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# Effect Of Functional Exercises Versus Conservative Treatment On Hand Function And Hand Grip Strength In Elderly Subjects.-A Comparative Study

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ABSTRACT-

**Background & Introduction**-Ageing is an irreversible process; the effects of a sedentary lifestyle are very evident in most people due to inactivity. When physical capacity falls below the ability required for the performance of daily tasks, functional limitations and a loss of independence may occur. Hence aim of the study is to see the Effect of functional exercises versus conservative treatment on pain, function and hand grip strength in elderly Subjects.

**METHODOLOGY**-This experimental study was conducted on 30 male and female subjects (aged above 60 years) without any severe illness. 30 subjects were divided into 2 groups, Group A was taught functional tasks exercise and Group B was taught conservative exercise for dominant hands, three days per week for total of 4 weeks. For the outcome measures, Hand functions was evaluated through Michigan hand outcome questionnaire and grip strength was measured using handheld dynamometer.

**Statistical analysis & Result** - The data collected was tabulated and data analysis was done by using the IBM SPSS software version 26 and Microsoft excel was used for graphs .The mean and standard deviation of all the variables were analyzed. Non parametric test were used since the data was not normally distributed and the result were considered significant if $p \leq 0.05$. There was significant effect in pre and post mean values of functional tasks exercise group and conservative exercise groups on grip strength ,functions in dominant hand ($p \leq 0.05$) . But on comparing the mean difference values of hand grip strength and Michigan Hand Outcome measure score between both the functional tasks exercise (Group A) and conservative exercises (Group B), functional tasks exercise shows more significant effect in improving the grip strength and hand functions in elderly subjects.

**Conclusion**- Both functional tasks exercise group (Group A) and conservative exercise group (Group B) have significant effect on improvement on hand function and grip strength in elderly subjects. But statistically, functional tasks exercise shows more significant effect in improving the grip strength and hand functions in elderly subjects.

**KEY WORDS**- functional exercises, Resistance exercises, hand function , grip strength

INROCUCTION- Presently, India has around a hundred million elderly at present and expected to increase to 323 million, constituting 20 percentage of the total at 2050 [1]. Old age and disablement are the main determinants of health care use and health issues regarding the older population are becoming increasingly important [2]. Ageing is characterized by a diminished function in multiple physiological domains, including the neuro- musculoskeletal system (e.g., loss of skeletal muscle mass, muscle strength, in muscle quality, in joint mobility, neuromuscular balance, etc.) deterioration of the respiratory system, cardiovascular system (e.g., diminished cardiovascular function, diminished endurance to exercise, postural hypotension, etc.) and so on. As one's age increase the manual function and quantity of hand muscle strength are decreased and in the geriatric age group will be present. These can be measured through grip and pinch strength measurement [3,6].

An exercise is an accessible form of prevention of physical functional decline. Several studies have found that adherence to a regular exercise program can improve hand muscle strength and function[10]. sufficient evidence exists to recommend that older people should exercise to increase hand function. The performance of functional tasks, however, is more complex and involves interplay of cognitive, perceptual, and motor functions and is closely linked to the individual's dynamic environment. Many studies have shown that regular exercise is beneficial to basic physical function in older adults, increasing muscle strength, balance, endurance and flexibility. However, the effects of exercise programs on the performance of daily tasks have not been proven indisputably. Hence , The aim of the study is to determine whether functional task and conservative exercise have significant effects on grip strength and hand function in the community-living elder people. This study will help find a suitable exercise programme , which will be helpful for the elderly subjects to improve their hand grip strength and hand functions leading to a better quality of life and improved ADL activities.

Aims -The aim of the study is to compare whether functional task exercise and conservative exercise have significant effect on grip strength and hand function in the elderly .

Objectives-

1. To determine the effect of functional task exercise on grip strength and hand functions in the elderly.

2. To determine the effect of conservative exercise on grip strength and hand functions in the elderly.

3. To compare the effect of functional task exercise and conservative exercise on grip strength and hand functions in the elderly.

Null hypothesis- states that

$H_0$1: There is no significant effect of functional task exercise on grip strength and hand functions in the elderly.

$H_0$2: There is no significant effect of resistance exercise on grip strength and hand functions in the elderly.

**Alternate hypothesis-states that**

$H_1$1: There is significant effect of functional task exercise on grip strength and hand functions in the elderly.

$H_1$1: There is significant effect of resistance exercise on grip strength and hand functions in the elderly.

