Effect of Hand Exercises Training Program on Mild Cognitive Impairment among Community Dwelling Elderly

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Abstract

Background & Aim: Mild cognitive impairment (MCI) refers to a very early stage of cognitive decline in patients not yet exhibiting dementia and is an important predictive risk factor for dementia which needs attention to prevent and improve it before deterioration. Therefore, this study aimed to evaluate the effect of hand exercises training program on mild cognitive impairment among community dwelling elderly. **Methods & Materials:** This randomized control trial study was conducted during 2022-2023 at Kafr Elhag Hassan, Sharkia governorate. **Sample:** The study sample composed of 80 elderly with MCI, purposively assigned according to study inclusion criteria, randomly assigned into two groups. The study group (n=40) received seven sessions and the control group (n=40) didn't receive any intervention. **Tools:** Four tools were used; Structure interview questionnaire, The Modified Mini- Mental State Test (3ms) (Arabic version) (pre- post), questionnaire to assess knowledge of hand exercises (pre – post), & observational questioner for doing hand exercises (pre – post). **Results:** The study findings showed statistically significant improvements in the study group's MMSE score, hand exercises knowledge and practice post intervention compared to the control group **Also,** MMSE score of the study group after the intervention positively correlated to hand exercises knowledge (r = 0 .726), hand exercises practice (r = 0.756). **Conclusion:** The applied hand exercise program was effective and could be used to improve mild cognitive impairment among community dwelling elderly.

Keywords: Hand Exercise Program, Mild Cognitive Impairment (MCI), Mini Mental Scale Examination (MMSE), Hand Exercise Knowledge, Community Dwelling Elderly.

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Introduction

The worldwide increase in life expectancy culminated on the increased incidence and prevalence of degenerative diseases such as dementia. Prior to the diagnosis of dementia, older adults

experience a transient state of cognitive function commonly known as mild cognitive impairment (MCI). Although pharmacological treatment has limited effect on cognitive function, currently there are indications that MCI can be reversed, or at least have its progression to dementia decelerated, by lifestyle changes i.e., educational attainment, occupational complexity, physical activity, exercises, social engagement, bilingualism, leisure activities, and Mediterranean diet **(Biazus-Sehn et al., 2020).**

Mild cognitive impairment (MCI) refers to a very early stage of cognitive decline in patients not yet exhibiting dementia and is an important predictive risk factor for dementia. Many people present to health services with MCI, which occurs in up to 20% of people older than 65 years of age, and 10–15% of patients with MCI develop dementia annually. Because the number of patients with dementia has been increasing, a comprehensive strategy for dementia research has been introduced, which includes analyses of the characteristics of patients with MCI. A multifactorial assessment of MCI can be useful for preventing the progression from MCI to dementia **(Saji et al., 2019).**

According to published literature, there are three groups of outcomes of MCI by pathogenesis: revision to normal aging, stability, or progress into dementia. Daily activities and physical functions may play an important role in the reversion of MCI to normal aging **(Breton et al., 2019).** Japanese researchers disclosed the associations between hand function and cognitive decline **(Shimada & Makizako 2019).**

Hand exercises are movements of the hands and fingers that utilize sensory receptors on the fingers. The stimulation of cerebral areas by gross motor skills influences not only physical skills but also cognitive functions. The functional somatotopy of the primary motor cortex and the primary somesthetic area show that the hand areas comprise the largest portion of cortical tissue. Therefore, finger movements may activate brain areas associated with cognitive functions as well as motor skills **(Liu et al., 2019).**

Unlike simple hand movements, the nurse has an important role in helping elderly to perform structured finger movements requiring concurrent visual and tactile information processing can demand the subject's continuous attention to both the current and upcoming stimuli. Therefore, teaching elderly to practice complex structured finger movement tasks could be utilized as a simple exercise intervention to develop the brain areas that perform cognitive functions with the aim of improving cognitive abilities, or delay cognitive decline **(Jang et al., 2020).**

Methods

Study Design and Setting

A randomized control trial design was used to conduct the current study from November 2022 up to the end of August 2023 at Kafr Elhag Hassan village, Sharkia governorate.

