



The Immediate Effect of Static Stretching on Grip Strength and Hand Function Using Hand Held Dynamometer in Geriatric Population: Randomized Controlled Trial

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ABSTRACT

Background: Hand function and grip strength decreases with age especially after the age of 65 years. Studies show anatomical and physiological changes in the aging hand. The age-related degenerative changes in the musculoskeletal, vascular, and nervous systems leads to decline in hand function in the elderly population is to a large degree. Deterioration of hand function in elderly adults is a combination of local structural changes in joints, muscle, tendon, bone, nerve and receptors, blood supply. There is scarcity of the studies when it comes to evaluate the immediate effect of the stretching and its effect on hand function and grip strength in geriatric population.

Materials and Methods: 34 Subjects were taken who meet the inclusion criteria were randomly assigned into two groups. Group A received static stretch, Group B received Muscle energy technique this was given to the immediate effect.

Results: The results suggested that static stretch values showed significant for hand grip and hand strength in geriatric population.

Conclusion: The study concludes that there is immediate effect of static stretching on grip strength & hand function.

Keywords- Eldarly, hand function, grip strength.

Introduction

A biological axiom of “Use it or lose it” applies to hand function.¹ One of the basic problem faced by elderly is decrease in manual dexterity, which becomes prominent in daily activities such as tying shoelace and fastening buttons. The time required in manipulating small objects increases 25 to 40 % by the age of 70 years of age.²

“The Ageing process is of course a biological reality which has its own dynamic, largely beyond

human control”. However, it is also subjects to the construction by which each society makes sense of old age. In the developed world, chronologically time plays a vital role. The age of 60 to 65, roughly equivalent to retirement ages in most developed countries, is said to be the beginning of old age. In many parts of the developing world, chronological time has little or no importance in the meaning of the old age. Other socially constructed meanings of age are

more significant such as the roles assigned to older people; in some cases it is the loss of roles accompanying in physical decline which is significant in defining old age. Thus, in contrast to the chronological milestones which mark life stages in the developed world, old age in many developing countries is seen to begin at the point when active contribution is no longer possible.³ Various findings indicate that the reduction in grip strength presents a prevalence of (25.5%), more among females (19.1%), in the age group of 80-89 year (18.5%).⁴

Studies show anatomical and physiological changes in the aging hand. The age-related changes are considered in Prehension Patterns (grip and pinch strength) & Hand Dexterity. The age-related degenerative changes in the musculoskeletal, vascular, and nervous systems leads to decline in hand function in the elderly population is, to a large degree. Deterioration of hand function in elderly adults is a combination of local structural changes in joints, muscle, tendon, bone, nerve and receptors, blood supply, skin, and fingernails.⁵ Prehension is defined as the act of seizing or grasping, whereas prehensile describes the adaptation of an organ for grasping or wrapping round an object. In humans the hand is the only prehensile organ.⁶ There is considerable difference in the terminology used by clinicians regarding Prehension of the hand. Prehension consists of various aspects of hand movement, including reaching, and postural motility.⁷ Prehension grips classified into Precision thumb-finger pinch grips, Passive palm pinch grips & Power grip⁸

One of the most common changes in aging skeletal muscle is a major reduction in muscle mass¹² ranging from 25% to 45%, described as “sarcopenia”.⁹ The diminished muscle strength of the aging hand has been characterized to decreasing muscle mass.¹⁰ There are 11 intrinsic muscles and 15 extrinsic muscles with functional roles in the hand. Extrinsic and intrinsic hand muscles produce the force for gripping objects

(grip force). After 60 years of age there is a decline in hand-grip strength, 20–25%.^{11,12}

Method and Materials

The primary data was collected from two old age homes and tertiary care hospital at Belagavi. elderly person above 65 years of age and subjects willing to participate was included in the study. Subjects with neurological disorders, fractures, osteoarthritis, rheumatoid arthritis and previous hand surgeries were excluded from the study.³⁷ subjects met the inclusion criteria which were randomly allocated in two group by envelop method group A was given static stretching and group B or control group was given muscle energy technique (MET). An approval for the study was obtained from the institutional ethical committee. All subjects were screened for inclusion criteria and exclusion criteria. Subjects were informed about the aims and procedure of the study. The treatment protocol was given to the subjects according to the following order. The stretching protocol is design to stretch the fingers flexors and consisted of 3 sets 30 second each. Subjects were standing in front of the therapist with his shoulder flexed at 90 degrees, elbow extended at 180 degrees, forearm and hand supinated position.

