

# Yoga intervention for arresting cognitive impairment and promoting mental health and physical fitness: A study of institutionalised seniors.

Shah Eshva Nishitkumar

Ahmedabad University

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## Abstract

Dementia prevalence is reported to be 7.4 per cent in the population above 60 years in India, most recently. Cognitive impairment is a known precursor to Dementia. The present research aims to study the effects of yoga training on cognitive functioning, physical fitness and mental health of Institutionalized Seniors with Mild Cognitive Impairment (SWMCI) in Ahmedabad, Gujarat. It used a pre-post experimental design with a waitlist control group. This study hypothesized that the experimental group's pre-post difference score would vary significantly from the control group on (a) cognitive impairment, (b). Depression, (c) Anxiety, (d) Stress, (e) Physical fitness. Seniors from senior living homes in Ahmedabad were recruited with permission from the management. Mini-Mental State Examination was used to identify seniors with only mild cognitive impairment. Identified seniors were randomly allocated to experimental (n=45) and control (n=43) groups after checking for their willingness to participate in the study and taking informed consent. A standardized chair yoga module, adopted with the recommendation of a doctor who is a yoga expert, was delivered for 12 weeks (2 days a week, one hour a day). An independent sample t-test between the pre-post difference scores of the experimental and control group reported a significant difference. The experimental group reported better cognitive functioning, better mental health and improved physical functioning than the waitlisted control. The findings have implications for developing a low- cost, sustainable, non-invasive intervention consisting of yoga training to arrest the progression of cognitive impairment to prevent Dementia and promote physical and mental health.

**Key words:** yoga training, mild cognitive impairment, depression, anxiety, stress, physical, fitness, institutionalized seniors.

## Introduction

Globally, in 2020 there were 1 billion people aged above 60 years. By 2030 the senior population aged above 60 is expected to reach 1.3 billion people (WHO, 2022). The senior population aged above 60 years is expected to double (2.1 billion) by 2050 (WHO, 2022). Based on the reports published by (WHO, 2023), there are more than 50 million who have dementia worldwide. In the World Alzheimer Report 2022 approximately,

there is 60 per cent of people living with dementia in lower-middle-income countries. By 2050 the expected number of people getting affected by dementia will be 138 million people. Every year there are more than 10 million new cases. According to (WHO, 2023) dementia is considered the seventh leading cause of death worldwide, and also a major cause of dependency and disability among seniors globally. Whereas in India, based on the report published by the Population

Census in 2011, there were approximately 104 million seniors people. The senior citizen population is expected to increase to 173 million people by 2026 (National Population Commission, 2011). While some seniors continue to participate in a variety of activities, the majority do not (Kar, 2023). The seniors are forced to live an institutional existence of loneliness, subpar medical care, financial instability, and emotional estrangement from other family members (Rajeev & Ajikumar, 2015). Health screening for seniors is inadequate and frequently overlooked (Kar et al., 2016). The cost of care in both government hospitals and private set up is challenging for rural populations. An alarming challenge is reported by seniors on how they are abused by their family members. Most nursing homes for seniors are of poor quality and provide inadequate care. Most people cannot afford the high expense of well-maintained senior housing (Kar, 2023).

Dementia is referred to as Major Neurocognitive Disorder in DSM V. According to the DSM V dementia is characterised by the “evidence of significant cognitive decline from a previous level of performance in one or more cognitive domains (complex attention, executive function, learning, memory, language, perceptual-motor, or social cognition)”. Mild cognitive impairment is referred to as Mild Neurocognitive Disorder (MiND) in DSM V. DSM V defines MiND as “evidence of modest cognitive decline from a previous level of performance in one or more cognitive domains (complex attention, executive function, learning, memory, language, perceptual-motor, or social cognition)”. These individuals who are diagnosed with MCI have a high possibility of developing dementia and thus require monitoring and identification (Kelley & Petersen, 2007). Globally the prevalence rate of MCI is approximately between 3 to 42 per cent (Ward et al., 2012). Studies published in India have reported a prevalence rate of MCI between

15 to 33 per cent (Das et al., 2007; Sosa et al., 2012; Swarnalatha, 2007). This implies that if the advancement of MCI can be arrested in Seniors, it will be helpful to prevent the onset of Dementia in them.

