. The median (P50) values by age group showed fairly consistent trends in grip strength across the ages of 14 to 25.

Median grip strength values did not have significant variation between age groups of female participants. There were some differences in each age group, but no consistent trend of increasing or decreasing was detected. Median values were relatively consistent, indicating that dominant hand grip strength does not significantly change during this age group, and is approaching adult levels of muscular

strength in young women.

Among males, there was a similar trend. The median grip strength values were higher and stayed higher throughout all age groups when compared to females. There were some slight age differences, but very little changes in muscular strength with age were observed. The higher percentile values found for males also indicated that they had a greater absolute strength capacity than females.

The comparison of age-specific percentile distributions of the measurements revealed a significant difference in grip strength among the various ages according to sex. Male participants had higher median, upper percentile, and lower percentile values than females, further underlining the need for separate normative reference values. Beyond that, there was minimal difference in the grip strength measures obtained at the ages of 17 through 26, which could be appropriate for use in developing normative reference values.

The overall analysis by age suggests that dominant hand strength does not vary significantly during the late adolescent and early adulthood age groups, and there are significant gender differences. The results of the present study favour the use of the age- and sex-specific percentile reference values for the assessment and interpretation of the muscular strength of youth of Haryana.

4.7 Proposed Normative Classification Framework

A percentile-based classification system was created for the ease of practical interpretation of the normative data. This is presented in Table 6.

Table 6. Proposed Normative Classification Framework for Dominant Hand Grip Strength

Percentile Range	Classification	Interpretation
< P10	Very Low	Indicates substantially lower grip strength than age- and sex-matched peers and may warrant further assessment.
P10 – P25	Low	Below-average grip strength relative to the reference population.

P25 – P75	Average	Represents the normal range of grip strength for age- and sex-matched individuals.
P75 – P90	Above Average	Higher-than-average muscular strength compared with the reference population.
> P90 (or P95 where available)	Excellent	Represents exceptionally high grip strength relative to age- and sex-matched peers.

Grip strength classification system consists of 5 categories – Very Low, Low, Average, Above Average, and Excellent. A person with a value below the 10th percentile may have a very low muscular strength compared to the muscular strength of children of his/her age and sex; a person with a value above the 90th percentile or 95th percentile may have a very strong muscular strength compared to the muscular strength of children of his/her age and sex.

The proposed framework has improved the applicability of the normative reference values and helps researchers, clinicians, educators, and sports practitioners to analyse the muscular fitness level among the youth of Haryana. The relationship of percentile scores to readily understood classification levels enhances the usefulness of the normative database in both research and applied contexts.

5. Discussion

The present study aimed to set the age and sex-specific Normative Reference Values of dominant hand grip strength for the youth population aged 17–26 years in the state of Haryana. The data obtained from 1010 participants formed percentile-based reference standards and explored the differences in grip strength by sex and age. The results give normative data on muscular fitness, which could help in the assessment of young adults' muscular fitness in the region of Haryana.

The great difference in dominant hand grip strength between men and women was one of the most significant findings of the study. Overall, the mean grip strength of the male participants was determined to be significantly higher than that of the female participants (43.00 kg vs. 24.41 kg, respectively) and the difference was highly statistically significant.

This difference was further strengthened by the distributions of grip strength among males and females, where the males consistently exhibited higher values of strength for all of the measurements. The results here confirm the need to use different normative reference standards for males and females and are in line with the existing knowledge that physiological differences between males and females affect measures of muscular strength.

This was shown by the relatively consistent grip strength percentile normative tables produced for both sexes between the ages of 17 and 26 years. For females, median (P50) values were in the range of 24 kg, with slight differences between age groups. Likewise, the male respondents showed relatively high medians, most of which are above 40 kg, across the various age groups. In some years, there were differences at particular ages, but no consistent trend for increase or decrease. Muscular strength is developmentally stable, becoming mature in late adolescence and remaining stable in early adulthood.

The comparative age analysis further showed that there were sex related differences in all age groups. Male respondents had higher scores at the median as well as in the lower and upper percentiles. The scores are always more widely spread among the males, indicating more variability in muscular strength amongst the male subgroup. The observations highlight the need for using age and sex specific reference standards for interpreting grip strength, rather than the population average value.

One of the important findings of the study is the normative classification system based on percentiles developed. The results were ranked by percentile to very low, low, average, above average, and excellent based on different strength percentile ranges to provide a practical tool for the interpretation of muscular fitness. This classification can help physical therapists, fitness trainers, coaches, and athletes identify those with relatively weak strength levels and track changes in muscular strength over time.