In Group A therapist manually positions the subjects forearm flexors in extended to hyper extended position. The stretches were given slowly until the mild discomfort is felt by the subjects. Subjects were instructed to relax while stretched position will be maintained. Each stretching of forearm and finger flexor will be repeated 3 times with 20 second rest interval between the sets.





Control Group Procedure: B group Patient is asked to fist and then flex the hand same is asked to repeat following of which therapist puts resistance to the movement patient is asked to put 25% of contraction for 30 second followed by relaxation

phase of 30 second, where full movement were tried to achieve. This was repeated for 3 times and then grip strength

Results

Statistical analysis for the present study was done manually as well as using statistical package of social sciences (SPSS) version 21 so as to verify the results obtained. For this purpose data was entered into an excel spread sheet, tabulated and subjected to statistical analysis. Various statistical measures such as mean, standard deviation, and test of significance such as paired and unpaired t –

test were used. Nominal data from patient's demographic data i.e. the age with respect to the duration of symptoms distribution were analyzed using t-test. Comparison of the pre intervention and post intervention and after 5 minutes outcome measures within the group was performed by using Independent T test, utilized to measure the difference between two groups (Intergroup comparison). Probability values < 0.05 were considered minimal statistically significant and values < 0.01 and 0.001 were considered highly significant and very high significant respectively. Age of the participants in the study was between 65 to 85 years. The mean age of the participants in group A was 73.65 ± 6.24 years, the mean age of participants in group B was 75.35 ± 7.14 . The 'p' value attained showed no significance in age between the groups ($p = 0.4638$). The mean BMI of the participants in Group A was 22.31 ± 2.5 , the mean BMI in group B was 21.78 ± 1.55 . The difference in the mean BMI was statistically not significant ($p = 0.4652$). (Table No.1)

Table 1

Variable	Groups	Mean \pm SD	SE	t-value	P-value
Age in yrs	Group A	73.65 \pm 6.24	1.51	-0.7415	0.4638
	Group B	75.35 \pm 7.14	1.73		
Ht (cms)	Group A	163.88 \pm 12.65	3.07	1.1260	0.2685
	Group B	159.85 \pm 7.60	1.84		
Wt (kgs)	Group A	59.88 \pm 12.38	3.00	0.9868	0.3311
	Group B	56.65 \pm 5.43	1.32		
BMI	Group A	22.31 \pm 2.52	0.61	0.7391	0.4652
	Group B	21.78 \pm 1.55	0.38		

Gender Distribution

Total number of male participants in group A was 6 and female participants were 11. In group B, the

total number of male participants was 2 and female participants were 15. (Table No.2)

Table 2

Gender	Group A	%	Group B	%	Total	%
Male	6	35.29	2	11.76	8	23.53
Female	11	64.71	15	88.24	26	76.47
Total	17	100.00	17	100.00	34	100.00

Table 3

Factors	Group A	%	Group B	%	Total	%
Diabetic Mellitus						
Yes	2	11.76	1	5.88	3	8.82
No	15	88.24	16	94.12	31	91.18
Hypertension						
Yes	3	17.65	3	17.65	6	17.65
No	14	82.35	14	82.35	28	82.35
Total	17	100.00	17	100.00	34	100.00

Out of 34 participants, 02 had diabetes mellitus in the group A and 01 participant had diabetes mellitus in group B. Total of 06 participants had

hypertension. Both groups had 3 participants in each group.(table-3)

Table: 4 Comparison of group A and group B with Grip strength scores at pretest, posttest and 5 minutes by independent t test

