



Original Article

Effects of Different Testing Postures on Hand Grip Strength Among Healthy Individuals

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ABSTRACT

Grip strength plays an important part in measuring the strength of the upper limb. Certain factors influence the handgrip strength like the body stance of the members during the test, the position of the body and different parts like elbow, lower arm, shoulder and wrist, age and gender, nutritional status, hand outline, and appendage length. **Objective:** To determine the effects of different testing postures (standing, sitting, supine, side-lying, and prone) on handgrip strength. **Methods:** A Cross-Sectional study was carried out at Shalimar School of Allied Health Sciences Lahore. This study recruited 45 participants of both genders, age-aged between 18 to 24 years. The handgrip strength of the dominant hand is measured in different testing postures (standing, sitting, supine, side-lying, and, prone) by using a handheld dynamometer. Correlation of all variables calculated through SPSS. **Result:** This study showed that handgrip strength was higher in the state ding position (36.60±10.79) and lower in the pa r e position (27.52±8.01).HHandgripstrength in sitting and supine position in males and females showed significant difference with standing position and non-significant difference with prone position while handgrip strength in prone showed nonsignificant difference with standing, sitting, and supine position and significant difference with the side-lying position. **Conclusion:** This study concludes that handgrip strength was higher in standing, sitting, and supine positions respectively, and lower in side-lying and prone positions.

INTRODUCTION

A muscle's strength is an ability to apply maximal exertion or oppose maximal contradicting power [1]. Human handgrip strength plays an important role in the function of the upper body[2].The grip is a demonstration of taking manually and keeping a firm hold of any article, device or instrument having various structures for the utilization of the hand, like the entire hand or the singular fingers [3]. Certain factors like body stance, age and gender,, weight, and hand length are considered to influence grip strength [4].H and Grip Strength estimation is a fundamental piece of hand rehabilitation, in the appraisal of upper appendage wounds, in deciding the viability of various treatment modalities, and in assessing work limit of patients with

neighborhood hand wounds like injury, consume, break or foundational clinical pathologies, for example, solid dystrophy or rheumatoid joint inflammation that impact hand strength [5]. Hand grip strength can be estimated from various kinds of the dynamometer. The handgrip dynamometer is an easy, simple and non-invasive device that is used to measure muscle strength [6]. Hand hold strength estimates the measure of static power that the hand is able to crush around a dynamometer. The power has most regularly been estimated in kilograms, pounds, yet additionally in millilitres of mercury and in Newton [7]. The hand hold strength is also affected by predominance of the hand. The distinction of grasp strength among

dominant and non-dominant [8]. According to literature, grip strength is used to correlate general body strength, upper extremity strength, and as an objective measure of upper extremity function [7]. A research showed that weakness is a major problem in patients of multiple sclerosis [10]. Another research showed weakened grip and pinch strength in osteoarthritis patients [11]. The hand grip strength is a major complication in smartphone users because of repetitive flexion and extension of wrist and fingers, which result in pathology [12]. A previously study indicate grip strength generally increased with age, males having greater strength than did females [13]. In terms of gender, a study found that adult male grip strength in different postures and body joint angles was significantly greater than adult female grip strength [14]. According to another study, it has been demonstrated that after reaching a peak value, handgrip strength started to decrease with increasing age. It can be due to the unchanged functional ability of the hand until the age of 65 years, and gradual decline occurs after this age [15]. In the other research grip, strength, and distress evaluations were estimated at different hand positions, which were characterized by the distance of the hand from the shoulder joint and the course of the line from the shoulder to the hand. The hand position was characterized by five hand directions 0°, 45°, 90°, 130°, and 180° also of the shoulder flexion point, and three hand-shoulder distances 100%, 75%, and half of the arms reach [16]. Handgrip strength was discovered to be more in standing position than in sitting position in the testing of two different body positions standing, sitting with elbow stretching out in each test position [17]. This study aims to evaluate the effect of different testing postures (standing, sitting, supine, side-lying, and prone) on handgrip strength among males and females having normal BMI.

METHODS

The cross-sectional study was conducted at Shalimar School of Allied Health Sciences, after approval from the institutional review board of Shalimar Medical and Dental College, Lahore. Non-Probability, Convenience Sampling technique was used. This study recruited 45 participants of both genders, aged between 18 to 24 years and with normal BMI. Handgrip strength of the dominant hand is measured in different testing postures (standing, sitting, supine, side-lying, and prone) with the shoulder in abduction and neutrally rotated, elbow flexed 90° forearm in mid-prone and wrist in neutral to 30° extension by using a handheld dynamometer. The data were analyzed by using SPSS version 25. Mean and standard deviation tables were used to present the socio-demographic data and a One-way repeated measure analysis of variance (ANOVA) is used to

compare HGS values. Correlation between dependent and independent variables is measured by Pearson Correlation Coefficient[®].

