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EFFECT OF BODY TEST POSITION ON THE HANDGRIP STRENGTH IN THE NURSING STUDENTS – AN OBSERVATIONAL PILOT STUDY

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ABSTRACT

Introduction: Nurses have to play a vital role in promoting responsible, appropriate, and ethical healthcare. Grip strength is reported to be an important predictor of good health, muscular endurance, dexterity, and overall strength.
Materials and Methods: An observational study was conducted on nursing students. Parul institute of nursing was approached for the data collection with an estimated sample size of 80 nursing students. The inclusion criteria were 18-25 years old nursing students (from both genders). Only right-hand dominant subjects were included in this study. Saehan handheld dynamometer was used for the collection of the data.
Results: A test of normality was done to assess the normality of the data. ANOVA was performed to know noteworthy differences and the p-value found was <0.05. An unpaired t-test was done to know the significant difference between male and female data and it was found that males had higher grip strength compared to the females with p-value <0.05. Paired t-test was done to know the significant difference between handgrip strength in the various body test position i.e. sitting v/s standing position. Maximum grip strength was found in standing position with elbow 180^{o} extension for males and in sitting with elbow 90^{o} flexion for females. Overall it was also noted that all the subjects had higher grip strength of the right hand.
Conclusion: In conclusion, nursing students had a positive effect on the body test position on the handgrip strength. It can be concluded that while performing gripping tasks males perform better in the standing position with elbow extended and females perform better in the sitting position with the elbow flexed.

Keywords: nursing students, handgrip strength, body position, Saehan hand dynamometer

INTRODUCTION:

Nurses have always been the mainstay of care for people throughout their life span, especially at the end of their lives. Nurses have to play a vital role in promoting responsible, appropriate, and ethical healthcare. Today, the nurse's attention is focused on providing nursing care to more severely ill clients within the constraints of scarce dollars, limited inpatient stays, reduced staff, and restricted numbers of health monitoring visits. (1)
Hand Grip strength (HGS) has been used so extensively as a predictor of entire muscular endurance in healthy children and healthy adults employing a hand dynamometer to quantify hand muscle activity. Muscle function is indeed said to be a dynamic proxy for muscle mass, as evaluated by HGS. (2,3,4) Using a handgrip strength dynamometer, handgrip strength (HGS) is an assessment of the greatest static strain that a hand can squeeze.
Grip strength assessment is popular because it's simple and inexpensive to analyze. (5,6,7)

The most typically measured limb muscles that create grip force are the biceps and forearms. Several factors are likely to be at play when grip strength is measured frequently. Grip strength is the most basic and straightforward of a variety of instrumented muscular strength tests. (8,9) There are a total of around 35 muscles in the forearm and hand that move, with several of them involved in grasping movements. "The musculature of the flexor mechanism in the hand and forearm provide grip strength while the muscles and tendons of the forearm stabilize the wrist" during gripping activities. (10)

Grip strength is said to be an excellent predictor of total strength, muscular endurance, dexterity, and health. The functional state of the upper extremities is reflected in grip strength. It's significant to remember that grip strength fluctuates by age and gender in healthy people, and by disease/injury in clinical people. (11)

SAEHAN DYNAMOMETER: Grip strength was measured with SAEHAN Hydraulic Hand Dynamometer, (Model no. SH5001, Korea). The validity and reliability of the SAEHAN dynamometer have been confirmed previously and the values obtained from this dynamometer are comparable to the reference values recorded with a Jamar dynamometer. (12, 13) The handheld dynamometer is one of the most objective and consistent tools to use accurately evaluating muscle grip strength and is also very easy to use. (14, 15)

Nurses are one of the most important parts of the healthcare team as they are loaded with a lot of pressure to give their best amount of support in the health sector. They always stay on top of the toes to deliver in the ICUs, neurological, gynaecological, and other such aspects of health and wellness of patients. Nurses need good handgrip strength for applying proper force while management of patients which mainly includes lifting them, positioning, and transferring. The need for the present study emerges because of frequently occurring health hazards in the hospital while at work. If the nurses will know the suitable and best position for them to generate maximum force with hand, then they can use that maximally.

The aim of this study was to assess the handgrip strength among nursing students and the effect of body testing posture on handgrip strength. The authors hypothesized in this study that there was no significant difference between the handgrip strength values after keeping the body testing position at the elbow with 90° flexion and elbow 0° extension in sitting and standing positions. Also, there was no significant difference between male and female handgrip strength values obtained by keeping the body testing posture at elbow 90° flexion and elbow 0° extension in sitting and standing positions.