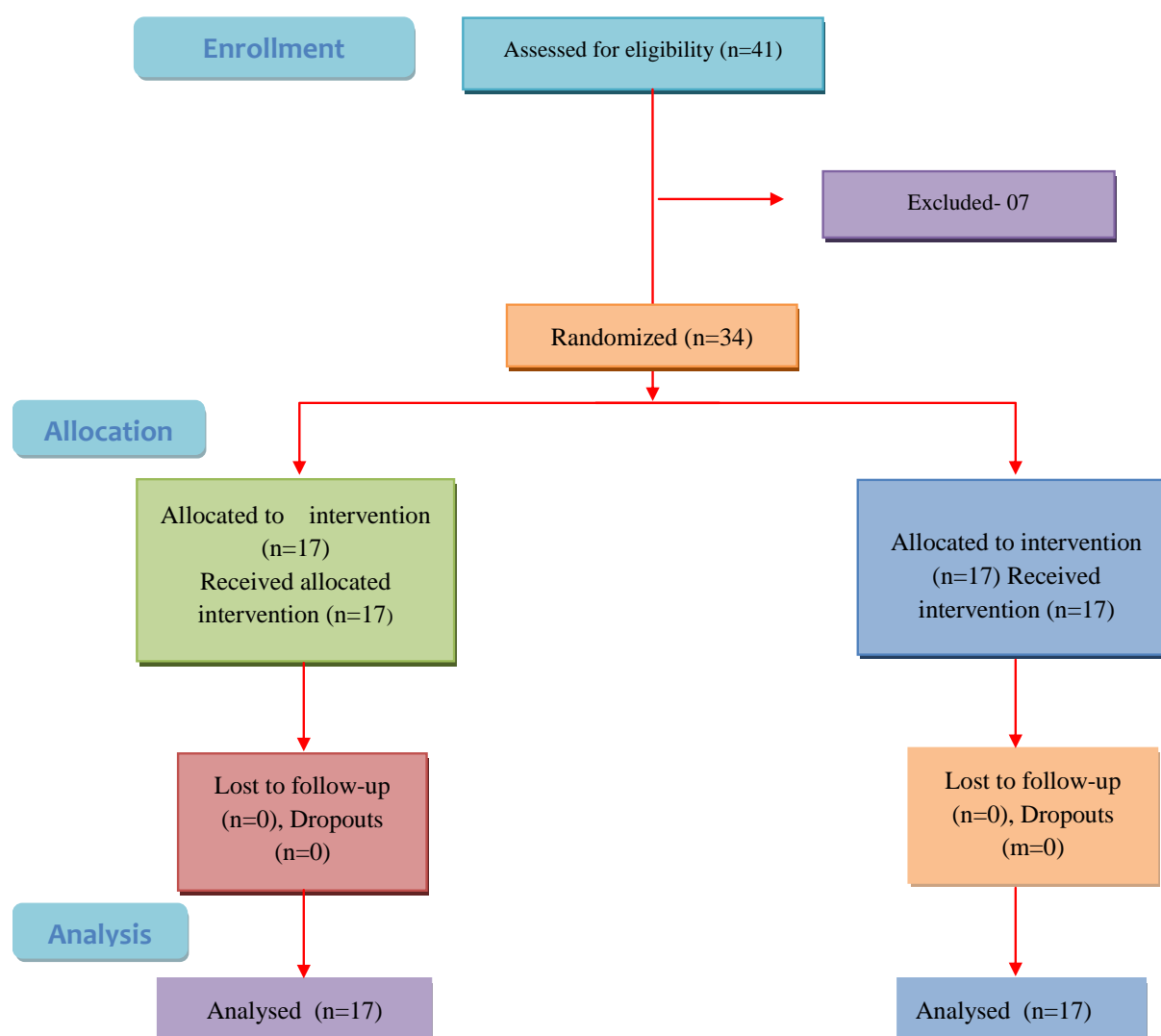
Time	Groups	Mean±SD	SE	t-value	P-value
Pretest	Group A	14.84±8.11	1.97	2.0922	0.0444*
	Group B	10.48±2.80	0.68		
Posttest	Group A	16.22±8.66	2.10	2.0829	0.0453*
	Group B	11.58±3.10	0.75		
5 minutes	Group A	16.49±8.98	2.18	2.0467	0.0500*
	Group B	11.82±3.21	0.78		

In group A, the mean hand grip strength score pre intervention was 14.84±8.11 which increased to 16.22±8.66 mean post hand grip intervention and After 5 minutes which increased to 16.49±8.98. the difference between mean of pretest, posttest and after 5 minutes was found to be statistically significant with p value (p=0.04), (p=0.04), (p=0.05) respectively.(table -4)

In group A, the mean hand function score pre-intervention was 56.24±5.26 which increased by 57.76±5.01 in hand function score. By dependent t-test it was found to be very highly significant (p=0.001) but no significant difference was found in group B

Table: 2 Comparison of at pretest and posttest Hand Function scores in group A and group B by dependent t test

Groups	Time	Mean±SD	Mean Diff.	SD Diff.	% of change	Paired t	P-value
Group A	Pretest	56.24±5.26	-1.53	1.62	-2.72	-3.8812	0.0013*
	Posttest	57.76±5.01					
Group B	Pretest	56.24±7.41	-0.53	1.42	-0.94	-1.5378	0.1436
	Posttest	56.76±7.15					