Sample

The sample of this study included 80 elderly (40 elderly in study group &40 elderly in control group) who fulfilled the following criteria: Elderly who able to cooperate and agree to participate in the study, elderly who diagnosed with mild cognitive impairment (take score of ≥ 78% in

MMSE scale), The enrolled elderly were randomly allocated in a 1:1 ratio to the study or control group. Study group received the educational program while the control group did not receive any intervention.

Sample size calculation

The sample size was calculated by software Epi-info package at level of confidence 95%, margin of error 5% and power of test were 80%, assuming average mild cognitive among elderly is 27.5 % from 366 (**Ishikawa, et al., 2022).** Elderly at kafr elhag hassan, and the least percentage of improvement after the intervention program will be 10% then the sample should include **73 elderly in addition to 10%** dropout, final sample size will be 80 elderly (40 elderly in study group &40 elderly in control group).

Tool of data collection

Four tools were used for collection of data. **Tool I:** Structure interview questionnaire that was developed by the researchers based on the literature review. It is composed of three parts: Demographic characteristics, medical history and physical activities of elderly.

Tool (II): The Modified Mini- Mental State Test (3ms) (Arabic version) after validity and modified by (Ghonim et al., 2018) (Pre - post):

Is a screening tool used to assess a broader variety of cognitive domains and covers a wider range of difficulty levels. The (3MS) extended the scope of The Mini-Mental State Examination (MMSE). It is a global measure of cognitive abilities tapping domains such as attention, concentration, orientation, to time and place along term and short-term memory, language ability, constructional praxis, abstract thinking, and list generating fluency.

Scoring system:

The score of the 15 items (13 items for illiterates) were summed up and the cognitive abilities (3MSE) were classified according to the total score gained by the elderly in the test as follows:

- Mild cognitive impairment: ≥ 78%
- Moderate cognitive impairment: 60-77%
- Severe cognitive impairment :< 60%

Tool (III): questionnaire to assess knowledge of hand exercises (pre - post):

This questionnaire was developed by the researcher after returned to related literature review. It will include questions as definition of hand exercises, importance, performance, duration).

Tool IV: Observational questioner for doing hand exercises:

This questionnaire was designed by the researcher to observe the elderly's performance of hand and finger exercises based on related literature which mainly focus on performing exercises which

related to enhancing cognitive abilities in front of elderly and encourage them to do them. After that, the post-test will be done after intervention.

Data Collection Process

Once the permission was granted to proceed with the study, the researcher started to prepare a schedule for collecting the data. The data of the study were collected by the researchers by face-to-face interviews with the elderly before and after the intervention. The fieldwork was carried out over a period of ten months, starting from the beginning of November 2022 up to the end of August 2023. This included the phases of assessment, planning, implementation, and evaluation of the program. The researcher read and explained each item of the study tools to the elderly and then recorded their response to each item. Data collection took about 25-30 min to complete for each elderly.

The hand exercise Intervention program

The intervention was designed based on the identified needs obtained from the analysis of the baseline assessment and in view of the relevant literature. The intervention was implemented in the form of seven sessions (sex theoretical and one practical) for 30-45 minutes. The theoretical part of the intervention was prepared in the form of an illustrative booklet distributed to all elderly in the study group. The practical sessions were prepared in the form of videos and pictures that demonstrate the exercises. The sessions were introduced individually as well as in small groups (2 to 4 elderly in each group) according to availability of elderly in each session. All elderly were instructed to perform hand exercises by themselves in their homes three times daily.

The Hand Exercises Program consisted of seven sessions as follows:

Session 1: The main objective of this session was to improve elderly's knowledge about definition, prevalence and causes of MCI.

Session 2: The main objective of this session was to enhance elderly's knowledge about risk factors and signs and symptoms of MCI.

Session 3: The main objective of this session was to equip elderly's knowledge about complications and management of MCI.

Session 4: The main objective of this session was to promote the elderly's knowledge about diagnosis and prevention of MCI.

Session 5: The main objective of this session was to improve elderly's knowledge about the functions and parts of the hand.