The prevalence rate of dementia in 2023 is 7.4 per cent in India (Yao et al. 2023). Choudhary et al. (2021) asserted that there are approximately 20 dementia cases reported for every 1000 people in India. Dementia affected older persons more frequently in rural areas than in urban areas (Choudhary et al., 2021). Saldanha et al. (2010) in their study based on Western India concluded that poor knowledge and awareness related to dementia, ageing, genetic factors, and poor socioeconomic status are primarily the major contributing risk factors of dementia. Whereas a study conducted by Chandra et al. (1998) in North India mentioned that nutritional deficiency and infectious disease were the major factors of dementia. Shaji et al. (1996) conducted a study in South India, their results indicate the contribution of family history, smoking and hypertension as the risk factors. A collective study conducted in Eastern India by Das et al. (2007) claims that smoking, hypertension, diabetes mellitus and chewing tobacco were the major risk factors. Preventing the onset of the disease, eliminating the disease, postponing the onset, and controlling the symptoms could be considered the primary objectives of intervention of dementia. Secondary prevention focuses on detecting before the emergence of overt dementia. This early identification of the disease would be beneficial to the person and their family, it will aid in stopping the disease, establish control over the progression of the disease, control the risk factors and also prepare the family members for the potential consequences of the decline in cognitive abilities (Sathianathan & Kantipudi, 2018). The current study's objective is to go for secondary prevention for institutionalized seniors.

According to the American Psychological Association (VandenBos, 2007),

depression can be defined as “the experience of negative affective state, ranging from unhappiness and discontent to an extreme feeling of sadness, pessimism, and despondency, that interferes with daily life.” There is an increased amount of literature suggesting an association between depression and dementia (Byers & Yaffe, 2011). According to Cummings (1989) depression and dementia have several relationships - dementia can be caused by depression, the causes of dementia and depression can be prevalent in similar conditions, and depression could also occur as a response to the onset of cognitive impairment. The similarity in the symptoms of major depressive disorder and dementing illness could lead to misdiagnosis from the clinician’s point of view.

Yoga is considered a mind-body practice that has ancient Indian roots. The National Centre for Complementary and Integrative Health claims that yoga is identified as a complementary health approach (Brenes et al., 2019). Yoga aids in self-managing emotional, physical and social challenges (Venkatesh et al. 2020). Yoga incorporates various postures (asanas), meditation techniques and breathing exercises (Pranayama) (Hariprasad et al., 2013). Yoga intervention is reported to provide promising results (Devore et al. 2023). Chair yoga (CY) is a type of yoga in which breathing exercises and modified postures are practised while seated or supported by a chair. Results from two intervention studies have demonstrated that CY therapy can improve life satisfaction and decrease pain and depression in older persons. For seniors with dementia, chair yoga poses are a secure, non-pharmacological, non-invasive, and low-impact intervention (Park et al., 2022). Research studies have claimed that yoga training has a profound impact on reducing depression, anxiety and stress for seniors. Seniors’ attention, executive function, and depression among other cognitive parameters are all positively impacted by yoga-based

therapies. Factors that improve the cognitive functions of people with dementia are physical fitness, nutrition, cognitive training, and social interventions (Bangalore & Varambally., 2012; Ballesteros et al., 2015).