Methodology- **STUDY DESIGN:** pre - post experimental study, **study population consisted of** elderly subjects of 60-75 yr of age, **sampling technique:** purposive sampling, **study duration:** 1 year. **sample size:** for sample size calculation in this study, the effect size was calculated from the result of the pilot study. The sample size was estimated in G power 3.1.9.2 version with effect size 1.18 and $\alpha = 0.05$ at 95% power. Sample size calculated was 40, 20 samples in functional task exercise group and 20 samples in resistance exercise group. **STUDY SETTING:** various physiotherapy OPDs of Surat. Inclusion criteria includes Subjects aged 60-75 years old, both males and females,who were able to perform the exercise, those who were willing to participate, GDS $\leq$ 2 and MMSE >25.Exclusion criteria were recent fractures in upper limb, musculoskeletal diseases,unstable cardiovascular conditions, recent nerve injury in upper limb, metabolic diseases or other chronic illnesses that might limit training.

**Procedure**- The patient was screened on the basis of inclusion and exclusion criteria and their demographic data was taken by an assessment Performa. Prior to the commencement of the study, detailed procedure of the study was explained to the patients and a signed informed consent form was taken from them, The subjects were allocated in to two groups based on lottery method. Descriptions of groups were given as follow: Group A:Functional task exercises Group B: Conservative exercises. On the first day of first week and last day of 4 th week , measurement for hand grip strength and Hand functions (dominant hand)was taken. Dominant hand was assessed via Edinburgh handedness inventory .

**Outcome measure**- Hand grip strength was recorded using handheld dynamometer , Hand function was assessed by using Michigan Hand Outcome Measures questionnaire.

**Hand grip assessment method**-Before taking the measurements, subjects were requested to sit comfortably on the chair with straight back, without armrest with the feet flat on the floor, shoulder adducted and neutrally rotated, elbow flexed at 900 , forearm in neutral position, wrist between 0-300 of extension and between 0-150 of ulnar deviation. Subjects were asked to hold the dynamometer in above said position and were instructed to squeeze the dynamometer as hard as possible without moving the body. Thus final grip strength was measured from the dynamometer scale when the pointer no longer moved. Mean of these three trials were taken as the reading.[4,5]

The Michigan Hand Outcomes Questionnaire (MHQ) is a tool used to assess patients with hand disorders through the measurement of 6 health domains: overall hand function, activities of daily living (ADLs), pain, work performance, aesthetics, and patient satisfaction.[3].Five of the six MHQ domains (overall hand function, activities of daily living (ADLs), work performance, aesthetics, and patient satisfaction) are scored from 0 – 100 in which 100 is the best possible ability. The pain domain is scored from 0 – 100, where 0 indicates no pain. Total MHQ score was calculated as the mean of all 6 domains (after converting pain from a “best score of 0” scale to a “best score of 100” scale).the scale was administered via interview method.

**Materials and tools** which were used for functional tasks exercise are as follows: plastic water bottle, Sandbags, Paper, the door lock, Pencil, table, Sand, Coins, Marbles, Buttons, Clay, Cards, Clothes, Water, Bowl, Spherical and cylindrical shape objects. Conservative exercise was done by hand gripper, squeezing resistance ball, elastic band, Putty clay.

- Edinburg handedness questionnaire sheets
- Hand held dynamometer[4]
- Michigan Hand Outcome Measures questionnaire.(3)

INTERVENTION

FUNCTIONAL TASK EXERCISES (GROUP A)- (8)

- Carrying a Plastic bottle of water transfer from one hand to another
- Transfer sandbag from one hand to another.
- Crumple a sheet of a paper into a ball try to spread it back out into a flat piece of paper
- Gripping the door lock
- Roll a pencil between the thumb and fingers
- Fill a bowl with sand or rice and place object in the sand try to find out the object without seeing.
- Molding the clay. • Turn cards over. Do typing movement. • Wringing out the wet clothes.

CONSERVATIVE EXERCISE (GROUP B)(8)

- Hand gripper
- Squeezing resistance ball
- elastic band
- putty clay

**Total duration , frequency and repetitions of exercises for both the groups-10 repetition × 2 sets with 5 seconds hold**-Total exercise duration approximately 15-20 minutes, Intervention duration was for 4 weeks and 5days/week

**Statistical Analysis**- The statistical software named statistical package of social sciences IBM(SPSS) version 26 was used for the analysis of the data and Microsoft word 2007 and Excel 2007 was used to generate graphs and tables. Descriptive statistical analysis was carried out at 95% confidence interval. Outcome measurements analyzed were presented as mean ± SD. Significance was assessed at 5 % level of significance with p value set at 0.05; the data were ensured for their normal distribution using (Shapiro-Wilk Test).