Session 6: The main objective of this session was to enhance elderly's knowledge about types and importance of hand exercises.

Session 7: The main objective of this session was to help the elderly to apply hand exercise practice.

Ethical Considerations

The study proposal was approved by the Research Ethics Committee (REC) and the Postgraduate Committee of the Faculty of Nursing at Zagazig University, Egypt. An informed consent for participation was taken verbally from each of the elderly subjects after a full explanation of the aim of the study. Participants were given the opportunity to refuse participation, and they were notified that they could withdraw at any stage of the data collection interviews. Also, they were assured that the information would be confidential and used for research purposes only. The researcher assured maintaining the anonymity and confidentiality of the subjects' data. The researcher's phone number and all possible communication methods were identified to the participants to return at any time for any explanation.

Statistical analysis

Statistical analysis was done using the SPSS 22 statistical software package. The descriptive analyses were expressed as frequencies, percentages, means, and standard deviations (SDs). Percentages of categorical variables were compared using the Chi-square test. Independent t-test was used to compare the means of the study variables between the study and control groups, and paired t-test was used to compare the means of the study variables pre and post-intervention in each group. In order to identify the correlation between the main study variables, Pearson's correlation coefficient was used. Statistical significance was considered at p. value < 0.05. Cronbach alpha coefficient was measured to identify the reliability of the scales through their internal consistency.

Results

Elderly characteristics in the intervention and control groups:

Considering the demographic characteristics of studied elderly in the study and control groups **table 1** revealed that 65.0 % of the of study group elderly aged 60-65 years, and the mean age of them was 64.80±5.35 years, 82.5% of them did not work and 90.0% of them were living with family. Meanwhile, 42.5% of the control group were aged between 60 – 65 with mean age of 67.47±4.84, 62.5% of them were female, 90.0% of them did not work, 97.5% of them were living with the family. The highest percentages of the studied elderly in both study and control groups have chronic diseases (85.0 %), were taking medications (77.5 %) and (65 %) respectively.

Table 2 clarifies that 90% of the studied elderly in the study group were depending on themselves to perform daily activities, 70.0% weren't participating any family, community activities or having any hobbies and 82.5 % weren't practicing in any kind of sport. On the other hand, 97.5% of the control group were depending on themselves to perform daily activities, 72.5% weren't participating in any family or community activities, 80.0% weren't having any hobbies and 90.0% of them weren't practicing any kind of sport.

Referring to mini- mental state test pre-post-intervention among the study and control groups

Table 3 reveals that there were no significant differences in MMSE score between the two groups in the pretest. There was significant improvement in the total mean score of mini- mental state test in the study group (93.53±3.85) post intervention. On the other hand, there was no significant improvement in it among control group post intervention. This means that there was statistically significant between the study and control groups in the total mean score of mini-mental state test post-the program.

The satisfaction level of hand exercises knowledge pre and post program among the study and control groups.

Figer1 portrays that there was highly statistically significant improvement in the total score of knowledge regarding hand exercises in the study group post-intervention with satisfaction level (87.5%) compared to the control group that had no statistically significant improvement in the total hand exercises knowledge. There was highly statistically significant ($p<0.001^{**}$) between the study and control groups post intervention.

Concerning pre-post-intervention of hand exercises practice among the study and control groups.

Table 4 displays that before the intervention, there was low level of satisfaction in the control and the study groups. On the other hand, there was no statistically significant improvement in the control group total mean score of hand exercises post-intervention. On the contrary, there was statistically significant improvement in the study group total mean score of hand exercises knowledge post-intervention and this means a significant difference between the mean scores of hand exercises practice in the study and control groups post intervention at ($P < 0.001$).

Predictors of MCI according to MMSE score among the study group

Table 5 indicates that there were statistically significant relations between the study group high total mean score of mini- mental state test and aging between 60– 65 years old, being male, high educational level, living with the family and high income. On the other hand, the elderly who have chronic diseases, smoker ad have family history of cognitive impairment were associated with low mini mental scale test score.

Correlations between the study variables post-intervention in the study group (Table 6)

The study results indicated that there was a significant positive correlation between MMST score and hand exercises knowledge & hand exercises practice which means that there was appositive correlation between all of the study variables.