The results also highlight the importance of the creation of population-specific reference standards. Normative values based on other countries or populations may give a wrong interpretation, as muscular strength is affected by demographic, biological, environmental, and cultural factors. The Haryana-specific reference values obtained in the present study, therefore, offer a better reference for the regional context when assessing young adults.

As a whole, the study gives comprehensive normative reference values for dominant hand grip strength of youth of Haryana and shows that there was a distinct difference between boys and girls and relative stability in the muscular strength of youth in the state of Haryana. The current results add to the knowledge base on muscular fitness assessment, which may help in the clinical assessment, fitness monitoring, sports screening, and future studies on young adult populations.

6. Conclusion

The norms for dominant hand grip strength have been fixed according to age-sex for 1010 youth of age group 17-26 years of Haryana area of India in this research. The results showed that there was a significant difference between gender for grip strength in all age groups with higher values obtained for males. The differences highlight a need to develop sex-specific reference standards for moulding muscular fitness.

The normative tables developed in the study are percentile based, which provides an in-depth picture of dominant hand grip strength of the youth in Haryana. The two age groups (17-26 years and 27-30 years) were investigated and it was determined that within these age bands, grip strength is relatively stable, thus indicating the age range of 17 and 26 years as a period of maintained muscular strength. Median values do not differ significantly among age groups thus providing support to the suitability of this age group for normative standards development.

The proposed percentile classification framework also renders the results meaningful and usable in real applications since it classifies the grip strength performance into meaningful levels. Normative values may assist a clinician, sports scientist, physical educator, and fitness professional in determining the level of fitness muscle health, determine those who have relatively weak muscle fitness, and track physical function. In overall evaluation, the study has set up certain reference standards for assessing hand grip strength of young adults of Haryana and can act as base for further studies and applications in the health segment as region-specific.

References

- Vaishya, R., Misra, A., Vaish, A., Ursino, N. and D'Ambrosi, R., 2024. Hand grip strength as a proposed new vital sign of health: a narrative review of evidences. *Journal of Health, Population and Nutrition*, 43(1), p.7. <https://doi.org/10.1186/s41043-024-00500-y>
- Szaflik, P., Zadoń, H., Michnik, R. and Nowakowska-Lipiec, K., 2025. Handgrip strength as an indicator of overall strength and functional performance—systematic review. *Applied Sciences*, 15(4), p.1847. <https://doi.org/10.3390/app15041847>
- Quattrocchi, A., Garufi, G., Gugliandolo, G., De Marchis, C., Collufio, D., Cardali, S.M. and Donato, N., 2024. Handgrip strength in health applications: a review of the measurement methodologies and influencing factors. *Sensors*, 24(16), p.5100. <https://doi.org/10.3390/s24165100>
- Nuzzo, J.L., 2025. Sex Differences in Grip Strength From Birth to Age 16: A Meta-Analysis. *European Journal of Sport Science*, 25(3), p.e12268. <https://doi.org/10.1002/ejsc.12268>
- Myles, L., Barnett, F. and Massy-Westropp, N., 2025. Do functional and biological factors influence the handgrip strength: A systematic review. *British Journal of Occupational Therapy*, 88(4), pp.198-216.

<https://doi.org/10.1177/03080226241293617>

Külkamp, W., Ache-Dias, J. and Dal Pupo, J., 2022. Handgrip strength adjusted for body mass and stratified by age and sex: normative data for healthy Brazilian adults based on a systematic review. *Sport Sciences for Health*, 18(4), pp.1149-1160.
<https://doi.org/10.1007/s11332-022-00916-1>

Roman-Liu, D., Kamińska, J. and Tokarski, T.M., 2024. Population-specific equations of age-related maximum handgrip force: a comprehensive review. *PeerJ*, 12, p.e17703.
<https://doi.org/10.7717/peerj.17703>

Morin, M., Duchesne, E., Bernier, J., Blanchette, P., Langlois, D. and Hébert, L.J., 2022. What is known about muscle strength reference values for adults measured by hand-held dynamometry: A scoping review. *Archives of Rehabilitation Research*

and *Clinical Translation*, 4(1), p.100172.
<https://doi.org/10.3390/jcm14238454>

Article History

Received: 05 May 2026

Accepted: 02 June 2026

Published: 25 June 2026

How to Cite: Kumar, P., Parveen (2026.). Establishing Age- and Sex-Specific Normative Reference Values for Dominant Hand Grip Strength Among Youth Aged 17–26 Years in Haryana *The Scholars Time: A Multidisciplinary Journal of Research and Development* 09 (06). 31-40.

COPYRIGHT

© This work is licensed under a Creative Commons Attribution 4.0 International License.