RESULT-Table 1 shows descriptive statistics for all variables in group A and B. Table 2 shows shapro -wilk test for normality distribution. Table 3. shows within group pre- post difference for HGS and MHOQS. TABLE 4.Shows between group test for Hand Grip strength. TABLE 5.Shows between group test for Hand functions MHOQS.

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| HGSPREA | 20 | 11.60 | 26.70 | 19.3000 | 5.50110 |
| MHOQPREA | 20 | 86.20 | 93.80 | 90.2650 | 2.51799 |
| HGSPREB | 20 | 12.40 | 26.60 | 17.2050 | 4.68272 |
| MHOQPREB | 20 | 86.30 | 93.60 | 89.4850 | 2.38775 |
| AGEA | 20 | 60.00 | 74.00 | 67.7500 | 4.20370 |
| AGEB | 20 | 60.00 | 74.00 | 67.7500 | 4.20370 |
| GENDERA | 20 | 1.00 | 2.00 | 1.5000 | .51299 |
| GENDERB | 20 | 1.00 | 2.00 | 1.3000 | .47016 |
| Valid N (listwise) | 20 | | | | |

TABLE 1-Shows descriptive statistics in both groups A and B

| | STATISTICS | P VALUE |
|---|---|---|
| HGSPRE | .845 | .000 |
| HGSPOST | .854 | .000 |
| MHOQPRE | .921 | .008 |
| MHOQPOST | .938 | .003 |

TABLE 2 Shows Shapro- wilk test for Normality Distribution. Since p≤0.05hence the data is not normally distributed.

| Test Statistics[a] | | |
|---|---|---|
| | HGSPOST - HGSPRE | MHOQPOST - MHOQPRE |
| Z | -5.514[b] | -5.520[b] |
| Asymp. Sig. (2-tailed) | .000 | .000 |

a. Wilcoxon Signed Ranks Test, b.based on negative ranks.

TABLE 3. shows within group pre post difference for HGS and MHOQS

| Test Statisticsa | |
|---|---|
| | MEANDIFHGS |
| Mann-Whitney U | 12.000 |
| Z | -5.099 |
| Asymp. Sig. (2-tailed) | .000 |
| Exact Sig. [2*(1-tailed Sig.)] | .000[b] |

a. Grouping Variable: GROUP

b. Not corrected for ties.

TABLE 4.Shows between group test for Hand Grip strength.

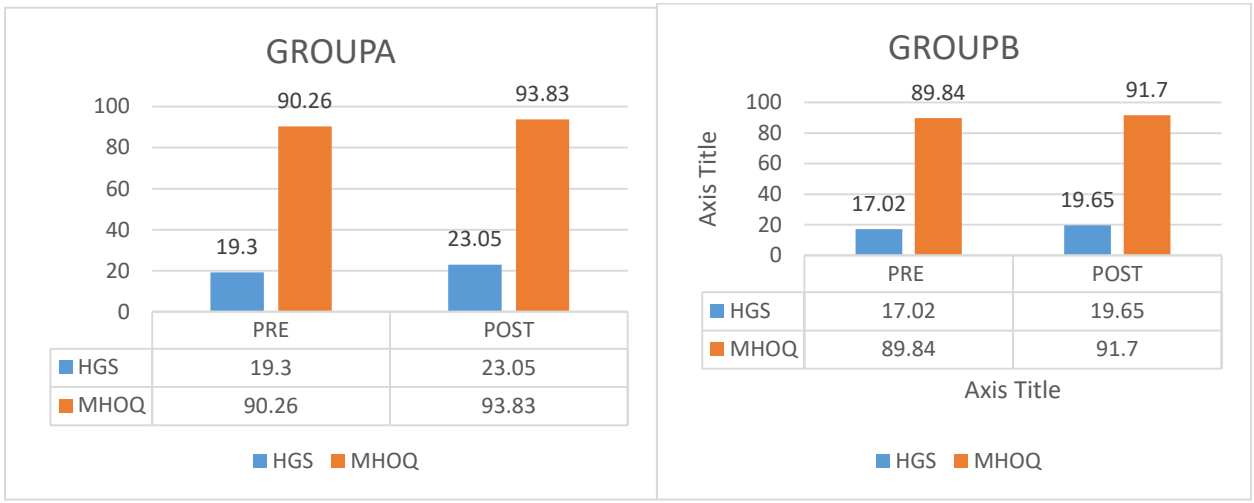
**Test Statistics[a]**

| | MEANDIFF MHOQ |
|---|---|
| Mann-Whitney U | 4.500 |
| Z | -5.326 |
| Asymp. Sig. (2-tailed) | .000 |
| Exact Sig. [2*(1-tailed Sig.)] | .000[b] |

