

A Study of Handgrip Strength in the South Indian Male Population

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ABSTRACT

Background: The anatomical system of the hand is complex and includes both static and moving parts. For the most part of our lives, we take our grip strength for granted. It is necessary to preserve the integrity of the handgrip and provides information regarding general muscle strength, endurance, and power. Handgrip strength can also serve as a straightforward, cost-effective, and practical tool in occupational health research; it can be used to assess nutritional status, track the loss of muscle strength, and develop prevention or intervention measures. The present study aimed to compare maximal hand grip strength in men of different age groups.

Materials and methods: 150 male subjects in total, whose ages ranged from 20 to 60, participated in the study. Subjects in the age group of 40–60 years were taken as Group I, and those in the age group of 20–39 years were taken as Group II. The strength of the dominant hand's grip was compared between the two groups in the current study. The grip strength of the dominant hand was measured three times at an interval of 1 minute, and the mean value recorded was considered to be the maximum hand grip strength. The data was analyzed by paired t tests using SPSS version 22.

Results: The handgrip strength in males aged 20-39 years was statistically significant ($p < 0.001$) as compared to the other group.

Conclusion: Handgrip strength is higher in younger males when compared to men over 40, probably due to increased muscle mass.

Key words: hand grip strength, hand dynamometer, male

INTRODUCTION

Muscular power, or the greatest force or tension produced by one's forearm muscles, is measured by grip strength. [1] It can be measured easily and inexpensively, making it a helpful indicator in a variety of therapeutic settings. As we age, our grip strength deteriorates, which finally starts to impact our daily activities. Depending on the strength of the hands, simple tasks like opening jars, carrying groceries, and turning doorknobs become more or less challenging. According to a review from 2016, handgrip strength is a reliable predictor of mortality, declines in cognition, mobility, and functional status in older individuals who live in communities. [2] Grip strength was cited as the best indicator of muscle strength in the 2010 report by the European Working Group on Sarcopenia in Older People (EWGSOP) that outlined the assessment criteria for sarcopenia. [3]

The handgrip test is the most popular method for assessing grip strength. Handgrip strength (HGS) is frequently measured as a total fitness parameter in the population or in sports practices. [4] Upper extremity and general body strength can be related to isometric grip strength. According to Norman and colleagues' systematic assessment of HGS as a nutritional marker, this measurement would be a reliable

indicator of nutritional status. [5] Grip strength changes can serve as reliable markers of the need for and success of rehabilitation therapy.

The JAMAR-Dynamometer and the Martin Vigorimeter are the tools that are most frequently used to measure grip strength. The former uses hydraulics to measure isometric strength in kilograms, whereas the latter uses a compressible rubber ball to measure compression force in kilopascals. [6, 7] By calculating the amount of static force that the hand can squeeze against a dynamometer, hand grip strength can be determined. However, there are many different ways to describe grip strength, depending on factors like the dynamometer used or the testing technique.

Analysis of grip strength by gender reveals that males have stronger grips at all ages, while analysis by age group shows that grip strength for both sexes' peaks in the fourth decade and then gradually declines. [8] Though there are a lot of studies showing differences in hand grip strength by age and gender, there is a lack of literature on the Indian population. Our study aims to describe the differences in hand grip strength between males of different age groups.

MATERIALS AND METHODS

Study population

This is a cross-sectional study conducted in the research lab of the Physiology Department of the Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu. 150 males in the age group of 20–60 years participated in our study. The study excluded participants with musculoskeletal disorders, any serious sickness, a history of upper-limb injuries or nerve damage, and a history of taking drugs that affected motor performance. The study

was conducted from January 2023 to April 2023.

Recording of hand grip strength

All of the participants were given an explanation of the study's goal and methodology at the outset. After being properly informed, all participants gave their written consent. Using a handgrip dynamometer (INCO Ambala, India), the maximum handgrip strength was determined. The subjects used the handgrip dynamometer to exercise grip strength while seated in a chair with their elbows straight and near their bodies. The examiner demonstrated how to grip the dynamometer handle before testing. For three seconds, subjects were instructed to squeeze the dynamometer handle as tightly as possible using their dominant hand. For each subject, three trials were conducted and recorded. To counteract the effects of weariness, a 2-minute rest interval was given to the participants. The mean of the three grip strength trials for the dominant hand was then used to compute the maximum voluntary hand grip strength.

STATISTICAL ANALYSIS

For statistical analysis, the paired t test was applied using SPSS software version 22. A p-value <0.05 was considered statistically significant, and a p-value <0.001 was statistically considered to be highly significant.

RESULTS

The present study included 150 males in the age group of 20–60 years. Group I included men of the age group 40–60 years, and Group II included men from 20–39 years. Age and physical characteristics like height (cm) and weight (kg) were recorded for all the subjects (Table 1).

Table 1. Descriptive statistics of the physical characteristics of the subjects (n = 150)

	Groups	n	Mean	Standard Deviation	p-value
Age	Group I	75	50.44	5.18	
	Group II	75	29.44	5.65	
Height	Group I	75	164.88	5.49	0.581
	Group II	75	165.37	5.41	
Weight	Group I	75	80.28	10.83	0.562
	Group II	75	81.24	9.32	
p-value based on Independent-t-Test					
* = Statistically Significant (p < 0.05)					

Statistically, no significant difference was noted in the mean values of age, height, and weight between both male groups. Table 2 shows the maximum handgrip strength in both the groups.

