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THE EFFICACY OF CHAIR AEROBIC EXERCISES ON COGNITIVE FUNCTIONS, PHYSICAL ACTIVITY AND QUALITY OF LIFE IN GERIATRIC POPULATION IN A TERTIARY CARE CENTER IN TIRUPATI.

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ABSTRACT:

INTRODUCTION: Geriatrics from the chronological viewpoint starts from the age of 65 years. It is associated with increased risk of cardiac diseases, metabolic syndrome. Due to prolong life expectancy, age related diseases have increased in recent decades.[1] The literature review indicates lifestyle factors which have impact on the people aging. Three lifestyle factors play a significant role in slowing the rate of cognitive decline and preventing dementia, they are socially integrated network, cognitive leisure activity and regular physical activity.[2]

Chair exercises can help the geriatrics to enhance the physical activities especially individuals with muscle strength and trunk balance. Apart from chair exercises individual based physical activity can be adopted. Effectiveness of the structured chair aerobic exercises can be measured using physical activity score, cognitive functions with MMSE, social network with oxford happiness questionnaire and quality of life using SF36 questionnaire in geriatric population.

AIM: To find out the influence of chair exercises on physical activity, cognitive functions, social network and quality of life in geriatric individuals.

OBJECTIVES:

- To find out the effect of chair aerobic exercises on physical activity in geriatrics using international physical activity questionnaire.
- To find out the effect of chair aerobic exercises on cognitive functions in geriatrics using mini mental state examination.
- To find out the effect of chair aerobic exercises on social network in geriatrics using oxford happiness questionnaire.
- To find out the effect of chair aerobic exercises on quality of life in geriatrics using sf36 questionnaire.

METHOD: 60 patients with age > 60 years old individuals (both genders) were taken in tertiary care centers in Tirupati, Andhra Pradesh for the study. Pre and Post comparison design was adopted. Inclusion criteria include Age 60 years above, Both genders (male and female), Mild and Moderate disability. Major neurological problems (stroke, Parkinson disease), History of cardiovascular disease (Coronary artery disease, Heart attack, Abnormal heart rhythms, Heart failure, Peri cardiac disease, vascular disease), Severe musculoskeletal disorders were excluded from the study.

Participants received 30-45 min of chair aerobic exercises, were implemented to the subjects every week as per the individual tolerance and the protocol is completed with relaxation positions. The protocol is implemented 4 days per week for 8 weeks. Four outcome measurements were measured initially before the intervention and after the intervention. Physical activity questionnaire, mini mental state examination, oxford happiness questionnaire. Sf36 questionnaire.

RESULTS: There is a statistically significant ($p<0.00$) improvement from baseline to 8th week in geriatric population.

CONCLUSION: Chair aerobic exercises proved to be effective in improving the cognitive function, physical activity, social network, and quality of life in geriatric population.

KEYWORDS:

PHYSICAL ACTIVITY (PA), MINI MENTAL STATE EXAMINATION (MMSE), INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE S(IPAQ).

INTRODUCTION

Geriatrics from the chronological viewpoint starts from the age of 65 years. It is associated with increased risk of cardiac diseases, metabolic syndrome. Due to prolong life expectancy, age related diseases have increased in recent

decades.[1] The literature review indicates lifestyle factors which have impact on the people aging. Three lifestyle factors play a significant role in slowing the rate of cognitive decline and preventing dementia, they are socially integrated network, cognitive leisure activity and regular physical activity.[2]

The proportion of the world population aged 60 and older is increasing rapidly. Within 35 years, it will have spiralled from 12% in 2015 to 22% in 2050. India has 112 million elderly people with multiple physical, social, psychological and economic problems with unmet needs in all domains of health. The incidence of the physical and psychological domain, of geriatrics in Indian population is as follows. 3.7 million suffer dementia, 40 million suffer from poor vision, 1.6 million annual stroke cases, 1 in 3 suffer from arthritis, 1 in 3 have hypertension, 1 in 5 suffer from diabetes, 1 in 5 has auditory problems, 1 in 4 suffer from depression, 1 in 10 fall and sustains fractures, 1 in 3 bowel disorders, Cancer is 10 times more common.