Discussion

The existing study results clarified that before the training program, the elderly in both study and control groups with mild cognitive impairment has low score of MMSE. This might be attributed to low medical services status that makes access to health information difficult to accomplish. They also had limited awareness regarding MCI and the importance of early detection, management and prevention of MCI especially at ruler area. In the same stream, a

study conducted in China by **Liu et al. (2021)** found that the prevalence of MCI in rural areas was twice that in urban areas and there is association between rural socioeconomic and lifestyle disadvantage and MCI. In addition, a study conducted in Thailand by **Griffiths et al. (2020)** found that the prevalence of MCI in older Thai people in a rural area is high compared with that in other countries.

After the implementation of the current study intervention, the existing study results indicated that there were statistically significant improvements in the total mean score of mini-mental state test in the study group (93.53±3.85). This might be attributed to the content of the intervention program, which focused on improving the cognitive functions, mental skills and also be sure that the hand exercises are applied by easy and attractive maneuver.

On the same line, a study conducted in China by **Wang et al. (2020)** demonstrated that after 12-week exercise intervention could improve cognitive function, mood, balance, and quality of life in people with MCI. Moreover, continuous exercising for a more extended period could produce better outcomes. In addition, a study conducted in Canada by **Salzman et al. (2022)** revealed a significant improvement of the MMSE score after intervention program.

Meanwhile, the control group had no statistically significant difference in the total mean score of MMSE pre- and post-the program78.53±2.31. In the same line, a study conducted in Korea by **Thapa et al. (2020)** included that there was no statistically improvement in the control group with MCI post intervention.

Considering the knowledge regarding hand exercises pre and post the training program; the existing study results clarified that more than three-quarters of the elderly in both study and control groups had unsatisfactory of hand exercises knowledge before the intervention. Possible explanation of such results may be related to the socio-cultural ageing stereotypes that ignore the importance of exercises especially hand exercise and Lack of talk through various means of communication about the role that exercises which provide improving mild cognitive impairment and thus improving perception, concentration, and thinking patterns, especially in rural areas.

In the same line a study conducted in UK by **Maduakolam et al. (2023)** approved that the elderly's knowledge related the hand exercises was low. In contrast, a study conducted in Nigeria by **Washif et al. (2022)** represents high level of the elderly's knowledge regarding hand exercises.

Referring to the post-intervention hand exercises knowledge in the study and control groups, the existing study results indicated that the study group had significant improvement in the total mean score of hand exercises practice (57.65± 5.78) with satisfaction level of 77.5. On the other hand, there was no statistically significant difference in the control group total mean score. This might be attributed to that one of the most important parts of the intervention was focusing on simple information and mention the parts of the hand and their functions in a simplified manner during the exercise with each movement and to rely on improving short-term memory during performance.

Similarly, **Ghaffari et al. (2024)** who conducted a study in Iran concluded that the mean of hand exercises knowledge score in the experimental group significantly increased while that level

was not significant in the control group. The result of independent t-test demonstrated a significant difference between the mean scores of knowledges in control and experimental groups immediately after the intervention (P < 0.001).

Considering the hand exercises practice program for elderly with mild cognitive impairment among community dwelling elderly pre and post the program; The existing study results clarified that the mean hand exercises practice score pre-intervention among the study and control groups were 23.22± 6.64 & 23.47±6.45 respectively. This finding can be attributed to a variety of reasons including; being in a rural environment and lack of awareness about the importance of exercise in general, its types and that there are hand exercises that can help improve cognitive abilities and memory in the elderly, in addition to the lack of talk about this aspect by health services. These findings are consistent with a study conducted in Germany by **Labott et al. (2019)** who reported that both the study and control groups had inadequate hand exercises practice prior to the program.

Conversely after intervention, the study group had significant improvement in the total mean score of hand exercises practice 57.65± 5.78 with satisfaction level of 77.5. On the other hand, there was no statistically significant difference in the control group total mean score of hand exercises practice pre- and post-intervention. This might be attributed to that the researcher provided the reassurance and support throughout the intervention. Also, the elderly received the training program with simple manner, full explanation of parts of the hands, made the practice first in front of them then allow them to repeat again. Likely, a study conducted in Denmark by **Ellegaard et al. (2019)** who concluded that participants in the study groups improved their hand exercise practice after the program.