In a low-middle-income country like India, it is better to prevent dementia than try to treat it. The project senior population is 173 million in 2026 (Agarwal, 2012; Vaishnav et al., 2022). India by 2001 surpassed the proportion of the estimated senior population from 7.47 per cent to 12.6 per cent in 2025. Thus, there is a drastic change in the Indian ageing population (Chakrabarti & Sarkar, 2011). In India, the overall population comprises 7.7 per cent of the total senior population. Every two-thirds of the seniors live in villages with socioeconomically poor status (Lena et al. 2009). This makes it over 70 per cent of the geriatric population living in rural areas in India (Vaishnav et al., 2022). The research conducted by Brenes et al. (2019) published a paper identifying the lack of available literature on the impact of yoga on the cognitive functioning of seniors with MCI and dementia. Moreover, there is a need to implement models that are continuous, integrated and holistic of healthcare for people living with dementia (Nulkar et al., 2019). Yoga-based training would be a cost-effective intervention for low-and-middle countries like India. Thus, this study examines the effect of yoga training on cognitive functioning, and physical fitness of institutionalized seniors with mild cognitive impairment aged 65 years and above in Ahmedabad, Gujarat, India. The study hypothesizes that there will be a significant difference between the experimental group and the control group in terms of mild cognitive impairment, well-being and physical fitness. For this study, local institutionalized places were selected. In Ahmedabad, Gujarat, India there are many senior care homes, particularly this research was able to finalize three institutes that had

participants willing to engage in the research.

## **Methodology**

### ***Study design***

A pre-post experimental control design is used for the research. Using exclusion and inclusion criteria, the participants of the study were recruited from old age homes.

### ***Sample/ Participants***

The study population comprised seniors staying in old age homes in the Ahmedabad city of Gujarat, who fulfilled the inclusion and exclusion criteria.

### ***Inclusion and exclusion criteria***

The inclusion criteria for this study are the following: the study included participants diagnosed with mild cognitive impairment. Senior participants living in institutions (nursing homes, NGOs, foster care) aged more than 65 years were included in the study. The following are the exclusion criteria of this study: participants diagnosed with Moderate to severe dementia were not selected. Senior participants were diagnosed with depression, psychopathology, chronic disease, alcohol dependence, Down Syndrome, brain injury, Huntington's disease, Parkinson's disease, and stroke. seniors living in retirement homes, assisted living, rehabilitation care, and palliative care, respite care are not a part of the study population.

A total of 102 participants were able to complete the pre-test phase questionnaire. The 88 participants were randomly added to the experimental group (n=45) and control group (n=43). A total of 8 participants were not considered because they did not have low MCI. A total of 44 females out of 94 (46.8 per cent) total participants were able to engage. Whereas, a total of 50 males out of 94 (53.2 per cent) participants were able to engage. The close to the equal ratio between male and female participants can be considered a potential strength for the comparison of data for this research. There is a larger group of participants aged between 65-70 years and 71 - 75 years. 30.9 per cent of

participants were between the ages of 71 - 75 years. 14.9 per cent of participants were between the ages of 76 - 80 years. 6.4 per cent of participants between the ages 81 - 85 years and 3.2 per cent of participants who are aged more than 86 years. In total 92.6 per cent of the participants have completed their school education. Whereas 3.2 per cent of the participants have completed undergraduate and postgraduate. 92.6 per cent of the participants are from lower socioeconomic status. Whereas 7.4 per cent of the participants are from a higher socioeconomic status.

### ***Tools/ Measures***

The following tools were included in the questionnaire. Mini mental state examination (MMSE), Depression Stress and anxiety scale (DASS) and Physical Fitness: 30 Second Chair Stand, 30 sec Arm Curl, 2 Minute Step Test, Back Scratch, 8 Foot Up and Go, Chair sit and reach. Mini Mental State Examination is a tool developed by Folstein et al. (1983). The Mini Mental State Examination (MMSE): it is a widely used screening tool for cognitive impairment (Molloy & Standish, 1997) MMSE is considered a global measure of cognitive abilities. It is considered a widely accepted testing tool because the test covers a wide range of cognitive domains like long-term memory, short-term memory, orientation to time and space, constructional ability, registration, recall, language, ability to follow commands and understand instructions (Molloy & Standish, 1997). The tool is used to diagnose an individual whether the person suffers from Mild Cognitive Impairment (MCI). The MMSE consists of 11 questions which take around 10 minutes to complete thus it is considered a practical and simple tool. It is called mini because it does not include the category of mood, abnormal experiences and thinking. It specifically focuses on the cognitive aspect of mental functions (Folstein et al., 1983). According to Bernard and Goldman (2010), MMSE shows a moderate-high level of reliability.

