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EFFICACY OF GRIP STRENGTHENING EXERCISES IN LARGE HANDED AND SMALL HANDED HOUSEWIVES

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ABSTRACT

***Introduction**: Hand is a vital and inevitable organ for humans. Its function ranges from fine to gross motor activities. Many daily functions and sports event require high activity of hands. Hand and forearm muscles plays a vital role in activities of daily living. Hand grip strength is derived from the combined contraction of intrinsic and extrinsic hand muscles. It is the integrated performance of muscles that can be produced in muscular contraction and it provides an objective index of the functional integrity of the upper extremity. Teraoka (1979) examined the effect of three body positions on grip strength (i.e.) standing, sitting and supine with the elbow joint held in full extension in each position. Finally, he found that grip strength was strongest with the subject in the standing position. **Methodology:** This is a Quasi-experimental type study conducted among 100 subjects with the study duration of 3 weeks in the clinical setting. Only female Subjects with the age of 30-50 years with small size hand length 15.9+1.53 and large size hand length 18.3+0.37 are included, **Result:** Table 1 shows that there were significant difference in the outcome measure for Group A tested by using paired t test and were found statistically significant at p: 0.0129, and the mean difference is 10.2±1.9. Table 2 shows that there were significant difference in outcome measure for Group B tested by using paired t test and were found statistically significant at p < 0.0001and the mean difference is 9.1±1.6. By comparing two groups we concluded that handgrip strength is improved in Group B when compared to Group A. **Conclusion:** The results of the study indicate that participant in both groups improved in handgrip strength and also, we found that the participants who underwent a theraband and resistive hand exercise in group B is superior than the participants who underwent only resisted exercises. The handgrip strength was measured by handgrip dynamometer.*

KEY WORDS

Inevitable organs, Quasi-Experimental type study.

INTRODUCTION

Hand is a vital and inevitable organ for humans. Its function range starts from fine to gross motor activities. Many daily functions and sports event require high activity of hands.

Hand grip strength is derived from the combined contraction of intrinsic and extrinsic hand muscles. The integrated function of these muscles produces muscular contraction and it provides an objective index of the functional integrity of the upper extremity. Teraoka (1979) examined the effect of three body positions on grip strength (i.e) standing, sitting and supine with the elbow joint held in full extension in each position. Finally, he found that grip strength was strongest with the subject in the standing position [(2)]

There are 35 muscles involved in movement of the forearm and hand. During gripping activities, the flexor muscles in the hand and forearm create grip strength while the extensors of the forearm stabilize the wrist. There are four major joints in the hand, they are carpometacarpal,intermetacarpal,metacarpophalangeal and interphalangeal joints. There are 9 extrinsic muscles that cross the wrist and 10 intrinsic muscles, all

these muscles attach distal to the wrist. These muscles include the pronator radii teres, flexor carpi radialis, flexor carpi ulnaris, flexor sublimus digitorum, and palmaris longus on the extrinsic layer and the flexor profundus digitorum, flexor pollicis longus, pronator quadratus, flexor pollicis brevis and abductor pollicis brevis on the intrinsic layer. Each of these muscles is active during gripping activities [(3).]

The degree of injury or inappropriate grip force are the cause of injury to muscles and bones. The maximal hand grip strength was obtained for a hand size of 55-66 mm for European males and in 50-60 mm for European females [(4)]. In women aged 80-89 years, the hand grip strength is 37% less than that of women aged 30-50 years and it declines with an average loss of 0.85 kg/year among women [(5).] According to Poliquin, these alignments are caused by improper strength ratios between the elbow and forearm muscles. Yosou et al found grip strength had a significant correlation with the muscle strength of 45-degree shoulder abduction and external rotation in the affected side. Guo et al and Kenjle et al found grip strength to be a strong predictor of an individual's nutritional status.

Anthropometry deals with the measurement of human body such as shape, strength, work capacity and body size and the hands are specialized appendages at the distal end of the upper limbs and are designed for grasping and precisely moving and it is defined as the study of comparative measurements of the human hand involving parameters such as hand length, palm length, thumb breadth, thumb length, index finger length and hand breadth [(6)]. Handedness has three different aspects; they are the relative performer for one hand in the execution of various uni-manual tasks, the greater skillfulness of one hand in the performance of these tasks or the greater strength of one hand [(7)].

Hand held grip strength dynamometry is used to measure the muscular force generated by flexor mechanisms of hand and forearm. There are three categories of handgrip dynamometer this includes spring loaded compression, air compression and hydraulic compression devices. According to Waldo, since grip is a force as well as pressure, it should be measured in pounds and kilograms

Theraband are safe and inexpensive and portable. It has unique properties and it allows the muscles to stretch and relax in smooth and consistent manner. The resistance provided by elastic bands or tubing is based on the amount of band or tubing is stretched. The theraband resistance measured in pounds of force depending on the percentage the band or tubing is stretched from its resting length; this is known as force elongation. The major significance of using theraband is not dependent on gravity for providing resistance. It is available in various thickness in strength. Theraband has a significant resistance in the tension force and it has a different colour. Theraband is effective for restoring muscle and joint function to build the strength.