Discussion

The present randomized controlled trial was aimed to compare the immediate effect of static stretch and muscle energy technique in geriatric population for increasing hand grip and hand function. The age-related degenerative changes in the musculoskeletal, vascular, and nervous systems leads to decline in hand function in the elderly population is, to a large degree. Deterioration of hand function in elderly adults is a combination of local structural changes (joints, muscle, tendon, bone, nerve and receptors, blood supply, skin, and fingernails) as well as in neural control.⁷ Prehension is defined as the act of seizing or grasping, whereas prehensile describes the adaptation of an organ for grasping or wrapping

round an object. In humans the hand is the only prehensile organ.⁸

In present study as we see that there was less individuals which are affected by diabetes mellitus so the relationship between hand grip and DM was not significant. But there was another study hand function and hand grip is affected by DM.¹⁷ The study done in young males and females show that BMI and gender difference plays important role in hand grip strength. The study also suggests that male had higher hand grip strength as compare to female participants. The present study also supports the correlation between gender difference and grip strength but it does not support the co-relation between BMI and grip strength. The possible reason for this finding

could be the higher age of participants in present study.¹³

The present study comparison of experimental and control group with grip strength at post test and after 5 minutes showed statically significance. The primary goal of study was to improve the immediate effect of static stretching and met on grip strength and hand function geriatric population. The potential benefits and outcomes of stretching and said to be increase in flexibility and Rom, general fitness, injury prevention and reduce post exercise muscle soreness and enhance performance.¹³ A study done by Gustavo Pereirel da indicates that the effect of stretching on maximum grip strength which indicates that stretching to 30 seconds has no impact on strength while a longer stretches (60 seconds) can decrease it. Following stretching is for immediate result and even stretches are of less duration to impair strength, the impairment is resolved within a few minutes.

By static upper body-stretching maintained for short time periods (30 seconds) there is shortly affected when stretching is maintained for long time periods (60 seconds), upper body stretching can be performed by athlete's by competing in field event, if enough time is given before performance effort based on current study, a 5 min period is sufficient to maximum grip strength after stretching.¹⁴ The study done by bandy WD indicates that 30-second duration is an effective amount of time to sustain a muscle stretch to increase ROM. There was not increased in flexibility when the duration was increase from 30 to 60 sec or was increased from one to three times per day.¹⁵ The study done by Christer sollerman he designed The Sollerman test to give a good measure of overall function of the hand (not the elbow and shoulder). The purpose was to produce a true picture of grip function in activities of daily living and to reflect the most common main grips used in daily life.¹⁶ The study done by Erole rubini suggest that this study has been used for different muscle group and no of sets & the duration of stretching were greater than the ranges was

normally there and use in sporting activities. Four sets of stretching was performed for each muscle group with 10-30 second duration in stretches position. In this every muscle is given stretching in their comfortable position. In this results shows that strength performance preceded by stretching exercises. Stretching should be 60 seconds for geriatric population.¹⁷

Static stretching

In present study, there was increased in hand function after post intervention by giving static stretch. There was statically change noted. Hand function decrease with age in both men & women, for effectiveness in the maintenance & improvement of joint range of motion owing to possible change in the viscoelastic properties of muscle stretching is given after 65 yrs of age. Deterioration of hand function in elderly population is due to combination of local and structural changes.¹⁴ stretching routines appear to have a negative effect on the activities particularly when they are strength dependent. Traditionally stretching recommended before most physical activities, hence it was important to evaluate to what extend stretching routine may influence the performance, previous findings suggests stretching decreases the performance whereas present study shows statistically significance in increase in grip strength.¹⁷ This could be the psychological effect on elderly subjects to perform more better than before along with the stretching of previously altered muscle fibers due to age related changes. The second possible reason for improvement in the score may be the pretest readings between A & B groups since both the groups were also statistically significant.

Muscle energy technique (MET)

In present study MET showed statistically high significance when compared within the group on grip strength. As earlier MET has been found to be useful to lengthen muscle, to increase strength of muscle & to mobilize a restricted articulation.¹⁸ between group findings are statistically not significant.

Conclusion

The study concludes that the static stretching improves the hand grip strength and the hand function in geriatric population as traditionally stretching is recommended before most activities of daily living. The immediate effect of static stretching on grip strength and hand function can be beneficial to geriatric population which may enhance the ability to work independently.

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