Referring to predictors of MCI indicated by MMSE score among the study group, the study findings exposed that the increased age was associated and a common independent negative predictor for the total MMSE score. A concordant study conducted in Austria by **Kasper et al. (2020)** demonstrated that increasing age is reflected by lower mini-mental state examination. Also, **Anderson. (2019)** in Canada explained that aging-associated with cognitive decline.

Additionally, the study findings demonstrated that being female was independent negative predictor for the total MMSE score. In the same line, study conducted in China by **Liu et al. (2022)** demonstrated that the prevalence of MCI was higher in the population of elderly women compared to men. In contrast, a study conducted in Malaysia by **Hussin et al. (2019)** after 1½-year follow-up, the incidence rate for MCI was considerably high among the respondents. Being male was predictor of the occurrence of MCI. Additionally, a study conducted in Taiwan by **Cheng et al. (2020)** suggest that chronic diseases and increased age contribute to different neurodegenerative processes in MCI.

The study represents that there were statistically significant relations between the study group total mean difference score of mini- mental state test and their educational level, living with whom. As well, a study conducted in Sweden by **Lövdénet al. (2020)** concluded that higher educational level and more years of education were associated with lower risk of incident MCI. In the same line, a study conducted in Brazil by **Angevaare et al. (2022)** concluded that higher

education decreased this risk of MCI. Similarly, study conducted in Pakistan by **Zafar al. (2021)** approved the relationship between loneliness of the elderly with MCI.

Accordingly, the study result demonstrated that there were statistically significant relations between the study group' total mean difference score of MMSE, chronic diseases and smoking. Similarly, a study conducted in China by **Angevaare et al. (2022)** demonstrate that the pooled estimated prevalence of mild cognitive impairment in chronic diseases elderly is high worldwide, especially in China Asia. Another study conducted in China by **Jia et al. (2020)** found that MCI predictors including rural residence, lower education, living alone, smoking and chronic diseases. Additionally, a study conducted in Italy by **Ranzini et al. (2020)** confirmed that chronic diseases contribute to a higher risk of Mild cognitive impairment.

Considering the correlation between the study variables,

the study findings clarified that there was a significant positive correlation between MMSE score & hand exercises knowledge and hand exercises practice. Which mean a significant positive correlation between all variables each other. This might be attributed that the elderly with high score of MMST have more ability to learn and gain knowledge that is the basis and reflection for any practice and any healthy behavior is often based on correct knowledge.

Likely, **Song et al. (2019)** carried out a study in China who indicated that there was a positive correlation between hand exercises practice and high level of MMSE score, which mean that elderly in the intervention group had a significantly greater improvement in their MMSE score compared with the control group over the pre-test and post-test periods.

Also, a study conducted by **Hesseberg et al. (2021)** in Norway concluded an association between hand exercises and improved hand exercises knowledge and MMSE score and decreased of MMSE score associated with decreased hand exercises practice.

Another study conducted in Taiwan by **Chang & Wu (2024)** approved the association between hand exercise practice and increased MMSE score. That approved the benefits of hand exercises for improving cognitive function, these interventions are feasible and suitable for promotion among community-dwelling older adults with mild cognitive impairment to delay the decline in cognitive and physical function.

Conclusion

The study findings were concluded that pre the hand exercises intervention, the elderly with mild cognitive impairment in either the study or control group had had low score of MMSE, inadequate knowledge hand exercises and unsatisfactory hand exercises practice. Meanwhile, after the intervention, the study group had significant improvements regarding their MMSE score, knowledge hand exercises and hand exercises practice. Ultimately, it was proved that the hand exercises intervention is effective in the improvement of mild cognitive impairment among community dwelling elderly.

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Declaration of Conflicting Interests

The Author(s) declares(s) that there is no conflict of interest.

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Table 1: Demographic characteristics and medical history of the studied elderly in the study and control groups (n=80).