An observational study was to examine the grip strength among college-going nursing students in different body postures with the following objectives:

- To understand the variability in grip strength as per gender
- To understand the variability as per hand dominance and
- To understand the variability as per postures and position of the arm
- To relate the handgrip strength values after keeping body testing position at elbow with 90° flexion and 0° extension in sitting and standing positions.
- To compare the handgrip strength after obtaining values of male and female by keeping the body test position at elbow 90° flexion and 0° extension in sitting and standing positions.

METHODOLOGY

A. SOURCE OF DATA:

Students of Parul Institute of Physiotherapy Limda, Ta-Waghodia, district. Vadodara.

B. METHOD OF COLLECTION OF DATA:

Study design: Observational study (Cross-sectional study)
Sampling method: Selective sampling who fits into the inclusion criteria
Data collection duration: 6 months
Sample size: 80

C. INCLUSION CRITERIA:

Age between 18-25 years.
BSc nursing students, MSc nursing students

D. EXCLUSION CRITERIA:

Trauma to wrist joint in past 3 months
Surgical repair related to the hand
History of neurological condition which can affect grip strength
Any trauma to an upper extremity or cervical region

E. MATERIALS USED IN THE STUDY:
Chair without armrest
Pen
Weighing machine
Measuring tape
Paper
Laptop
Calculator
F. OUTCOME MEASURE: Saehan hand dynamometer

figure no. 1: saehan hand held dynamometer

G. SUBJECTS:
Subjects were recruited from the nursing department of Parul University. All the subjects were assessed for the inclusion and exclusion criteria before getting into the study. When the subjects met the inclusion criteria they were explained about the study thoroughly and what will be the possible outcome and benefits to them. Then the participants were asked to give their written consent for the study before participation into the study and then the study was conducted. The identity of the subjects was kept hidden for the study.

H. PROCEDURE:

figure no. 2 and 3. figure 2 subject in standing with elbow extension to 180° and figure 3 subject in standing with elbow flexion to 90°

figure no. 4 & 5. figure 4 subject in sitting with elbow extension to 180° and figure 5 subject in sitting with elbow flexion to 90°

All subjects were selected according to inclusion criteria

Total 80 subjects (40 males and 40 females) were observed during the study and their handgrip strength was assessed in different test position

Variation in the elbow and body test position was done to assess the handgrip strength of all the subjects.

A. Elbow flexed to 90° in sitting position

B. Elbow extended to 180° in sitting position

C. Elbow flexed to 90° in standing position

D. Elbow extended to 180° in standing position

Saehan hand dynamometer was used and data collection was

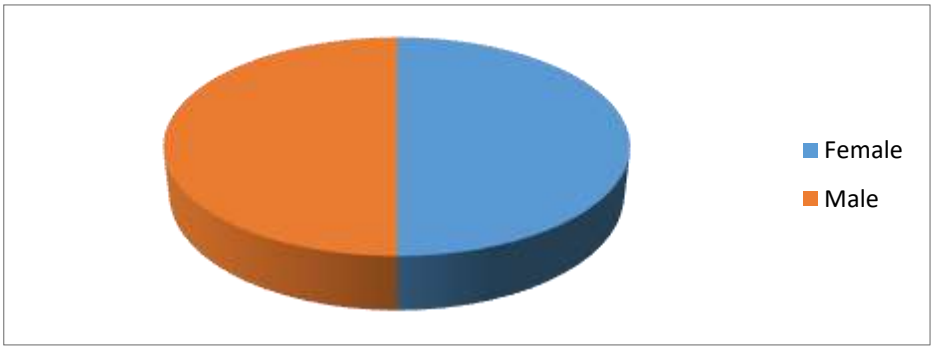
RESULTS AND STATISTICAL ANALYSIS

After the data was collected it was entered into the excel sheet and the results were analyzed with the help of SPSS version 20. Firstly, the test of normality was done to know the normal distribution of data. One-way ANOVA was done to know if there was any significant difference between various body test positions for males and also for females. Then descriptive analysis was done to get the SD and mean of all data which can be seen in table no. 2. Then paired t-test was done to analyze the male's and female's handgrip strength for same hand in sitting v/s standing position and data can be seen in table no.3 with the mean, SD, t-value, and p-value. The most significant difference was seen in males for left hand in sitting and standing with 90° of flexion (p-value =0.043) and for females, the most significant difference was seen for right hand in sitting and standing with 90° of flexion (p-value =0.000). An Independent t-test was done to know the substantial difference between the male and female handgrip strength.