It has also been reported with moderate construct validity because it is correlated with other dementia screening exams.

The Depression Anxiety Stress Scale is developed by Lovibond and Lovibond (1995). DASS-21 is a self-report assessment tool that aims to measure emotional states of anxiety, stress and depression. DASS-21 is a shorter version of DASS-41 (Marijanovic' et al., 2021). The main objective of DASS is to assess the severity of the symptoms of anxiety, stress and depression (Henry & Crawford, 2005). DASS-21 is scored based on a 4-point scale. The total score for stress, anxiety and depression is to be scored by summing the points of the respective items. Depression, stress and anxiety each have 7 items. High scores are indicative of distress in the testee, however, a low score is not necessarily substantial for the clinical interview (Henry & Crawford, 2005). The highest score a participant can receive in DASS-21 is 63. The main advantage of using DASS-21 is primarily because of the smaller number of items, as this would aid in administering perhaps in 10-15 minutes for the testee (Oei et al., 2013). DASS also demonstrated adequate discriminant and convergent validity (Henry & Crawford, 2005). Reliability is also established with the use of Cronbach's alpha (Henry & Crawford, 2005).

**Physical Fitness Test:** The Physical fitness tests helps in assessing and providing feedback to help improve functional mobility and delay physical frailty in seniors (Jones & Rikli, 2002). The tests are based on the following parameters: muscle endurance/strength, flexibility, aerobic endurance, motor ability, and body composition. 30 Second Chair Stand, 30 sec Arm Curl, 2 Minute Step Test, Back Scratch, 8 Foot Up and Go, Chair sit and reach are the tests proposed by (Jones & Rikli, 2002). The proposed tests measure the participants' ability to perform daily activities like walking, standing up, and stair climbing. The physical fitness tests proposed by Jones and Rikli (2002) have

good interrater and intratester reliability and good validity as well.

### ***Procedure – Yoga training and assessment***

A list of potential senior care homes was curated particularly in Ahmedabad, Gujarat, India. The project debrief was shared with the management team of the senior care homes considering the study population to be included in the research. Three senior care institutes were approved to participate in the research project. Before starting with the pre-test phase, the participants were debriefed about the purpose of this research and the ethical considerations were also shared. Only after receiving their informed consent in written form, the research was conducted. The pre-test phase included the following questionnaires MMSE (MCI), DASS, 30 Second Chair Stand, Arm Curl, 2 Minute Step Test, Chair Sit and Stand, Back Scratch, 8 Foot Up and Go (physical fitness). A total of 88 participants were able to engage in the research. Once the consent of the participants was received the pre-test phase was initiated. It was important to ensure that the participants only shared their responses to the questionnaire if they were clear with the instructions and their doubts (if any) were cleared. The questionnaire was translated and back-translated to establish transliterational equivalence. The researcher read the questions to the participants, and in case of problems in understanding, explained the question in comfortable language. MMSE was used to diagnose the participants for MCI. Based on the results, only participants with low MCI were selected. The primary reason to select participants with low MCI is that MCI is an indication of the stage between normal ageing and expected decline in cognitive functions and serious decline of dementia. A minimum total score between 19 to 23 was needed for the participants to meet the study requirement. All the participants who scored within this range were randomly allocated to experimental and

waitlist control groups using Microsoft Excel.

