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"TO STUDY HAND GRIP STRENGTH MEASUREMENT BY GRIP DYNAMOMETER."

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Abstract

Handgrip strength is a indicate the muscle health in hand & Forearms grip strength measured using a hand held grip dynamometer. Grip strength used to assess general strength in order to determine work capacity, for extent of injury, nutritional status & physical fitness. To study hand grip strength in male and female in same age (21-22) students to different places. In these study there are different factor to influence the grip dynamometer likes age, gender, Stress and nutrition. The provide additional information for understanding to the further study of hand grip strength. The Present study concluded that the right hand stronger than the left hand.

Key words: Hand grip strength dyanomometer, Muscle strength, Measurement.

Introduction

Grip Dynamometer is an instrument used for assessment of grip strength of individual. Grip strength is affected by factors like muscle fatigue,age, nutrition, less motion, occupation stress, etc. The purpose of hand grip strength is to measure the maximum isometric strength of the hand and forearmmuscles. Hand grip strength is important for any activity in which the hands are used for catching, throwing, or lifting. Handgrip strength is a measure of strength of several muscles in the hand and the forearm. Synergistic action offlexor and extensor muscles and their interplay play a key role in the resultinggrip (Richards, et al., 1996).

Grip strength has been used to assess general strength in order to determine work capacity, for extent of injury and disease processes and the potential for progress in rehabilitation (Dash, et al., 2001). Measurement of handgrip strength is commonly performed to measure baseline deficiency in hand muscle power, to monitor progress during rehabilitation, and to document outcome after rehabilitation. Strength testing has been used to monitor the therapeutic response of patients to medical therapies, hand surgery to orthotic interventions (Lee, et al., 1974). It is also a predictive measure of social behavior in older adolescent males (Gallup, et al., 2010).

Poor nutritional status has been associated with poor handgrip strength, independent of sex, age and height (Pieterse et al., 2009). Grip strength data could also be used to monitor specific hand disabilities, which causes progressive hand weakness (Agnew, et al., 1982). Hand strength has been identified as an important factor to predict disability in musculoskeletal diseases (Oken, et al., 2008) and bone mineral density (Monaco, et al., 2000). It even predicts complications and general morbidity after surgical interventions (Mahalakshmi, et al., 2004), general disability and future outcome in older age as well as cause specific and overall mortality in elderly people (Rantanen, et al., 1998).

Handgrip strength is found to be a significant determinant of bone mineral content and bone area and has a positive correlation with lean body mass and physical activity. It determines the whole body muscular strength of an individual. Thus, the present study was planned to search the effect of age, sex and demographic characteristics on handgrip strength in normal healthy male and female students. Currently, physical fitness is considered one of themost important health markers and is a determinant for future disability, morbidity and mortality (Ortega, et al., 2008).

It is well known that a lack of physical fitness is associated with many diseases, including cardiovascular disease, in middle-aged and older people (Rodriguez, et al., 1994; Blair, et al., 1995; Ruiz, et al., 2008; and Leong, et al., 2015). There is no single test for measuring muscle strength; however, thehand grip test has been one of the most used to assess muscular fitness in epidemiological studies (Ortega, et al., 2008; Norman, et al., 2011; and Newman,et al., 1984). A person's gender, age, body mass and height influencethe hand grip strength in addition to one's occupation and leisure activities (Puh,2010; and Norman, et al., 2011). Recently, some researchers reported that men have a stronger hand grip strength than women (Pieterse, et al., 2002).

Handgrip strength (HGS) is a reliable clinical parameter to assess nutritional status and physical fitness (Flood, et al., 2014). Handgrip strengthis the maximal power of forceful voluntary flexion of all fingers under normal biokinetic conditions (Sengupta, et al., 2011). Several factors were found to affect handgrip strength such as age, gender, muscle mass, body mass index, and hand dimensions (Fallahi, et al., 2011). Carey and Gallwey showed that the level of HGS varies significantly according to factors such as age, sex, physique, posture, and duration (Carey and Gallwey 2002). Hallbeck and Mc Mullin in (1993) showed that the HGS of females is weaker (approximately 74% in their study) than males.

There is strong scientific evidence on evolutionary and genetic relationships and patterns between the quality of hand grip strength as a suitable phenotype for identifying genetic variants relevant to the physical functioning of middle and old age (Frederickson, et al., 2002). Lower levels ofphysical ability are associated with a higher risk of subsequent health problems. Weaker grip strength and slower walking speeds have been found to be associated with an increased risk of future bone fractures and cognitive decline during aging (Cooper, et al., 2010). It has been confirmed that the gripstrength of the hands significantly defines the mineral content in the bones andbone surfaces at the forearm sites and that they have a positive correlation with active body weight and physical activity (Chatterjee and Chowdhuri, 1991).

