



# Exploring the Association of Anthropometric Variables with Handgrip Strength and Flexibility in Older Adults: Implications for Maintaining Functional Independence

**Jagpreet Singh**

Research Scholar,  
University of Technology, Jaipur

**Abstract:** It is notable that aging illnesses like sarcopenia and frailty are frequently accompanied by low muscle strength. The transfer of diseases that plague elderly persons receiving long-term care institutions has not been well studied. This study's objectives were to measure handgrip strength (HGS) in elderly men and women who were being considered for institutional placement and to examine the relationships between HGS and mobility, leg strength, flexibility, and postural balance. Stride speed was often highly associated with HGS in women, whereas upper appendage flexibility was for men. Early conclusion will aid in the development of appropriate mediations through the application of basic approaches, preventing death and disability in long-term care institutions. The handgrip strength test was employed in this study because it is an effective predictor of general strength and actual slightness. It was utilized to show actual functioning and muscular deficiency associated to active work. The handgrip strength test results show a genuinely significant difference between the two hands' grip strength depending on the level of activity (right hand:  $p= 0.0084$ , left hand:  $p= 0.0001$ ), indicating that regular activity influences grip strength as a sign of an older person's actual functioning and improvement of their level of personal satisfaction.

**Index Terms –** Exploring, Anthropometric Variables, Handgrip Strength, Flexibility, Older Adults, Functional Independence

## I. INTRODUCTION

Growing older is associated with a gradual decrease of muscle mass and an increase in fat mass. The bulk of geriatric disorders, such as deficit dysfunction, sarcopenia, mobility issues, and falls, can all be identified by a loss of muscle strength. Different morbidities had stronger associations with worse self-reported health and more brittle cognitive capacities. It is a critical predictor of the likelihood of mental impairment, dementia, and misery in elderly persons, according to epidemiological studies. A correlation between HGS and age, orientation, BMI, and health state has also been found.

Muscle power is a crucial component in the creation of sound. For both men and women, low handgrip strength (HGS) is a major contributor to portability issues. Due to the aging-related decrease of grip strength, older persons become less autonomous and must rely on family support or guardians. Along with manual dexterity of the upper extremities, it may be difficult to maintain postural balance and walk unassisted. It is used to forecast future death, doom, and disability. Early muscle weakness diagnosis can aid in identifying those who may be at risk for major mobility impairments and prolonged sleep duration. Individual estimations have limits for suggestive factors for individuals who are likely to fail. Data on the link between HGS and other potential components of mobility, leg strength, flexibility, and postural balance in the community of older adults considered for institutional care are, however, lacking.

Functional handicap acts as a barometer of general health despite segment variances. For therapeutic practice, it is essential to broaden the scope of reference values among older men and women getting institutional care in India because the global average grasp strength differs by area. Ageing is a dynamic and irreversible physiological interaction that occurs as live organic units grow and change in their own particular ways over the course of life. An expanded future on a basic level is one of humanity's notable accomplishments. The World Wellbeing Association (WHA) defines health as a person's complete state of physical, mental, and social well-being. It goes beyond simply being free from disease or sickness. Legislators and social orders began to advocate for healthy maturing, emphasizing both deferring and furthering life in order to improve the overall welfare of the aged and, as a result, reduce the financial burden on healthcare systems. It has been found to be challenging to get everyone to agree on what constitutes sound maturing. However, following WHO published the World Report on Aging and Wellbeing, solid maturing was described as "functional capacity to be and do what an older individual has motivation to esteem." Having connections, the ability to play a role or a character locally, the potential of freedom, happiness, and the capacity to grow personally, as well as security, are all examples of functional capacities. Because so many older individuals have at least one disorder that affects their welfare even when it is treated, many older persons do not have specific illnesses or fail to participate in everyday activities as main drivers of healthy aging.

One of the main markers of sound maturation is muscle strength. As the system matures, the strength of the outer muscular structure declines. Myostatin levels cause apoptosis and a decrease in the number of muscle cells, chemicals are released, the neuromuscular framework alters, proteins are broken down, provocative cycles occur in many sections of the body, and the body's provocation cycles. These multiple physiological alterations lead to weakening, incapacity, dependence, frequent falls, and hospitalizations as well as a decline in the effectiveness and quality of outer muscle execution.

## II. LITERATURE REVIEW

A review led by Shiffman (1992) examined the relationships among prehension design type and recurrence, hand strength, and execution time in functional tasks. Prehension designs were connected to a framework of functionally based order. Using a dynamometer and a squeeze check, grasp and three different types of squeeze were estimated. According to the findings, prehension design preference didn't seem to differ with age. However, there were measurable, significant differences in age for prehension design recurrence, hand strength, and execution time. Older, non-dysfunctional patients were observed resetting similar prehension designs in response to a sidelong squeeze deficiency, which increased prehension design recurrence and execution duration.

Desrosiers et al. (1995) used the Jamar dynamometer and the Martin vigorimeter to measure the hold strength of 360 patients who were 60 years of age or older and were randomly chosen based on age and orientation layers. They argued that men were consistently more anchored than women and that grip strength declines curvilinearly with age.