Demographic characteristics	Study group (n=40)		Control group (n=40)		X^2 (P-value)
	No.	%	No.	%	
Age group/year:					
60-65	26	65.0	17	42.5	
> 65	14	35.0	23	57.5	FET (0.072)
Mean ± SD	64.80±5.35		67.47±4.84		t=-2.345 p=0.32
Gender:					
Male	17	42.5	15	37.5	FET (0.820)
Female	23	57.5	25	62.5	
Educational level:					
illiterate	6	15.0	14	35.0	6.516 (0.164)
Read &write	6	15.0	5	12.5	
Basic education	3	7.5	5	12.5	
secondary education	9	22.5	8	20.0	
University education	16	40.0	8	20.0	

Previous working:	21	52.5	13	32.5	4.067 (0.254)
Employee	3	7.5	5	12.5	
Worker	3	7.5	2	5.0	
Farmer	13	32.5	20	50.0	
Housewife					
Current occupation:	33	82.5	36	90.0	FET (0.518)
Does not work	7	17.5	4	10.0	
Works					
Living with whom:	36	90.0	39	97.5	FET (0.359)
With the family	4	10.0	1	2.5	
On my own	0	0.0	0	0.0	
Others					
Monthly income:	25	62.5	22	55.0	1.058 (0.589)
sufficient	13	32.5	17	42.5	
insufficient	2	5.0	1	2.5	
sufficient and abundant					
chronic diseases:	34	85.0	34	92.5	FET (0.99)
Yes	6	15.0	6	15.0	
No					
Taking medications					
Yes	34	85.0	34	85.0	FET (0.323
No	9	22.5	14		

χ 2 : Chi square test, FET: Fisher exact test, t: student t-test, non-significant(p>0.05)

Table 2: Physical activity of the studied elderly in the study and control groups (n=80).

Physical activity	**Study group (n=40)**	**Control group (n=40)**	X^2

	No.	%	No.	%	(P-value)
Depending on yourself to perform daily activities such as eating, bathing, dressing, etc... Yes	36	90.0	39	97.5	FET (0.359)
no	4	10.0	1	2.5	
Depending on yourself to perform instrumental activities Yes	25	62.5	26	65.0	FET (0.99)
No	15	37.5	14	35.0	
Participation in any family or community activities? Yes	12	30	11	27.5	FET (0.99)
No	28	70.0	29	72.5	
Having any hobbies or any areas you are interested in Yes	12	30.0	8	20.0	FET (0.310)
No	28	70	32	80.0	
Practicing any kind of sport Yes	7	17.5	4	10	FET (0.518)
No	33	82.5	36	90.0	
In the case of yes, What kind of sport do you practice					
Running	2	28.6	0	0.0	6.724 (0.242)
Walking	5	71.4	1	25.0	
Football	0	0.0	1	25.0	
Hoki	0	0.0	1	25.0	
karate	0	0.0	1	25.0	
Practicing any kind of sport regularly					

Yes	3	7.5	2	5.0	FET (0.99)
No	37	92.5	38	95.0	

χ 2 : Chi square test , FET: Fisher exact test, non-significant(p>0.05)

Table (3): Total mean score of mini- mental state test pre-post-intervention in the study and control groups (n=80).

	pre		*t-test* (P-value)	Post		*t-test* (P-value)
	Study group (n=40)	Control group (n=40)		Study group (n=40)	Control group (n=40)	
	Mean± SD		1.1427 (0.2567)	Mean± SD		21.129(<0.001**)
Cognitive impairment score	78.23±2.85	77.68±1.07		93.53±3.85	78.53±2.31	

non-significant (p>0.05), **: statistically highly significant (p<0.01).