In addition, we have data to show that Indian elderly face several social issues such as loneliness, elder abuse, and neglect, lack of income, security, and poor access to health care. Because of these issues, geriatric individuals have physical, psychological issues leading to poor quality of health.[3]

Physical activity is most supportive against the deleterious effects of age on health and cognition. Broadly defined, physical activity refers to activity that is part of one's daily life involving bodily movement and the use of skeletal muscles. Physical exercises the category of physical activity that is planned, structured and purposive movements to improve specific physical skills or physical fitness. Evidence suggests that physical activity and exercise can lower the risk of adverse outcomes associated with increasing age. If they are maintained throughout life, it is associated with lower incidence and prevalence of chronic disease such as cancer, diabetes and cardiovascular coronary heart disease.[4,5] Recent studies suggest that physical exercise also protects against dementia.[6]

Several studies have been carried out on geriatrics and physical therapy. Adoption of regular walking, aerobic exercises, swimming, gardening etc has been implemented for geriatric population, it is found to be effective. But limitation of these studies is that, 30% of the populations are unable to continue the regular physical activity due to musculoskeletal deformities, social constraints and lack of availability of facilities also plays a major role on physical health status of geriatrics.

Chair exercises can help the geriatrics to enhance the physical activities especially individuals with muscle strength and trunk balance. Apart from chair exercises individual based physical activity can be adopted. Effectiveness of the structured chair aerobic exercises can be measured using physical activity score, cognitive functions using MMSE, social network using oxford happiness questionnaire and quality of life using SF36 questionnaire in geriatric population.

Hence, it is proposed to study the influence of chair aerobic exercises on cognitive function, physical activity and quality of life in geriatric population in tertiary care centre in Tirupati. Till now the various studies have been carried out to find out the influence of different types of exercises on geriatrics, it has revealed that enhancing physical activity alleviates quality of life.

NEED OF THE STUDY

A number of studies have been carried out (worldwide) to find out the relationship between physical activity and cognitive functions of the brain in geriatric population.

However, very few studies have been carried out in Indian population correlating physical parameters and cognitive functions of the brain. Hence, there is a need for this study, which will look at the relationship between aerobic chair exercises with brain function in Indian geriatric population.

AIM OF THE STUDY

To find out the influence of chair exercises on physical activity, cognitive functions, social network and quality of life in geriatric individuals.

OBJECTIVES OF THE STUDY

- To find out the effect of chair aerobic exercises on physical activity in geriatrics using international physical activity questionnaire.
- To find out the effect of chair aerobic exercises on cognitive functions in geriatrics using mini mental state examination.
- To find out the effect of chair aerobic exercises on social network in geriatrics using oxford happiness questionnaire.
- To find out the effect of chair aerobic exercises on quality of life in geriatrics using sf36 questionnaire.

STUDY DESIGN: pre and post comparison design,

ETHICAL COMMITTEE APROVAL: ethical approval was obtained from the **INSTITUTIONAL ETHICS COMMITTEE OF SVIMS UNIVERSITY,** with **IEC NO:910.**

STUDY CENTER: The study was conducted in tertiary care centers in Tirupati, Andhra Pradesh.

STUDY SUBJECTS: Age 60 years above, Both genders (male and female), Mild and Moderate disability (as determined by world health organization Disability assessment schedule 2.0).

SAMPLING METHOD: In a total of sixty samples, who met the inclusive criteria were taken up for the study. Samples were selected through focus group method technique.

STUDY DURATION: 3 months from December 2018 to February 2019.

SAMPLE SIZE CALCULATION: Effect = Average change in QOL due to intervention

Standard deviation of change

- This is called Cohan's d.
- Taking d = 0.5, power = 80%, alpha = 0.05 and using one tiled test.

SAMPLE SIZE: sixty samples.

SUBJECTS CONSENT: All the subjects were screened for inclusion and exclusion criteria. The subjects who met inclusion criteria had an initial consultation, the purpose of the study was explained to the subjects and those who accepted to participate in the study were asked to read a patient information sheet and sign in informed consent form.

INCLUSION CRITERIA:

- Age 60 years above.
- Both genders (male and female).
- Mild and Moderate disability (as determined by world health organization Disability assessment schedule 2.0).

EXCLUSION CRITERIA:

- Major neurological problems (stroke, Parkinson disease).
- History of cardiovascular disease (Coronary artery disease, Heart attack, Abnormal heart rhythms, Heart failure, Peri cardiac disease, vascular disease).
- Severe musculoskeletal disorders.
- Acute medical conditions

  (Asthma attack, Recent fractures, Bronchitis, Pneumonia, Burns).
- Age < 60 years.

MATERIALS AND METHODOLOGY:

MATERIALS: The materials used in the study are as follows:

- Mini mental state examination scale to assess the cognitive function in geriatric population.
- International physical activity questionnaire to assess the physical activity in geriatric population.
- SF 36 questionnaire to assess the quality of life in geriatric population.
- Oxford happiness questionnaire to assess the social network in geriatric population.
- Chairs.
- A pamphlet for exercise prescription.

