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Effectiveness of Tele Monitoring Group Exercise Programme On Fitness Among Institutionalized Elders

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ABSTRACT

Aging is defined by a reduction in physiological functions, which results in an elevated susceptibility to disease. Encouraging active aging through structured exercise programs becomes increasingly important as the elderly population expands. Telehealth is a promising solution for elevating physical activity levels among institutionalized elders. 200 elderly participants aged 60-75 years were divided into two groups for this experimental study: an experimental group that received telemonitored Otago exercises and a control group that participated in supervised group exercises. Both groups participated in 45-minute sessions three times a week for a period of 12 weeks. The Senior Fitness Test was employed to evaluate physical fitness both before and after the intervention. In the experimental group, there were substantial improvements in the following: chair stand ($p<0.001$), arm curl ($p<0.001$), 2-minute step test ($p<0.001$), chair sit reach ($p<0.001$), back itch ($p<0.001$), and up and go test ($p<0.001$). In contrast, the control group exhibited less significant improvements. The telemonitored group exercise was found to be a highly effective alternative to traditional supervised exercises, as it substantially improved the mobility and strength of the lower body in institutionalized elders.

Keywords: Aging, Telehealth, Group Exercise, Institutionalized Elders, Physical Fitness, Otago Exercise Program

INTRODUCTION

Aging is an intricate and unavoidable process that results in a deterioration of the body's physiological functions and physical abilities[1]. Aging is typically defined by a gradual decline in function, leading to increased susceptibility to environmental stressors, and a higher likelihood of developing diseases and disabilities[2]. Life expectancy has significantly increased over the last century, leading to a future where there will be more older individuals than children worldwide. India's aging population is projected to steadily expand over the next few decades[3]. The proportion of people aged 60 and over is expected to rise from 8% in 2015 to 19% in 2050. By the end of the century, the elderly will make up around 34% of the country's entire population[4]. Tamil Nadu had the second-largest population of people over the age of 60 years in India, accounting for 11.2% according to the 2011 census[5]. The number of elderly individuals in institutions is rising as a consequence of modernization and lifestyle changes, which are causing joint families to break up and transition into nuclear families[6]. Elders may find themselves living alone or relocating to institutions or old age homes due to shifts in family structure, psychological dynamics, and values[7,8].

The World Health Organization introduced the 'Active Aging' policy to address the challenges associated with aging by promoting physical activity and improving the quality of life related to health. Active aging aims to optimize health, participation, and security in old age to enhance overall quality of life[4]. Compelling scientific data indicates that an organized exercise program can enhance the physiological function, health-related quality of life, and functional ability of older individuals[1,5]. Many elderly individuals have inactive lifestyles due to noncompliance with planned exercise programs, notwithstanding the benefits[8].

Research shows that individuals aged 55 and older internationally have low levels of reporting moderate to vigorous physical activity, and aging is closely linked to a rise in physical inactivity[8]. An elderly individual in India did not fulfill the WHO's recommended minimum of

150 minutes of physical activity each week. Being inactive is linked to a higher likelihood of developing heart disease, type 2 diabetes, hypertension, and osteoporosis[9,10]. India is facing a population surge, resulting in a low patient-to-healthcare professional ratio.

Telehealth is a developing healthcare delivery method that utilizes different technologies and modalities to address the obstacles people encounter in receiving services caused by a shortage of healthcare providers[11]. This technology offers numerous benefits for health funders in providing healthcare services, thereby enhancing patient accessibility. This could be a cost-effective and conveniently accessible option for patients, especially those residing in distant areas. Telehealth is expected to expand globally to 1.8 million users by 2017, as reported by the World Market of Telehealth[11].

Physiotherapy is essential for the prevention, promotion of health, and rehabilitation of aged adults with disorders. A group fitness program is a beneficial method for improving the health and overall well-being of older individuals. It is essential to recommend group exercise for preventing falls in elderly patients as part of geriatric care. Physiotherapy Delivering physiotherapy services in distant places is difficult because of constraints such as restricted time, a low ratio of physiotherapists to the population, and the economic circumstances of the patients. Using current technologies is essential for delivering physiotherapy services to underprivileged communities.

The World Physiotherapy, Australian Physiotherapy association and APTA support the use of telehealth, including tele monitoring and tele physiotherapy, as essential components of providing physiotherapy services when needed[12]. The acceptance of technology by older individuals is uncertain and influenced by factors such as education level, cultural background, and socioeconomic status, despite the emergence of the internet and technology in India.

The effectiveness of telemonitoring exercise programs for institutionalized elderly may be influenced by their willingness to adopt new technology. This study aims to evaluate the impact of a telemonitoring

group exercise program on the physical fitness of institutionalized elderly in Tamil Nadu, assess their satisfaction with the program, and determine their participation levels.

MATERIALS AND METHODS

This study employed an experimental design with pretest and posttest assessments. A sample size of 200 elderly individuals was determined using the mean and standard deviation of specific variables, calculated with the OpenEpi web tool. Participants were selected using the Consecutive Sampling Technique.