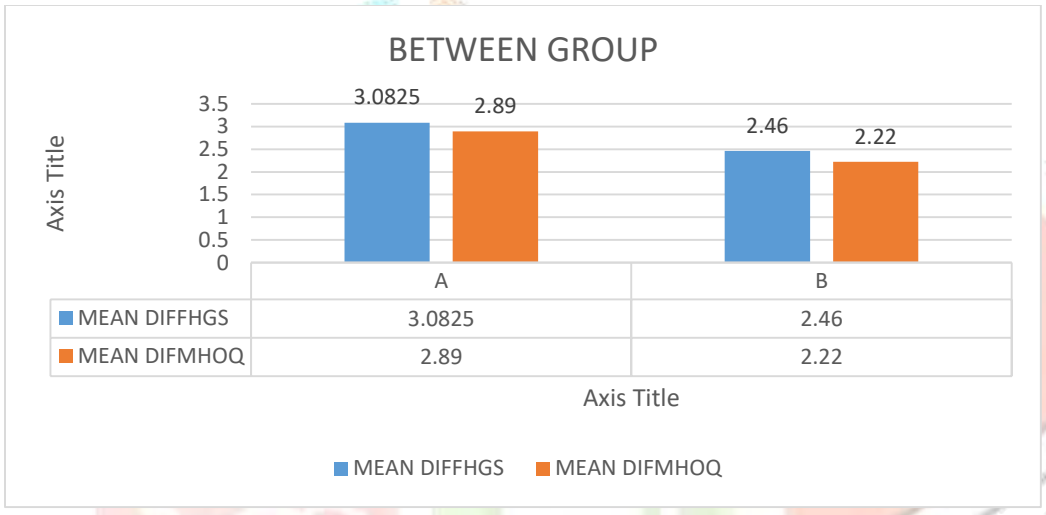
a. Grouping Variable: GROUP

b. Not corrected for ties.

TABLE 5.Shows between group test for Hand functions MHOQS.




GRAPH 1 & 2 Shows pre- post mean values for HGS and MHOQS in both groups A and B




GRAPH 3 shows mean diff values for HGS and MHOQS between both groups

DISCUSSION-In this present study, there is statistical significance on comparison of pre and post mean values of functional tasks exercise group on grip strength measurements of dominant hand and hand functions (MHOQ). Since the functional task exercises concentrates more on the day to day activities like wringing out the wet clothes, turn cards, gripping the door lock, etc. and not specific ,training the wrist flexors and extensors like resistance exercises. This was proved by Nelson et al,that the minimally supervised functional exercises are safe and can improve functional performance in elderly individuals.(7)

The comparison of pre and post mean values of resistance exercise group also shows statistically significant effect on grip strength measurements of dominant hand and hand functions (MHOQ).

Conservative treatment which basically included ,Resistance exercises concentrates more on the flexion and extension activity of fingers with the hand gripper, putty clay, elastic band and squeezing ball exercises. This was supported by study of Barry, who showed that older adults experience neural adaptation to resistance training and these adaptations will improve the functional movement capabilities of older individuals.(8)

While comparing the mean Diff. values of functional tasks exercise (Group A) and conservative exercise (Group B), the functional task exercise group values show more significance than the conservative exercise group. This

shows that the conservative exercises group has better effect on improving grip strength and hand functions in elderly than the conservative exercise group.

Bastone et al, have concluded that it might be more beneficial to train using movements that closely mirror daily activities rather than to train to increase strength and the power of the individual muscle groups [4]. Vreedel et al,showed that the functional tasks exercise shows better improvement on hand functions, when compared to the resistance exercise in elderly population [3], which means that older individuals may continue functional task exercising and thus maintain the effects of exercise.

Limitations of the study are small sample size; duration of the study was short, only normal elderly were studied. Recommendations for further studies are larger sample size, any other age groups can be targeted, long duration study can be done, comparison of male and female grip strength can be assessed, and any other hand conditions can be studied like post traumatic hand conditions.

CONCLUSION-Both functional tasks exercise group (Group A) and conservative exercise group (Group B) have significant improvement on hand function and hand grip strength in elderly population. Comparing the mean difference of both groups , functional task exercise has better improvement in hand functions and hand grip strength in elderly as compared to conservative exercise group.

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