METHODOLOGY

- **ASESSMENT:**

  All these samples were examined for cognitive function, physical activity, quality of life and social network before starting the intervention programme and exercise protocol is advised as mentioned in the table number.1 for 8 weeks and reassessed after 8 weeks of intervention with the above mentioned parameter.

- **OUTCOMES MEASURES:**
  - Physical activity is measured using international physical activity questionnaire.[7,8,13]
  - Cognitive function is measured using mini mental state examination (MMSE).[11,12,13,17,18]
  - Social network is measured using oxford happiness questionnaire.[9,10]
  - Quality of life is measured using sf36 questionnaire.[14,15,16,17]
- **INTERVENTION:**
  - Stretching's 5 minutes.
  - Chair aerobic exercise 30-45 min / day, 4 days a week, 8 weeks.
  - Chair aerobic exercise includes.[19]
  - Alternate heel digs with bilateral biceps curl 8 repetitions once a day.
  - V- Step with bilateral hammer curls 8 repetitions once a day.
  - Lateral step touch with bilateral biceps curls 8 repetitions once a day.
  - Knee lift 8 repetitions once a day.
  - Arm swings 8 repetitions once a day.
  - Clap swing 8 repetitions once a day.
  - Sit, stand and clap 8 repetitions once a day.

TABLE NO.1: EXERCISE PROTOCOL:-

	Warm up	Chair aerobic exercises
Week 1	5 min	25min
Week 2	5 min	30 min
Week 3	5 min	35 min
Week 4	5 min	40 min
Week 5	5 min	40 min
Week 6	5 min	40 min
Week 7	5 min	40 min
Week 8	5 min	40 min

Complete the protocol with relaxed positions.

RESULTS

TABLE 2: ANALYSIS OF PRE AND POST THERAPEUTIC VALUES OF COGNITIVE FUNCTION IN GERIATRIC POPULATION.

Parameters		N	Mean ± STDEV	t- value	Df	p- value
Cognitive function	Pre	60	21.83 ± 1.36	7.352	47	0.00
	Post	60	1.59			

Results: pre and post mean and std. deviation values mini mental state examination score are 21.83 ± 1.36 and 22.95 ± 1.59 which shows significant increase in post therapeutic values.

FIG.1: GRAPHICAL REPRESENTATION OF PRE AND POST THERAPEUTIC VALUES OF COGNITIVE FUNCTION IN GERIATRIC POPULATION.

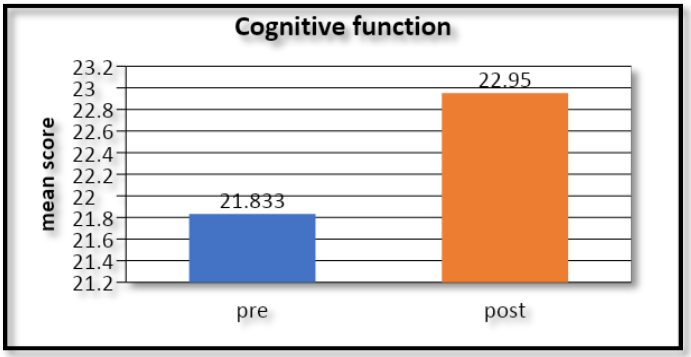


TABLE 3: ANALYSIS OF PRE AND POST THERAPEUTIC VALUES OF PHYSICAL ACTIVITY IN GERIATRIC POPULATION

Parameters		N	Mean ± STDEV	t- value	Df	p- value
Physical activity	Pre	60	595.93 ± 229.85	8.170	2574.2	0.00
	Post	60	659.54 ± 246.88			

Results: pre and post mean and std. deviation values international physical activity questionnaire are 595.93 ± 229.85 and 659.54 ± 246.88 which shows significant increase in post therapeutic values.

FIG.2: GRAPHICAL REPRESENTATION OF PRE AND POST THERAPEUTIC VALUES OF PHYSICAL ACTIVITY IN GERIATRIC POPULATION.