Classification	**Male(L)**	**Male(R)**	**Female(L)**	**Female(R)**
Excellent	> 68	> 70	> 37	> 41
Good	56-67	62-69	34-36	38-40
Average	43-55	48-61	22-33	28-37
Below avg.	39-42	43-47	15-21	22-24
Poor	< 39	< 41	< 18	< 22

Procedure -

1. Subjects are told to stand and keep their arms free without touching their body. Subjects were told to hold instrument in hand to be tested,right hand first and then left hand.

2. Subjects were asked to squeeze the hand with maximum isometric pressure which is maintained about 3-5 seconds. No other body movementis allowed.

3. Readings should be taken at each position i.e. Vertical and Horizontal for each hand.

4. All the readings should be properly noted and compared with the givenchart.

Average grip strength of adult in Kg

Fig-HAND GRIP DYNAMOMETER

Table 1 : Descriptive Statistics

Variable	Gender	Mean	Min	Max	Range	SD
Right Hand (H)	Male	52	32	70	38	5.29
	Female	36	17	44	27	4.08
Right Hand (V)	Male	52	38	70	32	4.72
	Female	36	17	44	27	4.08
Left Hand (H)	Male	48	37	70	33	4.96
	Female	30	14	54	40	3.87
Left Hand ((V)	Male	46	35	70	35	4.79
	Female	31	12	45	33	3.91

Table 2 : Differences between the hand grip strength of the right and left hand of students.

Variable	Gender (M-5/F-10)	Mean ± SD	Diff.	T	DF	P (0.05)
Right Hand (H)	Male	52±5.29	1.74	766	4	2.132
	Female	36±3.55		909	9	1.833
Right Hand (V)	Male	52±4.72	0.64	766	4	2.132
	Female	36±4.08		918	9	1.833
Left Hand (H)	Male	48±4.96	1.09	742	4	2.132
	Female	30±3.87		899	9	1.833
Left Hand (V)	Male	46±4.79	0.88	754	4	2.132
	Female	31±3.91		903	9	1.833