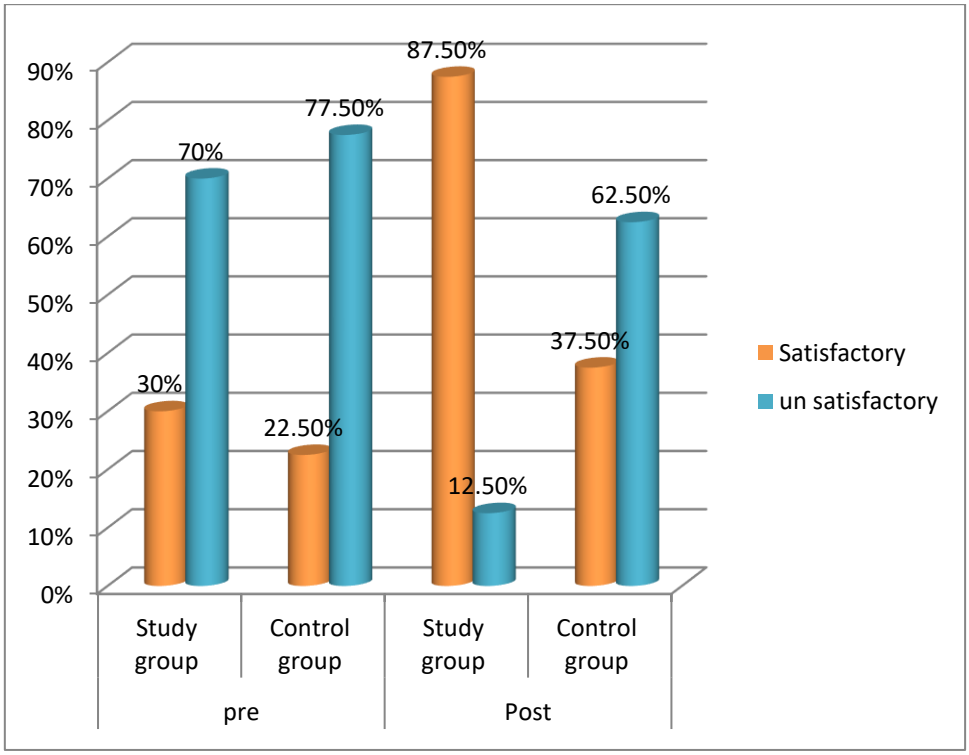

Figure (2): Bar chart showing total score of knowledge regarding hand exercises of the studied and control groups pre and post intervention.

Table (4): Total score of hand exercises practice as reported by the studied and control groups pre and post intervention (n=80)

Hand exercise score	pre				*test* (P-value)	Post				*test* (P-value)
	Study group (n=40)		Control group (n=40)			Study group (n=40)		Control group (n=40)		
	No.	%	No.	%		No.	%	No.	%	
Satisfactory	7	17.5	9	22.5	FET (0.78)	31	77.5	11	28.2	FET (<0.001**)
un satisfactory	33	82.5	31	77.5		9	22.5	28	71.8	
Mean± SD	23.22± 6.64		23.47±6.45		t-test= 0 .171 p=0.865	57.65± 5.78		24.10±5.49		t-test= 26.584 p<0.001**

FET: Fisher exact test, non-significant(p>0.05), **: statistically highly significant (p<0.01).

Table (5): Best fitting multiple linear regression for predicting factors which affect MMST

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	75.516	.522		144.686	.000	74.476	76.555
Intervention program	-0.770	0.051	-0.764	-15.047	<0.001**	-0.872	-0.668
Education	-0.969	0.150	-0.328	-6.454	<0.001**	1.268	-0.670
Aging	-.448-	.184	-.265-	-2.429-	0.017*	-.814	-.081-
Gender (female)	-.823-	2.031	-.046-	-2.405-	0.045*	-4.867	3.221
living with whom (with the family)	3.587	4.095	.099	3.876	0.038*	4.566	11.740
chronic diseases	1.083	2.787	.044	4.389	0.032*	4.465	6.632

**: statistically highly significant (p<0.01).

R-square=0.816, ANOVA: F= 168.630, P<0.001

Table 6: Correlation matrix between study variables post intervention.

Items	MMST	MCI knowledge	hand exercises knowledge	Hand exercises practice
Mild cognitive impairment (r) MMST				
hand knowledge (r)	0.726**	0 .798 *		
Hand exercises practice (r)	0.756**	0 .825 **	0 .824 **	

r: correlation coefficient, **: statistically highly significant (p<0.01)