Ellis et al. (2000) focused on 86 children and teenagers from a private school for the hard of hearing who were matched with 86 children and youth with typical hearing from four state-funded schools (by age, sex, level, weight, and hand inclination). An positioned, aligned, water-powered dynamometer was used to test each participant's grab strength. There were no obvious crucial distinctions between the bunches. The comparative group exhibitions were attributed to the private school's comparable open doors for athletic cooperation and practical instruction.

Häger-Ross and Rösblad (2002) showed that grab strength averaged over the course of the 10 seconds when they utilized the tool Grippit to measure peak grip strength on 530 Swedish children between the ages of 4 and 16. Young men and young women both exhibited an increase in grip strength with age up to the age of 10, but after that, young men were typically more grounded than young women. There were substantial areas of strength between grab strength and the anthropometric parameters of weight, level, and particularly hand length. Children who had their dominant hand be their right hand tended to be more stable, whereas children who had their dominant hand be their left hand showed no preference in hand strength. Therefore, it was recommended that while assessing grip strength in left-handed youngsters, two hands should be thought of as about areas of strength. The idea was also put up that right-handed kids should actually rely on their right hand to be 10% more grounded. With slightly lower values in younger children, supported grasp strength was generally between 80 and 85 percent of maximum hold strength.

Incel et al. (2002) looked at the grip and squeeze strength differences between sides for the right and left handed populations and reasoned that the dominant hand in right handed subjects was fundamentally more grounded but that there was no such significant difference between sides for left handers.

## III. MATERIALS AND METHODS

46 examinees who were 60 years of age or older in total participated in the review. The exercises were designed with older people in mind and were overseen by physiotherapy college interns. Three separate components of the activities were created. A 10-minute warm-up was required in the first section. All test takers engaged in extensive bunch practice. The benefits of the estimation of the handgrip were obtained for the purposes of this evaluation using the Jamar Water-driven Hand Dynamometer, manufactured by Patterson Clinical [formerly Sammons Preston], Warrenville, IL, USA. Every respondent submitted two estimations, and the mean incentive for two hands was used in a subsequent quantitative analysis. Table 1 lists the dynamometry reference values by age grouping and direction.

**Table 1:** Age- and gender-specific dynamometry reference values

	Age group		
	60-64	65-69	70+
<b>Male right hand</b>	42	42	31
<b>Male left hand</b>	34	34	30
<b>Female right hand</b>	26	24	20
<b>Female left hand</b>	21	21	18

The results are presented as number-crunching means, least and greatest characteristics, and standard deviations, with engaging insights as the primary product. It was determined whether the information distribution was typical using the Kolmogorov-Smirnov test. The matched instances t-test was also utilized to see if there was a clearly discernible difference in grip strength between the left and right hands at the start and close to the end of the activities. Each and every responder actively filled out the survey, and they were free to stop at any point.

## IV. RESULTS

### 4.1 All test subjects' left and right hands' handgrip strength

The right hand's grip strength is initially stimulated by the number juggling. The right hand's grip strength during activities shows a genuinely significant difference in the data ( $p = 0.0084$ ). The left hand's grip strength changes when the exercises are done, and this difference is measurably significant ( $p = 0.0001$ ). Table 2 provides a summary of the data.

**Table 2:** All test subjects had a handgrip strength test.

	N	Mean value (kg)	Minimum (kg)	Maximum (kg)	Std. dev. (kg)	p-value
Right hand (first measurement)	46	24.23	4.00	30.00	6.00	0.0084
Right hand (second measurement)	46	24.48	15.00	30.00	4.32	
Left hand (first measurement)	46	22.31	7.00	35.00	5.02	0.0001
Right hand (second measurement)	46	25.30	15.00	37.00	3.88	

#### 4.2 Women's left and right hands' grip capacity

The group consisted of 13 ladies, whose ages ranged from 60 to 64. In the two calculations, the average reward for the right hand is more than the benchmark value for this age group. The age group included 13 women between the ages of 65 and 69. Table 3 provides a summary of the data.

**Table 3:** Women were tested for their right handgrip strength according to their age group before and after the 8-month exercise program.

	N	Mean value (kg)	Minimum (kg)	Maximum (kg)	Std. dev. (kg)
first measurement(60-64)	13	25.03	21.40	31.40	2.85
second measurement (60-64)	13	27.03	24.00	22.00	2.25
first measurement (65-69)	13	24.31	15.40	35.00	3.32
second measurement (65-69)	13	26.07	21.40	35.00	2.66
first measurement (70+)	22	18.80	4.00	34.40	6.48
second measurement (70+)	22	23.28	15.00	31.00	3.33

The average attributes on the first and second estimation for the previously mentioned age group exceeded the reference esteem. Both negative traits exceed the standard of decency. The mean value of the main estimation is almost identical to the benchmark incentive for this age group. Left handgrip strength test results for this age group's second estimation have a mean value that is higher than the reference value. The data are summarized in Table 4.

**Table 4:** Women's left handgrip strength was assessed before and after an 8-month workout program, according to their age group.