The intervention phase began once the randomized groups are formed. Methodologically, this phase is very crucial and high maintenance and safety precautions are required to be followed. A weekly schedule for the three institutions with two hours of intervention a week was prepared. The yoga intervention module was validated by yoga experts and doctors from the Sir Sayajirao Institute of Research in Yoga, Ayurveda, Naturopathy, Music, and Allied Sciences from Vadodara. The intervention was provided to the participants through YouTube videos, carefully selected and validated by these experts to demonstrate the various asanas and pranayamas. For the intervention phase, the first 6 weeks would be when the experimental group will be trained for the yoga module two days every week. The influence of specific postures/exercises was taken from available valid literature. During the training yoga, videos were recorded (for this permission and consent were taken during the consent form itself). The nearby hospitals were available in case of emergency. Attendance was also taken for all the participants present during the sessions. Once the 6 weeks of training for the experimental group is completed the post-test phase will be initiated. During these 6 weeks of intervention time, the

waitlist control group continued with their respective daily schedule. The post-test phase was initiated and the data was recorded.

### ***Ethical approval***

The ethical approval for this research study was received from Ahmedabad University's ethical review committee. All three institutes had nearby hospitals in case of any emergency. The management team also had the number of doctors available again in case of any emergency.

### ***The Intervention Module***

The yoga intervention module includes the following exercise categories: om chanting, prayer, Sukshma kriya, Pranayama, flexibility exercises (chair yoga poses), deep breathing exercises, mindfulness and relaxation exercises. The table 1 and 2 below present the yoga exercises that were taught to the participants of the experimental group. The exercises were equally divided in terms of the above-mentioned categories. The module on both days was taught for an hour every week. Yoga practitioners and experts have verified the modules and the YouTube video links that were used to teach the module. A feedback session was also initiated after the completion of the module each day. The purpose of the feedback session was to ensure that any possible injuries were reported and taken care of.

Table 1. Represents the yoga training module for Day 1.

Sr no.	Yoga	Details	Set	Time
1	Om chanting	-	More than 10 times	10 mins
2	Prayer	-	2-3	7 mins
3	Head stretching	Up and down	5-7 times and hold	5-7 mins
4	Head stretching	Left and right	5-7 times and hold	5-7 mins
5	Head stretching	Side	5-7 times and hold	5-7 mins
6	Neck stretching	Side	5-7 times and hold	5-7 mins
7	Neck stretching	Circular and reverse	5-7 times and hold	5-7 mins
8	Shoulder stretching	Up and down	5-7 times and hold	5-7 mins
9	Shoulder stretching	Circular and reverse	5-7 times and hold	5-7 mins
10	Hand stretching	Side	5-7 times and hold	5-7 mins
11	Hand stretching	Up and down	5-7 times and hold	5-7 mins
12	Hand stretching	Circular and reverse	5-7 times and hold	5-7 mins
13	Wrist stretching	Up and down	5-7 times and hold	5-7 mins
14	Wrist stretching	Circular and reverse	5-7 times and hold	5-7 mins
15	Loosening fingers	Open and close	5-7 times and hold	5-7 mins
16	Ankle stretching	up and down	5-7 times and hold	5-7 mins
17	Ankle stretching	Circular and reverse	5-7 times and hold	5-7 mins
18	Ankle stretching	Finger open and close	5-7 times and hold	5-7 mins
19	Tadasana	-	5-7 times and hold	5-7 mins
20	Deep breathing	-	5-7 times and hold	7-9 mins
21	Anuloma Viloma	-	5-7 times and hold	7-9 mins
22	Bhastrika Pranayama	-	5-7 times and hold	7-9 mins
23	Bhramari Pranayama	-	5-7 times and hold	7-9 mins
24	Om chanting	-	More than 10 times	10 mins
25	Prayer	-	2-3	7 mins