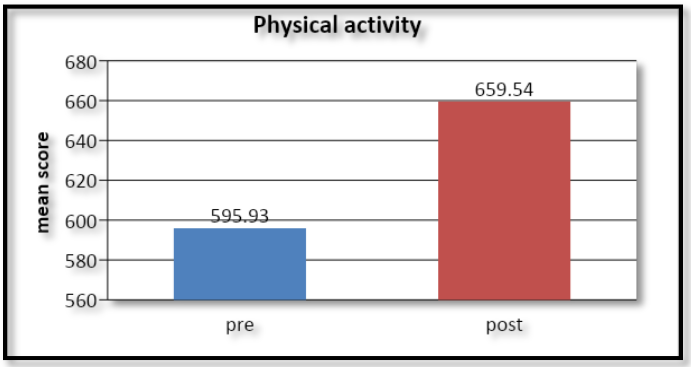


TABLE 4: ANALYSIS OF PRE AND POST THERAPEUTIC VALUES OF QUALITY OF LIFE IN GERIATRIC POPULATION.

Domains	PRE-TEST VALUE		POST-TEST VALUE		Df	t- value	p-value
	Mean	Mean±STDEV	Mean	Mean±STDEV			
PF	58.08333	58.08±7.59	70.41667	70.41±10.66	740	15.39042	0.00
PH	35	35±20.68	58.33333	58.33±20.92	1400	28.74022	0.00
EP	37.21167	37.21±21.35	70.58667	70.58±21.34	2002.5	1803.358	0.00
E/F	36.75	36.75±6.299	46.5	46.5±4.044	585	16.95046	0.00
EW	47.7	47.7±6.22	56.66667	56.66±6.79	538	17.4014	0.00
SF	42.29167	42.29±16.12	57.5	57.5±14.95	912.5	20.73911	0.00
PAIN	71.125	71.12±11.59	82.875	82.87±11.38	705	16.12891	0.00
GH	59.1	59.1±9.015	67.86667	67.86±8.45	526	16.77578	0.00
HC	42.5	42.5±5.47	66.66667	66.66±15.032	1450	29	0.00

Results: pre and post mean and std. deviation values SF-36 questionnaire are given in above table no.4, which shows significant increase in post therapeutic values.

FIG.3: GRAPHICAL REPRESENTATION OF PRE AND POST THERAPEUTIC VALUES OF QUALITY OF LIFE IN GERIATRIC POPULATION.

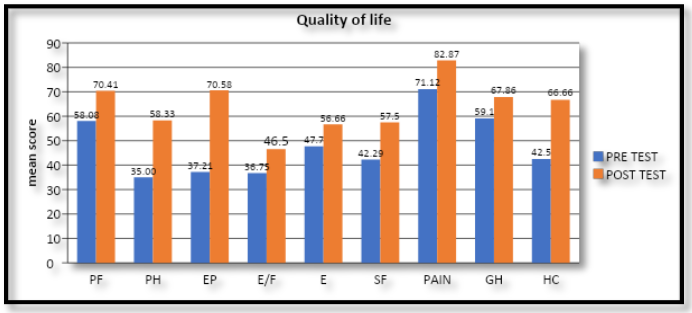
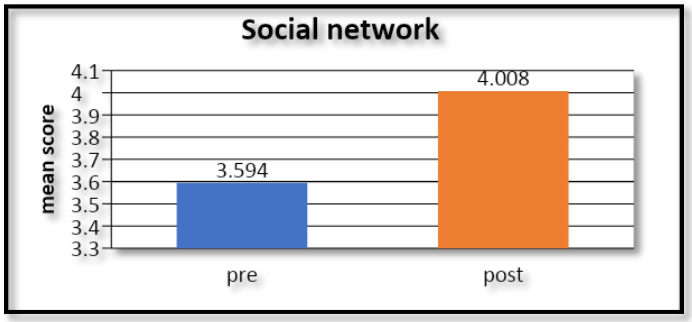


TABLE 5: ANALYSIS OF PRE AND POST THERAPEUTIC VALUES OF SOCIAL NETWORK IN GERIATRIC POPULATION.

Parameters		N	Mean ± STDEV	t- value	Df	p- value
Social network	Pre	60	3.59 ± 0.41	6.407	16.132	0.00
	Post	60	4 ± 0.68			

Results: pre and post mean and std. deviation values oxford happiness questionnaire are 3.59 ± 0.41 and 4 ± 0.68 which shows significant increase in post therapeutic values.

FIG.4: GRAPHICAL REPRESENTATION OF PRE AND POST THERAPEUTIC VALUES OF SOCIAL NETWORK IN GERIATRIC POPULATION.



There was a significant differences between pre and post therapeutic values of social network in geriatric population.

DISCUSSION

- The present study is carried out to study the efficacy of chair aerobic exercises on cognitive functions, physical activity and quality of life in geriatric population in a tertiary care center in Tirupati. Total numbers of subjects are 60, they

were selected by using focus group method, structured exercise protocol were administered for 8 weeks.