	N	Mean value (kg)	Minimum (kg)	Maximum (kg)	Std. dev. (kg)
first measurement(60-64)	13	24.53	14.00	32.00	3.52
second measurement (60-64)	13	26.07	25.00	35.00	2.35
first measurement (65-69)	13	23.83	16.00	31.00	2.80
second measurement (65-69)	13	24.31	21.00	31.00	2.77
first measurement (70+)	22	18.06	7.00	35.00	5.77
second measurement (70+)	22	22.37	15.00	28.40	3.40

#### 4.3 Men's left and right hands' handgrip power

The male test volunteers were both older than 70 years old. In the two estimates, the right hand grip was positioned below the reference reward for this age group. The average characteristics on the two estimates on the left hand were above the norm and a motivator for that age group. Table 5 contains a summary of the data.

**Table 5:** Men's left and right handgrip strength was assessed before and after an 8-month workout regimen based on their age group.

	N	Mean value (kg)	Minimum (kg)	Maximum (kg)	Std. dev. (kg)
Right hand: first measurement (70+)	2	27.00	15.00	41.00	15.86
Right hand: second measurement (70+)	2	23.26	13.40	31.00	11.85
Left hand: first measurement (70+)	2	35.40	32.00	41.00	3.84
Left hand: second measurement (70+)	2	32.00	31.00	35.00	3.35

## V. DISCUSSION

Sarcopenia, a reduced capacity for activity, continuous cardiovascular degeneration, and disability can all be brought on by a lack of skeletal mass. The significance of muscle strength as a possible indicator for the healing of chronic disorders and illnesses in older persons is demonstrated by all of the aforementioned examples. Therefore, assessing muscle strength may be crucial in detecting which senior persons are more susceptible to developing specific diseases.

The strength of the arm muscles can be determined anthropometrically by measuring handgrip strength also referred to as arm strength. The ability of an elderly person to grab objects is a sign of their general health. Our grip becomes more brittle as we age, which over time has an impact on how content we feel with ourselves. Simple chores like twisting door handles, pushing entryways, lugging sacks of staple foods, and opening jars become quite challenging. That can result in action limitations and a decrease in how frequently a person leaves their house, which might affect their social, psychological, and functional wellness. According to the summary of the analysis undertaken by the research scholar, actual work is linked to a number of characteristics that constitute personal contentment. Functional constraints, emotional stability, necessity, and mental cycles are all related to these regions. Active labor may also have an impact on a person's sense of independence and the fundamental mental elements of fulfillment. A connection between actual work/dormancy and mental capacities as people age has also been found by studies. Even the slightest variations in handgrip strength can be detected using an estimation of handgrip strength, especially in elderly adults who exercise frequently. It's critical to emphasize that while decreasing strength doesn't always signify chronic disability, it does imply a person's level of happiness is lower. Whatever the circumstance, even the smallest amount of actual exercise per day that is advised improves joint flexibility and muscular strength, lowers the risk of developing a handicap, and boosts general well-being. The majority of participants in this survey were aged 70 and older, in contrast to prior research that examined the relationship between handgrip strength, age, chronic illnesses, and active occupation in the elderly.

The results showed that the base value in the succeeding estimation grew, and the right handgrip strength of all test subjects increased; none of the participants had right handgrip strength less than 14kg. The mean and least worth both went up in the second assessment of left handgrip strength. In contrast, actual delay in the older population was substantially connected with low handgrip strength, according to an English study that looked at actual work and handgrip strength. Handgrip strength varies between people and is frequently seen as being higher in men than in women, according to studies by Bohannon et al. In this study, women across all age categories showed higher grip strength, despite the fact that after eight months of exercise, males had a lower mean motivation. The fact that the male test subjects did not exhibit any change may be attributed to their advanced age (over 70 years old) or their seldom participation in the activities. Additionally, it should be noted that more female participants in study and exercise groups are remembered.

## VI. CONCLUSION

Low grasp-strength males and females were identified for institutional consideration. HGS is less concerned with direction and more concerned with flexibility, the strength of the lower appendages, and dynamic equilibrium. HGS evaluation is a quick, effective, and acceptable method for determining the frequency of portability restrictions and functional execution. When utilized in conjunction with the design and implementation of suitable therapies, early identification will aid in the prevention of disability and mortality in long-term care institutions. This review looked at how active work affected historical handgrip strength. It has been shown that the handgrip gets stronger as you go about your daily business. None of the test individuals' two-handed handgrip strength decreased, which raises total personal happiness. Regular, spirited effort is necessary to maintain muscle strength and stop new wounds. Reduced handgrip strength is one of the most obvious signs of incapacity, physical fragility, and death, thus older people need to be encouraged to change their lives and be more conscious of the value of active labor.

The practical implications of the discoveries are related to the advantages that active labor provides for elderly persons. We are all aware that tips for good aging and fall prevention emphasize balance and strengthening every muscle in the body. However, this study demonstrates that it is critical to advance genuine job in both senior age and younger age to focus on the personal pleasure. The hand hold strength, the findings of which are shown in this investigation, is an action that is considered one of the essential indications of sound maturing and whose value is directly influenced by actual work.



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