Sr no.	Yoga	Details	Set	Time
1	Om chanting	-	More than 10 times	10 mins
2	Prayer	-	2-3	7 mins
3	All stretching	Up and down	5 times and hold	10-12 mins
4	Remind about exercises	-	-	5-7 mins
5	Forward bending	-	5-7 times and hold	5-7 mins
6	Backward bending	Side	5-7 times and hold	5-7 mins
7	Side bending	-	5-7 times and hold	5-7 mins
8	Twisting	Standing and sitting	5-7 times and hold	5-7 mins
9	Instant relaxation exercises	Deep breathing	5-7 times and hold	5-7 mins
10	Heel stretching	Up and down	5-7 times and hold	5-7 mins
11	Ardh - Kati chakrasana	-	5-7 times and hold	5-7 mins
12	Marijari asana	Seated	5-7 times and hold	5-7 mins
13	Standing relaxation pose	Deep breathing	5-7 times and hold	5-7 mins
14	Mindfulness	Walk around	5 rounds of walk and hold	5-7 mins
15	Mindfulness - sense activity	All senses	once and hold	5-7 mins
16	Deep breathing	-	5-7 times	7-9 mins
17	Anuloma viloma	-	5-7 times	7-9 mins
18	Kapalbhati	abdominal breathing	5-7 times	7-9 mins
19	Vibhagiya Pranayama	3 stages	5-7 times	7-9 mins
20	Om chanting	-	More than 10 times	10 mins
21	Prayer	-	2-3	7 mins

Table 2. Represents the yoga training module for Day 2.

### Statistical analysis

The data collected were coded using the manual of the assessment tools and tests. The data was cleaned using SPSS. Using IBM-SPSS license an independent sample t-test was carried out between two sets of difference scores from the experimental and control group. To the institution, descriptive and inferential statistics were calculated. A difference score between the post and pre-intervention data was calculated for both experimental and

control groups. To find out whether the intervention to the experimental group has brought in a significant change in the post-test score.

### Results

The mean, and standard deviation of the pre-intervention and post-intervention scores for the experimental and control groups, along with the results of the independent sample t-test between the d scores of both groups are presented in Table 3.

**Table 3:** The Mean difference test between the post-pre-intervention difference score of the experimental and control group.

Group	Experimental group			Control group			
	Pre Mean (Std. dev)	Post Mean (Std. dev)	d mean	Pre Mean (Std. dev)	Post Mean (Std. dev)	d mean	t
MMSE	22.06 (1.21)	25.31 (1.83)	3.24	22.07 (1.21)	23 (1.83)	0.93	4.37**
DASS Stress	10.84 (8.01)	7.33 (3.61)	-3.51	9.88 (4.96)	11.27 (3.61)	1.40	-4.96**
DASS Depression	9.49 (3.18)	6.68 (3.16)	-2.80	8.93 (3.18)	11.16 (3.16)	2.23	-6.70**
DASS Anxiety	10.68 (4.01)	7.3 (2.72)	-3.33	10.04 (4.01)	11.39 (2.96)	1.35	-5.42**
Chair stand	10.64 (4.18)	13.71 (3.71)	3.07	11.16 (4.18)	11.39 (3.88)	0.23	4.15**
Arm curl	13.08 (3.28)	16.06 (3.57)	2.98	13.53 (3.28)	12 (3.33)	-1.53	7.16**
2 min step	64.91 (11.54)	70.57 (14.22)	5.67	70 (11.54)	64.44 (11.50)	-5.56	6.17**
Chair sit and reach	3.37 (3.62)	1.62 (1.63)	-1.76	2.46 (3.62)	2.97 (1.34)	0.51	-4.40**
Back scratch	9.63 (3.64)	7.37 (3.87)	-2.26	7.97 (3.64)	9.23 (2.99)	1.26	-6.07**
8 foot up and go	2.02 (1.42)	1.31 (1.52)	-0.71	1.72 (1.42)	3.20 (1.02)	1.49	-7.42**

Equal variance assumed.

As presented in Table 3, there is a significant difference in the pre-post test difference scores of the experimental and waitlist control

groups. The mean values on the d score of the measures indicate that the cognitive functioning of the participants of the experimental

group has significantly improved as compared to the control group.

Depression, anxiety and stress have significantly decreased post-intervention for the experimental group compared to the control group.