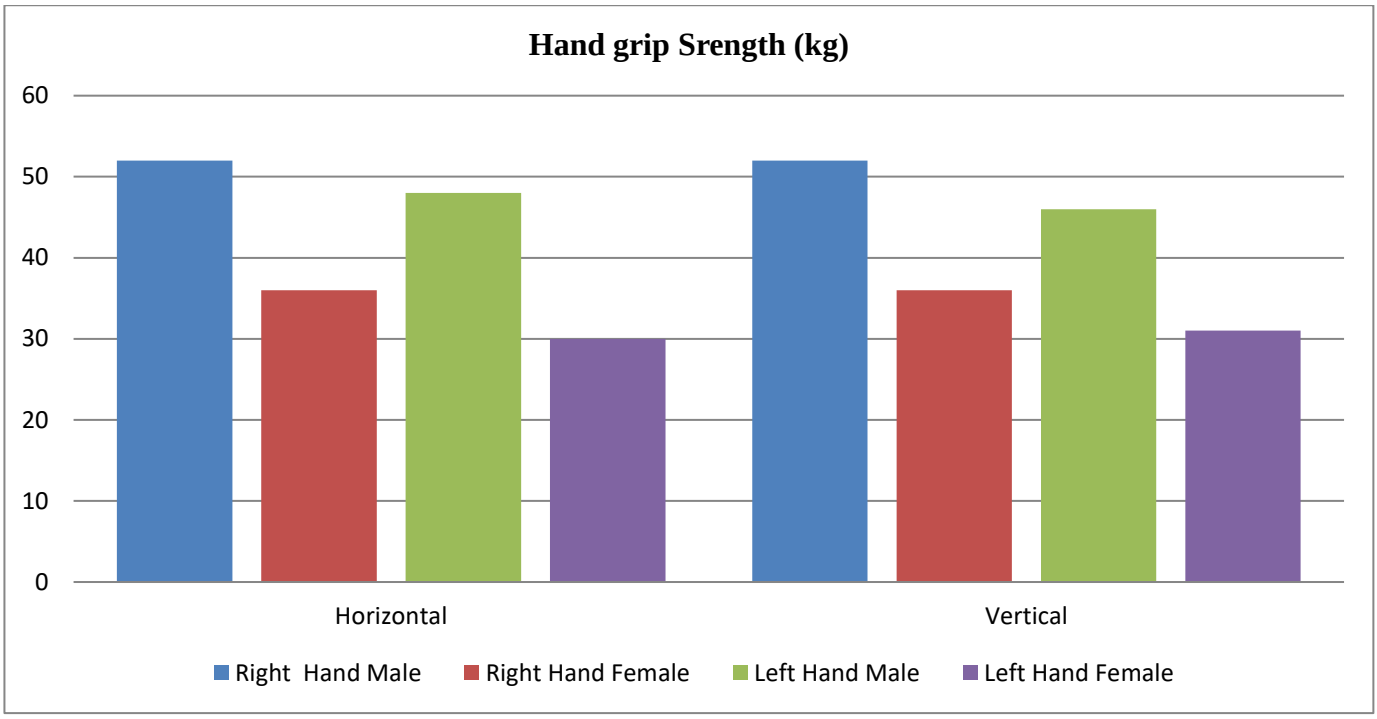

Fig- Differences between the hand grip strength of the right hand (Male/Female) horizontal and left hand (Male/female) vertical of students.

OBSERVATIONS

Table number 1 contains the statistical parameters of hand grip strength. In these study the hand grip strength male and female samples. The maximum and minimum hand grip strength the right hand (H) of male students is 70 kg and 32 kg. The maximum and minimum hand grip strength the left hand (H) of male students is 70 kg and 37 kg. The maximum and minimum hand grip strength the right hand (H) of female students is 44 kg and 17 kg. The maximum and minimum hand grip strength the left hand (H) of female students is 54 kg and 12 kg. The table number 2 contains Differences between the hand grip strength of the right and left hand of students.

In general, value (average, maximum and minimum values) of hand grip strength is higher in male than in female. The given observation concluded that the right hand proved to be stronger than the left.

DISCUSSION

Handgrip strength are significantly higher in females than males. It is generally accepted that hand grip strength measurements can be used as a health marker (nutritional status, cardiovascular health and functional limitations, such as impaired walking and balance, etc.) and for overall fitness assessment. Additionally, measuring the hand strength using a hand dynamometer is fast, easy to perform, reliable and produces results that are simple to record.

Age and gender are the strongest influencing factors for hand grip strengthin healthy people. The increase in

handgrip strength with age was approximately parallel for male and female students. It is a common knowledge that females generally have lesser muscle strength than males and that muscle strength decreases with age. The sex differences in handgrip strength are also known to contribute to the inter-individual differences in handgrip strength. Sex wise, males showed a higher mean value for handgrip strength than females.

Muscle strength is an important aspect of physical fitness and health, whereany decrease in muscle strength causes significant functional limitations. The subject of the current research involves the examination of the contractile characteristics of the hand as the basic manipulative organ with the main goal ofthe study to determine the maximum isometric muscle force of the hand grip and the difference in terms of full dimorphism of students.

The obtained T-test results confirmed statistically significant differences between the so-called dominant and non-dominant hands between male subjects ($p<2.132$) and between female subjects ($p<1.833$), thus confirming significant dimorphism in both genders. In our female sample, the maximum grip force of the left hand is 31 kg±3.91 kg and the right hand 36 kg±4.08 kg. While in male sample, the maximum grip force of the left hand is 48 kg±4.96

kg and the right hand 52kg±5.29kg.

CONCLUSION

In present study number of factors affects the grip strength like, age, sex, occupation, stress, nutrition. The further study result shows that the grip strength value is minimum, maximum and average range in male and females.

- The average of maximum grip strength of right hand (H) male and female is 70 kg and 44 kg. The average of minimum grip strength of right hand (H) male and female is 32 kg and 17 kg.
- The average of maximum grip strength of left hand (H) male and female is 70 kg and 54 kg.The average of minimum grip strength of left hand male (H) and female is 37 kg and 12 kg.
- The average of maximum grip strength of right hand (V) male and female is 70 kg and 44 kg. The average of minimum grip strength of right hand (V) male and female is 38 kg and 17 kg.
- The average of maximum grip strength of left hand (V) male and female is 70 kg and 45 kg.The average of minimum grip strength of left hand male (V) and female is 35 kg and 12 kg.
- The effect of number of factors on hand grip strength be provide additional information

for understanding to the study of hand grip strength.

In the present study concluded that the right hand stronger than the left hand.

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