- The results of the present study show that there is a statistically significant improvement in quality of life and improvement in physical activity.
- Simultaneously the cognitive function and social network has improved through chair aerobic exercises.
- According to the data analysis, a significant difference was found between the pre and post-test values of physical activity, quality of life, cognitive function and social network in geriatrics ($p < 0.00$).
- The first aim of the study was to assess the effects of chair aerobic exercises on physical activity in geriatric population. The result of the present study is statistically significant, in enhancing the physical activity.
- Chair aerobic exercises does not require any special equipment's or places. In addition, it is easy for the elderly patients to understand and perform at home. It is found that chair aerobic exercises would be one of the practical choices when exercise training is implemented among elderly.
- Aerobic exercises are a low intensity exercise, which causes the increase of glycogen stores. The skeletal muscles of older adults increase in capillary derivative mitochondrial enzyme levels and ability of muscle to extract oxygen from blood, along with this peripheral adaptation occurs which enhances the muscle capacity to do the activity[20].
- The second aim of the study was to assess the effects of chair aerobic exercises on quality of life, cognitive functions, social network in geriatric populations.
- Physical activity is the key to quality of life and as associated with physiological and psychological health benefits. In healthy population exercise is a stress controlling factor assists in improving QOL by decreasing the depression, anxiety and psychological wellbeing.[21]
- **LULIIA PAVLOVA ET AL (2014),** find out the relation between life quality and physical activity level of older people. Strong correlation coefficients were found for physical activity and SF-36 scales.
- The intense physical activity was not a prerequisite for optimal health and well-being of older people. Instead, daily activities- walking, lifting up the stairs, farm work and house work can improve the life quality of older people.
- QOL improves because of constant, positive emotional orientation, determination of optimal power of work, versatility.
- Cognitive impairment was defined based on the description of the population or by using the MMSE scores (cut off point of 23/30).
- Chair aerobic exercise may enhance cognition indirectly by improving health conditions (stress, sleep) and reducing chronic diseases (coronary heart diseases) that impact neurocognitive functions.
- Increased aerobic fitness increases oxygen extraction, glucose utilisation and cerebral blood flow (Churchill 2002). Cerebral blood flow meets metabolic needs of the brain and removes waste (Lojovich 2010). Increased aerobic fitness also increases Brain-Derived Neurotrophic Fac- tor (BDNF) and other growth factors which mediate structural changes (Cotman 2002; Cotman 2007). For example, BDNF is implicated in neurogenesis, synaptogenesis, dendritic branching and neuroprotection (Lojovich 2010). Improvements in cardiovascular (aerobic) fitness mediate the benefits of physical activity on cognitive capacity (Etnier 2007; McAuley 2004).
- **LANGLOIS ET AL,** recently observed that three months of training in frail older adults resulted in significant improvement in both physical capacity and cognitive performance (executive functions, processing speed, and working memory) as well as quality of life associated with leisure activities and satisfaction with physical capacity.
- **SOFI ET AL.** observed that physical activity significantly and consistently prevented cognitive decline. Individuals who were highly physically active showed 38% less risk of cognitive decline, and those who did low-to-moderate level exercise also showed a significantly 35% reduced risk.
- **JINGWEN ZHANG** an author says "we were able to use the positive signals to form a reinforcing loop that pushed everyone to exercise more". According to this study four independent measures (physical activity, quality of life, cognitive function and social network) had a strong response to the effects of 8 weeks structured exercise protocol on physical activity, quality of life, cognitive functions, and social network in geriatric populations.
- Loss of social interaction and isolation leads to stress decreased, QOL while good social network gives strength, self-confidence.[22]

CONCLUSION

In this study the physical activity, quality of life, cognitive function and social network improved significantly in post-test values of geriatric population by using chair aerobic exercises. Clinically and statistically relevant

improvements were observed in chair aerobic exercises.

Hence, it is concluded that chair aerobic exercises are effective in increasing in the physical activity, and enhancing the quality of life, and improving the cognitive functions, and social network in geriatric populations.

The present study proves the alternate hypothesis that chair aerobic exercises is effective in increasing in the physical activity, enhancing the quality of life, improving the cognitive functions, and social network in geriatric populations.

LIMITATIONS

- Gender specificity is not mentioned in this study
- Study duration is less for cognitive function and social network in geriatric population.

RECOMMENDATIONS

- The future study is recommended for more than twelve weeks duration for better results in cognitive function and social network.
- The future study is recommended for spinal cord injuries subjects
- The future study is recommended in gender wise geriatric population.

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