Table 3 displays the results of the physical fitness tests. The mean values of the experimental group of chair stand, arm curl, 2-minute step, chair sit and reach, back

scratch, and 8-foot up and go differ significantly from the control group. The data indicates that the intervention considerably improved physical fitness performance as compared to the control group. The data indicate an improvement in body strength, upper body strength, aerobic endurance, lower body flexibility, shoulder flexibility strength, agility, and dynamic balance following the intervention.

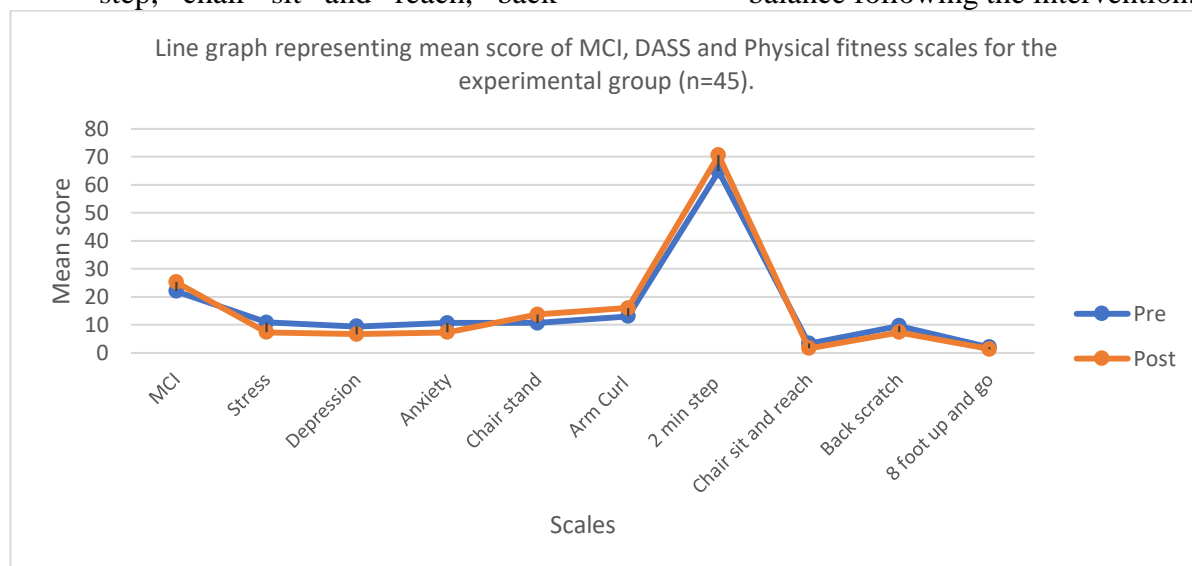


Figure 1. Represents the mean score of MCI, DASS and physical fitness scales for the experimental group. There is a significant difference in the post and pre-test scores for the experimental group. Post the intervention the MCI score has increased. Based on the scoring method provided by the researcher of MMSE, a higher score in MMSE indicates better cognitive functioning. Stress, anxiety and depression scores post intervention has reduced for the experimental group. Performance post the intervention for upper body strength, endurance, balance, shoulder strength, agility and lower body flexibility has improved.

The mean for the pre-test MMSE score is 22 and the mean for the post-test score is 25. The range for pre-test MMSE score is 5. Whereas the range of post-MMSE scores is 8. The researchers who published MMSE test claim a higher score on MMSE is indicative of better cognitive functioning. The majority of the

participants received a score closer to 30 post intervention. Which indicates that the overall score of cognitive functioning has increased.

The mean for the pre-test DASS stress score is 10.84 and the mean for the post-test score is 7.33. The range for the pre-test DASS stress score is 19. Whereas the range of post-test DASS stress score is 16. The mean for pre-test DASS depression score is 9.48 and the mean for post test score is 6.68. The range for pre-test DASS depression score is 14. Whereas the range of post DASS depression score is 14. The mean for the pre-test DASS anxiety score is 10.68 and the mean for the post-test score is 7.35. The range for the pre-test DASS anxiety score is 16. Whereas the range of post-test DASS anxiety score is 12. The researchers who published DASS claim that a lower score for stress, depression and anxiety are indicative of reduction. Thus, this indicates that the intervention has positively benefited the



participants with a reduction in stress, depression and anxiety in the experimental group.