Hence the aim of the study is to show 'the efficacy of optimal hand grip strength in housewives. The objective of the study is to find out ergonomic risk factors for housewives using the Rapid Upper Limb Assessment (RULA). To analyse the hand grip strength by using theraband and resistive hand exercise.To evaluate the hand grip strength by using the hand grip dynamometer.

METHODOLOGY

Study design	: Experimental study
Study type	: Quasi- experimental
Sample size	: 100
Study duration	: 3 weeks
Study location	: individual house setting

INCLUSION CRITERIA

1. Age: 30-50 years
2. Female subjects only included
3. Subjects with small size hand length of 15.9+1.53
4. Subjects with large size hand length of 18.3+0.37

EXCLUSION CRITERIA

a. Any muscle injuries in upper limb
b. Any bone and joint related injuries in upper limb
c. Impairment in the upper limb function
d. Hand burns
e. Any musculoskeletal problem in upper limb

TOOLS USED

INCHTAPE

THERABAND

SPRING

WATER GEL BALL

OUTCOME MEASURES

Hand grip dynamometer

PROCEDURE

100 subjects who fulfilled the inclusion criteria were taken into the study and the written informed consent was obtained from the subjects. These participants underwent a thorough examination of the entire upper limb using rapid upper limb assessment (RULA) tool.

After which the subjects were categorized in to two separate groups according to their hand sizes as large handed and small handed. In this group A consist of large handed subjects who received active exercises (general active shoulder exercises were encouraged for 15 repetitions for 3 sets) for the upper limb and resistive hand grip exercises for 30 minutes, group B consist of shorthanded subjects who received theraband and resistive exercises for 30 minutes. In both the groups, the overall duration of the treatment was for 3 weeks. After which the posttest assessment was done and the obtained data was analyzed.

MEASURING HANDGRIP DYNAMOMETER

RESISTIVE HAND EXERCISE:

SI.NO	EXERCISES	REPETITIONS	MINUTES
1.	SPRING EXERCISE	10 SEC HOLD, 10 REPETITIONS	3 MINUTES
2.	BALL SQUEEZE	10 SEC HOLD, 10 REPETITIONS	3 MINUTES
3.	TOWEL PULL UPS	10 REPETITIONS	3 MINUTES
4.	BAND HAND EXTENSION	10 REPETITIONS	3 MINUTES
5.	WRIST FLEXION & EXTENSION	10 REPETITIONS	3 MINUTES

RESISTIVE HAND EXERCISE

SPRING EXERCISE

BALL SQUEEZE

TOWEL PULLUPS

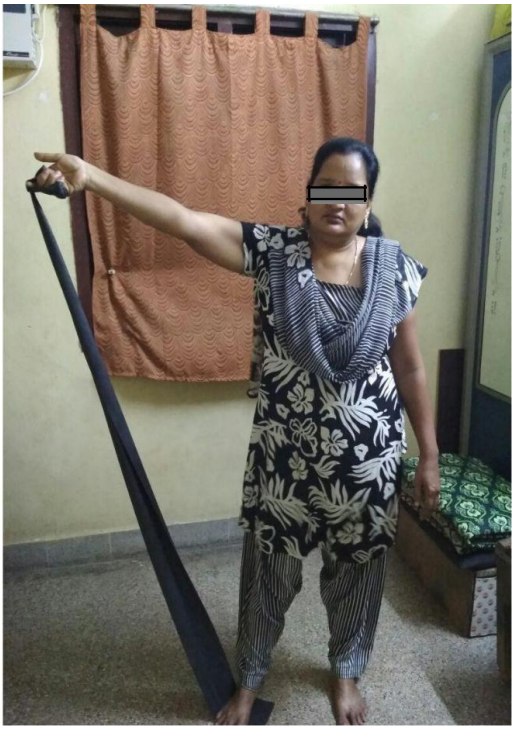
WRIST FLEXION AND EXTENSION

THERABAND EXERCISE

SI.NO	EXERCISES		REPETITIONS	MINUTES
1.	SHOULDER EXTENSION	FLEXION	& 10 REPETITIONS	3 MINUTES
2.	SHOULDER ADDUCTION	ABDUCTION	& 10 REPETITIONS	3 MINUTES
3.	ELBOW EXTENSION	FLEXION	& 10 REPETITIONS	3 MINUTES

SHOULDER FLEXION AND EXTENSION

ABDUCTION AND ADDUCTION



RESULTS:

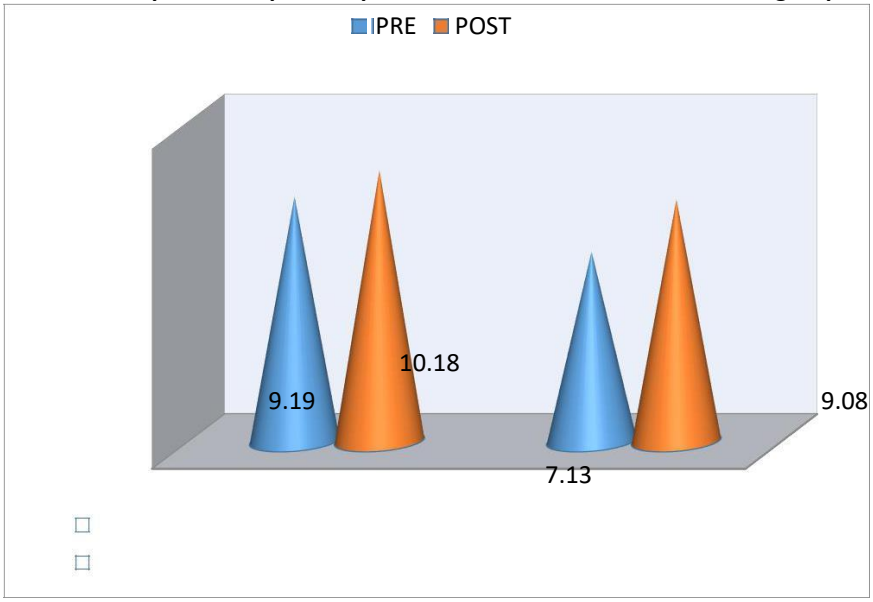
GROUP A:

OUTCOME MEASURES	MEAN		STANDARD DEVIATION		t VALUE	P VALUE
	PRE	POST	PRE	POST		
HANDGRIP DYNAMOMETER	9.192	10.180	1.939	1.961	2.5330	0.0129

GROUP B:

OUTCOME MEASURES	MEAN		STANDARD DEVIATION		t VALUE	P VALUE
HANDGRIP DYNAMOMETER	PRE	POST	PRE	POST		
	7.138	9.088	1.436	1.639	6.3293	0.0001

GRAPH: Comparison of pre and post intervention scores for both the groups



TEST	GROUP A	GROUP B
PRE-TEST	9.19	7.13
POST TEST	10.18	9.08

RESULTS

Table 1 shows that there were significant difference in Group A (Theraband exercise) for the outcome measure handgrip dynamometer were tested by using paired t test and were found statistically significant at p: 0.0129, and the mean difference is 10.2±1.9.

Table 2 shows that there were significant difference in Group B (Theraband exercise and resistive hand exercise) for the outcome measure handgrip dynamometer were tested by using paired t test and were found statistically significant at p < 0.0001and the mean difference is 9.1±1.6.

By comparing two groups we concluded that handgrip strength is improved in Group B when compared to Group A.

DISCUSSION

Hand's length was a crucial significant factor that affects the hand grip strength. The hand size was influenced by optimal grip span in women not in men. These contrasting results may have been due to differences in hand size. The author Ruiz stated that hand size was determined by measuring both, maximal width and the distance separating the distal extremes of the first and

fifth digits. In the current study, hand size was measured from the base of the hand to the tip of the middle finger. This study results demonstrated that the hand grip strength was affected by hand size. People with a long hand would be shown as having strong hand grip strength. However, grip control strength was not obviously affected by hand size.

Resistive hand exerciser are ergonomically designed and made to fit the contours of the hand, latex free. Resistive hand exerciser has the shape that feels great in the hand. It is designed to provide effective resistive therapy in wide variety of exercises for the fingers, hand, wrist, and forearm. With regular use there is improvement in grip strength, increase dexterity and mobility.

The theraband, which provides varied resistance through the range of movement, has been used for rehabilitation in combination with therapeutic exercise. It is light and portable, has low resistance, and can be adjusted to accommodate various situations. The force deformation and stress elongation relationship of the elastic bands is commonly used in therapeutic exercises the increase in length corresponded to a progressive increase in the elastic resistance and stiffness of the material in the color sequence (yellow, red, black and silver). The smallest increment in force, i.e.the least progression of difficulty, occurs between the yellow and red bands, while the greatest increase in force i.e. greatest progression of difficulty occurs between the black and silver bands.

The limitations of this study was it was conducted only for 3 weeks and the sample size was only 100 and exercises were theraband and resistance ball were used future studies can be done for a longer duration in different professions with more number of sample size and the repetition of the exercises can also be increased to have a better outcomes. This study positively proves that theraband and resisitive exercises are effective in improving the grip strength in shorthanded subjects compared to that of the long-handed subjects.

CONCLUSION

The result of the study positively indicates that participant in both groups improved in handgrip strength and also we found that the participants who underwent a Theraband and resistive hand exercise in group B was comparatively better than that of group A in handgrip strength when measured using handgrip dynamometer.

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