Impact of Two Grip Strengthening Exercise Protocols on Grip Strength of Non-Dominant Hand

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Abstract

Introduction: Power grip is commonly used as an index to assess impairment and treatment outcomes of hand.There is very less literature available on effect of strengthening exercises on non dominant hand in normal individuals. This study is planned with a vision to get an exercise protocol which can improve the hand grip strength of non dominant hand significantly in both genders.

Methodology: Study sample was extracted from all the students of Subharti College of physiotherapy.30 male subjects and 30 female subjects between 18-25 years were selected randomly. These individuals were then distributed randomly in two groups keeping in mind the equal distribution of males and females in both the groups. Group A(control) was allocated for squeezing exercises alone for 6 weeks with periodicity of exercising 3 times a week. Group B(experiment) was advised the combination squeezing and hand gripper exercises for 6 weeks with periodicity of exercising 3 times a week.

Results: Increase in the mean grip strength of experimental group was statistically significant while of control group it was not. Increase in mean grip strength of males was statistically significant in experimental group while it was significant in control group while in females mean grip strength increased significantly in both experimental and control groups.

Conclusion: Combination of grip and squeezing exercises have a better impact on mean grip strength than squeezing exercise alone in non dominant hand in normal person. Findings can be used in sports like cricket, lawn tennis etc , where grip of nondominant hand is also important.

Key Words- *Grip exercise, non dominant hand, squeezing exercise, gripping exercise*

Introduction

The human hand has been characterized as a symbol of power, as an extension of intellect, as the seat of the will. The hand and the wrist are the most active and intricate parts of the upper extremity because of this they are vulnerable to injury, which can led to functional difficulties, and they do not respond well to serious trauma[1]. Many daily activities involve interaction with objects that are grasped in the hand. The manipulative ability of human hand requires effective force and dexterity[2] . Hand functionality is considered to be vital in most of the daily activities involving upper limb be it carrying loads, lifting objects, opening or closing doors to name a few. Most sports activities also require adequate grip strength to enhance performance and

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prevent injuries. For routine daily activities of hand high activity of flexor musculature of forearm and hand is required[3]. Power grip is a forceful act resulting in flexion of all finger joints. When thumb is used, it act as a stabilizer to the object held between the fingers and the palm. Power grip is commonly used as an index to assess impairment and treatment outcomes of hand function[4]. Analysis of grip strength is an important index of hand rehabilitation program as because it assess the patient's initial limitation and can be compared with normal. Measurement of hand grip strength utility continues throughout the treatment process because it provides a quick reassessment[5]. Hand grip strength is widely considered as an objective index of functionality of upper extremity which can be optimized with a reliable evaluation[6,7]. It has been proved earlier that the population as a whole demonstrated significant differences between the dominant and non-dominant handgrip strength[8]**.** Therapist often follows the 10% rule as general guidelines. This rule states that person's grip strength in dominant hand is 10% greater than that of non-dominant hand [9] **.** There is very less literature available on effect of strengthening exercises on non dominant hand in normal individuals. This study is planned with a vision to get an exercise protocol which can improve the hand grip strength of non dominant hand significantly in both genders. Non dominant hand strengthening is a very important part of rehabilitation process, because If, the injuries involving dominant hand loss also. The objective of study was to evaluate the effectiveness of squeezing exercise and combination ofsqueezing and hand gripper exercises for grip strengthening of non dominant hand in 18-25 years old students of both genders.

Methodology

Study sample was extracted from all the students of Subharti College of physiotherapy.30 male subjects and 30 female subjects between 18-25 years were selected randomly.

Inclusion criteria includes Normal healthy individuals, Age group 18-25 years, Both males and females, Right hand dominant persons, not having any history of traumatic injury to non- dominant hand (left) since last 1 year, Not having any neurological deficit in Non- Dominant Hand. **Exclusion criteria includes** Age below 18 years and above 25 years, Left hand dominant person,Unhealthy individuals,Having any history of traumatic injury to Non-dominant hand since last one year,Neurological deficit in non dominant hand. This device is the most widely reported and recommended measure of grip strength.

Photograph 1. Showing equipments used in study

These individuals were then distributed randomly in two groups keeping in mind the equal distribution of males and females in both the groups. Group A with 30 subjects was control group and Group B also having 30 subjects constituted experimental group**.**

Group A was allocated for squeezing exercises alone for 6 weeks with periodicity of exercising 3 times a week.

Group B was advised the combination squeezing and hand gripper exercises for 6 weeks with periodicity of exercising 3 times a week. Subjects were asked to sit on the chair with straight back, without armrest with the feet flat on the floor, shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm in neutral position and wrist between 0° – 30° of extension and between 0°-15° of ulnar deviation (As given by ASHT)[10-13]. Then the handle of dynamometer was set at setting 3.8 cm apart[14] and kept constant for all. Subjects were asked to hold the dynamometer in above said position and were instructed to squeeze to initiate the optimal handgrip strength. All the subjects were evaluated in same position and under the same protocol. Every subject was demonstrated and then was asked to initiate handgrip strength using dynamometer.