### **Discussion**

The first hypothesis suggests that there will be a significant difference between the pre-post difference score of the experimental group and the control group on a. MCI, b. Stress, c. Depression, d. Anxiety and e. Physical fitness (Chair stand, arm curl, 2 min step, chair sit and reach, back scratch and 8 foot up and go). There is a significant difference between the pre-post test scores of the experimental and control group. This implies that the intervention significantly affects the above-mentioned psychological factors. Although for the rest of the factors, the post-test scores suggest a positive impact. In comparison to the experimental group, for the control group, there is a slight change in the post-test scores. However, it is not as prominent as the experimental group post-intervention.

Based on the results obtained for this research, the post-test scores for the experimental group, MMSE have increased indicating that the cognitive functions have improved. This is also supported by available research conducted by Chatterjee et al. (2021) concluding that yoga training has a positive impact on the cognitive functions of middle-aged participants. The results of this study indicate that the outcome which in this case is the intervention did have an impact (improvement in attention and alertness) on the participants. The middle-aged group particularly in terms of serial learning (short-term memory) improved after yoga training. Factors that improve the cognitive functions of people with dementia are physical fitness, nutrition, cognitive training, and social interventions (Ballesteros et al., 2015; Bangalore & Varambally., 2012).

The findings of this study also reported that depression, anxiety, and stress among participants got reduced in post-intervention assessment. Chobe et al. (2020) carried out a systematic review to

evaluate the effect of yoga in improving mental health and cognitive factors in seniors. The study concludes that yoga has a profound impact on decreasing depression, stress and anxiety. The researchers conclude that executive functions, memory, attention, and language were the most well-examined cognitive variables, whereas depression, anxiety, stress, and mood were the most thoroughly studied mental health factors. Seniors' attention, executive function, and depression among other cognitive parameters are all positively impacted by yoga-based therapies. To draw firm findings, this review also strongly advises doing more randomized control studies using conventional study design, proven yoga intervention modules, and long-term follow-up. In conclusion, the intervention of 12 weeks (12 hours) has benefited the participants by showing a significant difference in the above-mentioned dependent variables.

### **Recommendation**

For this research, one of the major limitations includes the need to conduct a follow-up test. The follow-up-test phase was not conducted due to time constraints thus, in future studies for this research a follow-up test phase would be beneficial to test the validity of the data. It would also show whether seniors are practising or not practising and the impact of it on the dependent variables. Another major limitation of this research is related to yoga training intervention. Even though the intervention module was validated by a yoga practitioner, if the module was taught by a yoga teacher the explanation and the impact of their work would be different. Moreover, the intervention test phase in this research was for 12 weeks and 2 days. An increase in hours and weeks would also be beneficial to examine the objectives of this study. For this research study, the videos for each module were taken in particular for each day. However, it was not shared with the participants because they did not have access to gadgets. Thus, this affects the ability to monitor the

continuity of the intervention module. It is hard to know if, after the intervention test phase, the participants have realised the importance of engaging in physical exercise of any form. Furthermore, the target sample for this research is senior citizens over the age of 65 years living in institutionalised settings. This research was able to collect the demographic details of each participant however, there is a need to collect more information on the educational and economic background of these participants.

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## Conclusion

The yoga training intervention has benefitted the participants. The findings suggest an improvement in cognitive functioning, physical fitness and reduction in depression, stress and anxiety. The results indicate that yoga as an intervention is effective in arresting the progression of cognitive impairment, and also creates a positive impact in preventing seniors from the occurrence or risk of dementia. This yoga intervention study can be considered safe and helpful for future studies.

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