- **The distribution of male and female samples was taken equally in this study.**

table no. 1: distribution by gender

MALE	FEMALE	TOTAL
40	40	80



graph 1: distribution by gender

- **The descriptive analysis was done and it was obtained as:**

table no. 2: descriptive analysis of the data obtained by testing the handgrip strength of males and females

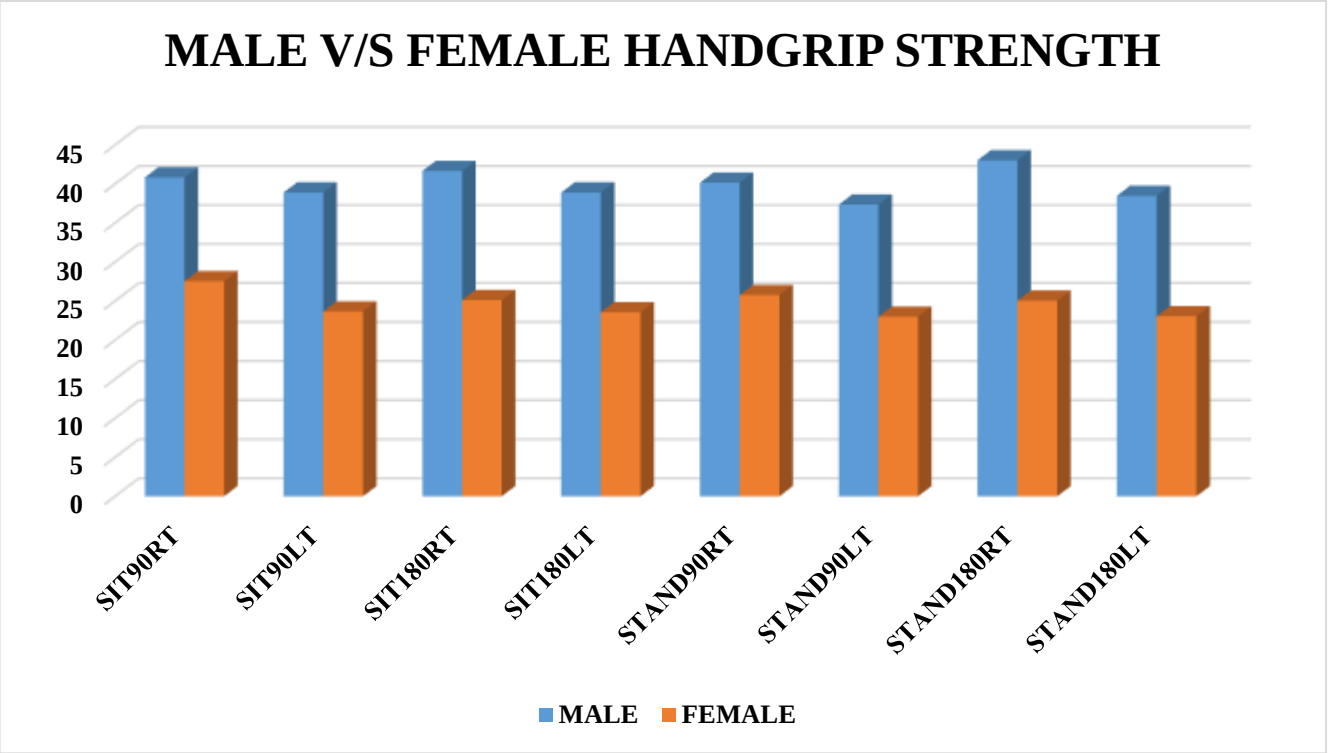
DESCRIPTIVE STATISTICS (MALE AND FEMALE)				
POSITION	MEAN		STANDARD DEVIATION	
	MALE	FEMALE	MALE	FEMALE
Sitting 90 Right	40.8250	27.5250	7.74559	4.54599
Sitting 90 Left	38.9000	23.6500	8.11393	4.78003
Sitting 180 Right	41.6500	25.1000	7.82681	5.00666
Sitting 180 Left	38.9000	23.5500	7.24940	4.71740
Standing 90 Right	40.1500	25.7500	6.92283	4.31901
Standing 90 left	37.3500	22.9750	6.70840	4.31151
Standing 180 Right	43.0250	25.0250	6.89663	4.69308
Standing 180 Left	38.4750	23.0250	7.16110	4.70944

table no. 3 paired sample t-test for analysis of male's handgrip and female's handgrip strength comparison of same hand in sitting v/s standing position as follows:

		SIT90 RT - STAND90RT	SIT90LT - STAND90LT	SIT180RT - STAND180RT	SIT180LT - STAND180LT
MEAN	MALE	.67500	1.55000	.62500	.42500
	FEMALE	1.77500	.67500	.07500	.52500
STD. DEVIATION	MALE	5.15099	4.69014	4.27088	3.56541
	FEMALE	2.77800	2.56593	2.41138	2.54183
T-VALUE	MALE	.829	2.090	.926	.754
	FEMALE	4.041	1.664	.197	1.306
P-VALUE	MALE	.412	.043	.360	.455
	FEMALE	.000	.104	.845	.199

table no. 4: un-paired sample t-test/ independent t-test for analysis of male v/s female handgrip strength data are as follows:

POSITION	Mean Difference	t-value	p-value
SITTING Right 90	14.84286	13.829	.000
SITTING Left 90	15.28571	15.106	.000
SITTING Right 180	19.28571	17.046	.000
SITTING Left 180	16.74286	16.622	.000
STANDING Right 90	15.22857	14.373	.000
STANDING left 90	14.45714	15.306	.000
STANDING Right 180	18.94286	17.874	.000
STANDING Left 180	16.78571	16.552	.000



graph 2: comparison between male and female handgrip strength in all the positions.

DISCUSSION

This present study was done to know the effect of body test position on handgrip strength in nursing students of Parul University. In this study total of 80 subjects were taken between 18 to 25 years of age including both male and female. To our knowledge, this is the first study investigating the handgrip strength among healthy nursing subjects in four different body positions with the variation in the elbow position. For the examined hand, the study covered fundamental and derivative upper extremity positions in the position suggested by the American society of hand therapists.

The result of the present study showed that there was a positive effect of different body postures on the handgrip strength in nursing students of Parul University. Based on the result, it was found that males had higher grip strength in standing position with elbow extension. And the females had higher grip strength in a sitting position with elbow flexion. Also, there was a difference between the right and the left hand of all the subjects i.e. both male and female which can be seen in table no.3. And the males had higher grip strength compared to the females which can be understood with the help of graph no.2 and values can be seen in table no.4 which shows the mean difference between male and female grip strength along with the t-value and all of the p-values are significant with values <0.05.

Nursing frequently requires heavily loaded physical work tasks such as lifting and transferring patients, which necessitate jerky movements, almost all of the time against non-neutral body posture, working in awkward postures, and operating hazardous equipment, (16, 17) so the goal of this study was to help them figure out which posture works best for them and how to use it to their full potential for efficient work and avoid common injuries to the back, hand, wrist, and other joints.

The result related to Grip strength analysis showed that Grip strength of dominant right hand in various body postures was higher than left side for both males and females, in which males had higher grip strength than females which came similar to studies were done by Leyk D, et. al. (18), Puh U., et. al. (19). Justification for this can be due to divergence among the innumerable tasks done by both genders. Males are related to physically demanding tasks and are more accompanied by weight-handling activities as compared to females.

Grip strength variation due to positions can be justified by the previous studies cited showing differences in maximum handgrip strength in different upper limb positions of the subjects. The possible causes for changes in strength may be related to variation in muscle force capacity resulting from changing muscle length, which is related to upper limb posture. (20, 21, 22)

The usual way of measuring grip strength is by using all five fingers to maximally grip onto a handgrip dynamometer. Teraoka studied the effect of three-body positions (standing, sitting and supine) on grip strength with elbow extended in each test position and indicated that grip strength was found to be stronger in standing position than in sitting position. (23) Similar results were found in our study for the male participants. Also, in the study of Balogun et al., the grip

strength of dominant hands of 61 individuals aged between 16 and 28 years was evaluated in four positions. They reported that grip strength was the lowest in the sitting position with an elbow in 90° flexion, whereas it was the highest with the subject standing with elbow in full extension which was seen in our study in the male subjects. (24)

ETHICAL CONSIDERATIONS COMPLIANCE WITH ETHICAL GUIDELINES

All ethical considerations were maintained during collection of data. Written informed consent was taken before participation. There was no violation of the privacy of any individuals.

LIMITATION OF STUDY

This study had a smaller number of subjects' future studies can take more subjects for the study.

FUTURE RECOMMENDATIONS

Future studies can be done for different professionals and can help in preventing health hazards. More subjects should be included to get a precise idea of which position works best for males and females. Reasons for difference in male and female values should be focused that why females are having better strength in sitting with the elbow flexed to 90° and why males have higher grip force in the standing position with the elbow extended to 180°.

SOURCE OF FUNDING

Self

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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