RESULTS

A total of 45 participants (28 females and 8 males) were recruited for this study shown in table 1 from age 18 to 24. The HGS values for standing, sitting, supine, side-lying, and, prone shown in Table 2 which show that handgrip strength in standing position showed significant difference with sitting and supine and non-significant difference with side-lying and prone position while handgrip strength in the prone position showed non-significant difference with standing, sitting and supine position and significant difference with the side-lying position. . Figure 1 show higher grip strength in sitting position and lower in the prone position. Table 3 shows that there is a strong linear relationship of Standing HGS with sitting ($r=0.972$) and supine ($r=0.931$), moderate with side-lying ($r=0.925$), and weak with prone ($r=0.894$). Among the participants 28(62.2%) were female and 17(37.8%) were male.

Gender	Frequency	Percent
Female	28	62.2
Male	17	37.8
Total	45	100.0

Table 1: Frequencies distribution according to gender

	Mean	Std Deviation
Standing HGS	36.60	10.79
Sitting	34.27	9.95
Supine	32.06	9.38
Side Lying	30.14	8.89
Prone	27.52	8.01

Table 2: Mean and standard deviation of hand postures.

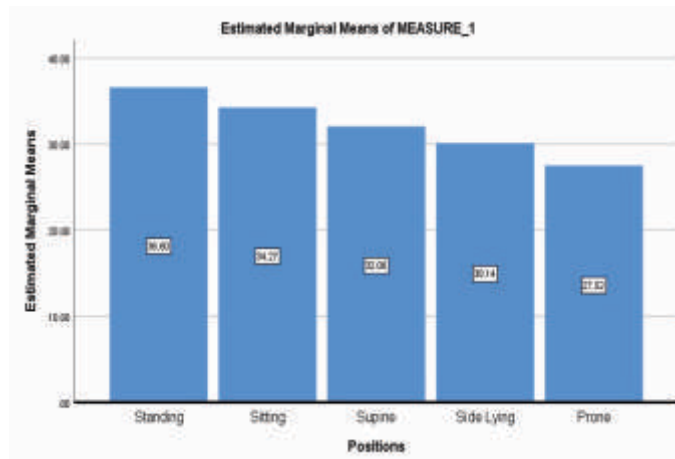


Figure 1: Handgrip strength in different sitting postures

		Handgrip Strength				
Correlations		Standing	Sitting	Supine	Side lying	Prone
BMI	Pearson Correlation	-0.066	-0.104	-0.067	-0.071	-0.078
	Sig.(2 -tailed)	0.664	0.495	0.663	0.644	0.611
	N	45	45	45	45	45
Standing	Pearson Correlation		.972 **	.931 **	.925 **	.894 **
	Sig.(2 -tailed)		0	0	0	0
	N		45	45	45	45
Sitting	Pearson Correlation			.963 **	.938 **	.907 **
	Sig.(2 -tailed)			0	0	0
	N			45	45	45
Supine	Pearson Correlation				.976 **	.937 **
	Sig.(2 -tailed)				0	0
	N				45	45
Side lying	Pearson Correlation					.949 **
	Sig.(2 -tailed)					0
	N					45

Table 3: Descriptive statistics of Handgrip strength in different sitting postures

DISCUSSION

This study investigated hand grip strength among healthy male and female in five different testing positions (standing, sitting, supine, side lying and prone). This study showed that hand grip strength changed according to the different positions of body. Previous studies in the past showed that women are weaker in strength 40% to 60% than males. Males have more strength than the females because they have more muscle bulk and more physically fit than females [16]. Many studies have been done in past that have revealed that grip strength is higher in standing and sitting position when elbow is extended [17]. On a physiological basis, it is due to increase activity of muscles during standing position while sitting promotes relaxation. From biomechanical perspective hand grip strength is high in standing position than sitting because arm is not supported and muscles have to work more [3]. Another study showed that there is a relationship exist between range of motion and hand grip strength for the forearm and wrist this means that hand grip strength will change with range of motion of forearm and wrist [21]. There is a literature evidence that hand grip strength increased with hand size, hand width and hand span [14]. Grip strength is higher in standing position as compare to sitting position and also changed with the position of forearm it is higher when in supination and lower when forearm in pronation [19]. In the other research grip strength and distress

evaluations were estimated at different hand positions, which were characterized by the distance of the hand from the shoulder joint and the course of the line from the shoulder to the hand. The hand position was characterized by five hand directions 0°, 45°, 90°, 130°, and 180° also of the shoulder flexion point, and three hand-shoulder distances 100%, 75%, and half of the arm reach [16]. In this study, higher hand grip strength is found in standing position and lower in prone position. The values of hand grip strength in standing, sitting and supine position showed non-significant difference while supine lying and prone position showed significant difference with standing, sitting and supine positions this study also showed that males have grip strength more than females. The hand grip strength is higher in standing because muscles have to work more to counterbalance gravity but in the supine and prone position, the effect of gravity decreases. This study will provide a lot of help in the early mobilization of patients. In a clinical setting, it will help in developing the rehabilitation program and strengthening program in alternative postures for patients who cannot tolerate upright positions.

CONCLUSION

This study provides useful values for grip strength in different positions. This study concludes that the value of handgrip strength is higher when the subject was in standing, sitting, and supine position and it significantly reduced in side-lying and prone position.

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