Exercise Protocol

1) General squeezing exercises with squeezing ball.

a) Holding time-10 seconds.

b) Resting time-2 seconds

c) No. of repetition-10 times

d) Total duration-2 minutes

e) No of sitting-3 times a week for 6 weeks

2) Hand gripper exercises (20 kg weight)

a) Holding time-2 seconds

b) Resting time-1 seconds

c) No. of repetition-10 times

d) Total duration- 30 second

e) No of sitting-3 times a week for 6 weeks

All the analysis was obtained using SPSS 19. A base line data was taken at the beginning of the study (pre test values) and after the completion of the intervention (post test values) to analyze the difference between the two groups and group themselves, Mann-Whitney U-statistic was used. A level of 0.05 was used to determine the statistical significance.

Results

When the experimental and control groups were compared pre and post intervention, it was found that the increase in the mean grip strength of experimental group was statistically significant while of control group it was not (Table 1).

Table 1- Pre and post intervention comparison (total)

	Experimental group		**Control group**	
Parameter	**Pre intervention**	**Post intervention**	**Pre intervention**	**Post intervention**
Mean grip strength	20.15	25.40	21.150	23.400
Standard deviation	3.15	4.29	3.787	4.122
Standard error	.70	0.96	0.8469	0.9217
	Mann-Whitney U-statistic = 66.000 The two-tailed P value is 0.0003		Mann-Whitney U-statistic = 134.00 The two-tailed P value is 0.0762	

When the comparison was done among females of experimental and control group,pre and post intervention , it was found that increase in mean grip strength was statistically significant in both categories but experimental group had more significant difference than control group (Table 2).

Table 2. Pre and post intervention in females of experimental and control group.

	Experimental group		**Control group**	
Parameter	**Pre intervention**	**Post intervention**	**Pre intervention**	**Post intervention**
Mean grip strength	17.7	22.3	18.4	20.5
Standard deviation	1.2	1.7	1.8	1.5
Standard error	0.36	0.53	0.58	0.47
	Mann-Whitney U-statistic = 1.5 The two-tailed P value is 0.0003		Mann-Whitney U-statistic = 21.0 The two-tailed P value is 0.03	

When the comparison was done among males of experimental and control group, pre and post intervention, it was found that increase in mean grip strength was statistically significant in experimental group while it was significant in control group (Table 3).

Table-3. Pre and post intervention in males of experimental and control group.

	Experimental group		**Control group**	
Parameter	**Pre intervention**	**Post intervention**	**Pre intervention**	**Post intervention**
Mean grip strength	22.6	28.5	23.9	26.3
Standard deviation	2.5	3.8	3.18	3.8
Standard error	0.79	1.2	1.0	1.2
	Mann-Whitney U-statistic = 9.5 The two-tailed P value is 0.003		Mann-Whitney U-statistic = 1.5 The two-tailed P value is 0.17	

Discussion

Present study was aimed to compare the effect produced by squeezing exercises alone and combination of squeezing and grip strengthening exercises on non dominant hand.

Results of the study revealed that the increase in the strength after combination of exercises was significantly higher while the effect produced by squeezing exercise alone was not statistically significant. In control group only females had significantly increased mean grip strength after completion of protocol, in squeezing exercises, while males did not. The difference might be due to the fact that normal males in routine life bears this minimal amount of resistance in activity of daily living as driving bikes, playing cricket etc.

Hence the outcome expected from such exercise would not be significant, on the other hand females don't encounter such tasks daily, so even, this soft exercise was able to produce significant difference. This difference was also discussed by Vincent Wai-Shing Lau et al[15] when they stated that It is recommended that when assessing the progress and outcome of hand rehabilitation, the occupation and demand level of hand use of the patient must be taken into consideration when using the uninjured hand for comparison. This fact was also proved in different way by Paddy Jarit [16] where they found that in young basketball players there was no significant difference in strength of dominant and non dominant hand since both the hands were used equally for same amount of resistance. Like the results of present study Mika Matsumura et al[17],Matthew W. Rogerset et al[18] & Hartwig Woldag et al[19] also find the significant rise in grip strength after gripping exercises. Present study found that the males has higher grip strength than females which matches with the findings of Shu-Wen Wu et al[20] ,R.E. Anakweet al[21] & Esther Luna-Heredia et al[22] who found that gender difference is present for grip strength and males had higher grip strength than females. Grip exercises are absolute necessity to improve the grip strength and limb exercises are not a sustitute for grip strengthning this was also proves when Birgitta Langhammer et al [23] ,Sandstedt et al [24] and Suleyman Patlar[25] did not notice any improvement in grip strength after routine limb exercises.

Acknowledgement-

Conflict of Interest- No

Conclusion

Combination of grip and squeezing exercises have a better impact on mean grip strength than squeezing

exercise alone in non dominant hand in normal person. Findings can be used in sports like cricket, lawn tennis etc , where grip of nondominant hand is also important.

Ethical Clearance- Taken from Institutional Ethical Committee

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