Table 2. Comparison of maximum handgrip strength in both age groups (n=150)

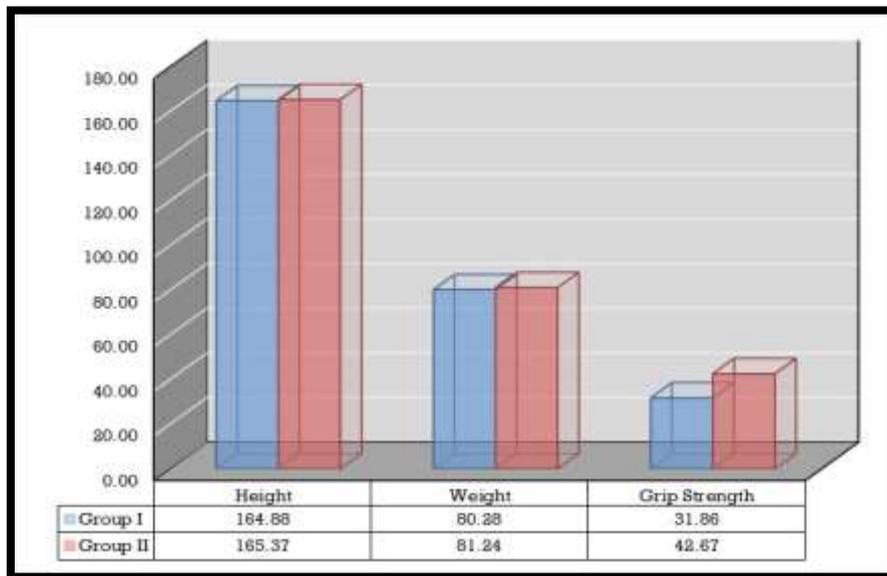
	Groups	n	Mean	Standard deviation	p-value
Grip Strength	Group I (40-60 years)	75	31.86	3.40	< 0.001*
	Group II (20-39 years)	75	42.67	5.09	

p-value based on Independent-t-Test
 * = Statistically Significant (p < 0.05)

The maximum hand grip strength in the age group 40–60 years was 31.86 ± 3.40 and the maximum hand grip strength in the age group 20–39 years was 42.67 ± 5.09 . There was a clinically and statistically significant

(p < 0.001) difference in the hand grip strength of both age groups. Graph 1 shows the physical characteristics and handgrip strength comparisons of both age groups.

Graph 1. Physical characteristics and hand grip strength in both age groups



DISCUSSION

One of the most popular methods for determining an adult's level of muscular fitness is the handgrip test, which is also a crucial gauge of athletic performance. In the current study, 150 male individuals' handgrip strength was compared. This can give males in the 20–60 age range baseline data and handgrip reference values. The mean handgrip strength (in kg) for men in the age group 20–39 years was significantly higher than for men in the age group 40–60 years.

Grip strength has been previously reported to correlate with gender and age. [9] A study done by Rufus A. Adedoyin et al.

showed that grip strength peaked in the 20–29-year age category for both males and females. [10] A study done by Chilima et al. showed that there was a significant decline in handgrip strength with age. [11] Several other studies also report that hand grip strength decreases with increasing age. [12, 13] Only among the male participants in this study was a significant association between age and grip strength discovered. This supports earlier studies that claimed a connection existed between hand strength and age. A study done by Bassey et al. reported that there was a significant decline in strength with age of 2% per year for men and women. [14] A study done in Saudi

Arabian men by Alahmari et al. reported that stronger hand grip strength is determined by a longer hand length, a larger forearm circumference, and a younger age in Saudi Arabian men. [15]

Decreasing handgrip strength in the elderly is associated with their fiber-type transformation, shifts in muscle fiber architecture, and the process of excitation-contraction (EC) coupling, genetic factors, and oxidative stress. [16] However, it is thought that the fundamental mechanism causing the decline in muscle strength is the diminishing muscle fiber type II, which is crucial for anaerobic metabolism (i.e., glycolysis is high). Muscle strength is generally favorably correlated with physical activity, but excessive or inappropriate activity can lead to impaired physical functioning in later life. By providing a larger safety margin over the threshold of disability, good muscle strength in middle age may shield people from old-age disability. Measurements of grip strength could be used to identify those who are more likely to be physically disabled due to low muscle strength in early population screening. Exercise programmes aimed at strengthening all muscle groups in these people may reduce their likelihood of developing a physical handicap in the future.

The study included a number of restrictions. Generalizations based on the results are challenging due to the small sample size, absence of female participation, and large age range. For clinical usage and hand rehabilitation, the current study presents data on hand grip strength for a sample of healthy adult males.

CONCLUSION

This study reports the age- and sex-stratified reference values for handgrip strength in a representative sample of the South Indian population, aged 20-60 years. It can be concluded that men in the age group of 20-39 years had significantly higher hand grip strength as compared to 40-60-year old

men, which is probably due to a decrease in muscle mass.

Declaration by Authors

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