The study was conducted over one year in three geriatric homes located in and around the suburbs of Chennai, Tamil Nadu. The remote telemonitoring center at SRM Institute of Science and Technology was utilized for the intervention.

Participants were required to be aged between 60 and 75 years, of any gender, capable of walking without assistance, and able to understand and follow verbal and visual instructions. Individuals with significant cardiovascular diseases, neurological disorders, diabetes-related complications, or depression were excluded from the study.

A total of 200 participants who met the inclusion criteria were randomly assigned to two groups of 100 each using computer-generated random numbers. The experimental group (Group A) participated in a telemonitoring group Otago exercise program, while the control group (Group B) engaged in a supervised group Otago exercise program. Both programs included exercises focusing on balance, coordination, mobility, strength, and flexibility. Participants were instructed to attend 45-minute exercise sessions three times a week for 12 weeks.

Physical fitness in both groups was assessed before and after the exercise program using the Senior Fitness Test as the outcome measure[13].

The collected data were analyzed using SPSS version 21. Initial data normality was tested using the Kolmogorov-Smirnov test. Descriptive and inferential statistics were then applied to analyze the data.

RESULT

This study evaluated the impact of a well-organized rehabilitation program on different indicators of physical fitness. The participants age, weight and height are provided in Table 1. It compared the results after the intervention between two groups: Group A (experimental) and Group B (control). Comparison of pre-test and post-test values of senior fitness test in experimental group and control group are provided in Table 2 and 3, respectively. The results of the post-test comparisons are presented in Table 4.

The groups had notable disparities in specific fitness assessments. Group A (mean = 12.17, standard deviation = 2.16) had substantially better performance than Group B (mean = 10.18, standard deviation = 2.01) in the Chair Stand test, with a t-value of 6.75 and a P <0.001, based on a sample size of 200. Group A demonstrated a significant advantage over Group B in terms of mobility and lower body strength, as indicated by the Up and Go Test results. The mean score for Group A was 14.35 (SD = 3.99), whereas the mean score for Group B was 17.32 (SD = 4.74). The t-test ($t(198) = -4.79$, $p < .001$) confirmed these findings, suggesting that the intervention led to improved mobility and lower body strength.

Nevertheless, the remaining fitness metrics did not exhibit any statistically significant disparities. The Arm Curl results were significantly higher for Group A (mean = 13.13, standard deviation = 2.22) compared to Group B (mean = 12.52, standard deviation = 2.90), but this difference did not reach statistical significance, $t(198) = 1.66$, $p = .10$. The scores of the 2 Min Step Test were comparable in both groups (Group A: M = 41.69, SD = 6.28; Group B: M = 41.16, SD = 15.20), $t(198) = 0.32$, $p = .75$. In the Chair SIT Reach task, there was no

significant difference between Group A (mean = 0.55, standard deviation = 2.63) and Group B (mean = 1.24, standard deviation = 4.33), t(198) = -1.36, p = .17. The Back Scratch test revealed no statistically significant difference between the two groups (Group A: M = -1.37, SD = 1.91; Group B: M = -1.42, SD = 2.29), t(198) = 0.14, p = .89.

Table 1: Participants age, weight, height mean and standard deviation

Variable	N	Mean	SD
Age	200	69.74	4.36
Weight	200	56.81	8.67
Height	200	159.52	8.07

Table 2- Comparison of pre-test and post-test values of senior fitness test in experimental group

Measure	Pre-test Mean ± SD	Post-test Mean ± SD	T value	p-value	Cohen's D
Chair Stand	10.92 ± 2.64	12.19 ± 2.15	-10.01	< .001	0.63
Arm Curl	11.62 ± 2.33	13.14 ± 2.20	-11.01	< .001	0.69
2 Min Step Test	37.83 ± 6.96	41.70 ± 6.22	-7.98	< .001	0.50
Chair Sit Reach	-0.88 ± 3.58	0.54 ± 2.60	-6.13	< .001	0.38
Back Scratch Test	-4.26 ± 3.67	-1.37 ± 1.90	-10.23	< .001	0.64
Up and Go Test	16.21 ± 5.30	14.28 ± 3.98	8.34	< .001	0.52

Table 3: Comparison of pre-test and post-test values of senior fitness test in control group

Measure	Pre Test Mean and SD	Post Test Mean and SD	T Value	P Value	Cohen's D
Chair Stand	9.84 ± 3.19	10.03 ± 1.99	-0.51	0.615	-0.05

Arm Curl	11.92 ± 3.20	12.53 ± 2.89	-1.40	0.166	-0.19
2 Min Step Test	33.40 ± 12.23	40.44 ± 14.36	-4.35	0.000	-0.56
Chair SIT Reach	-2.38 ± 6.72	0.78 ± 4.28	-4.07	0.000	-0.44
Back Scratch Test	-5.85 ± 5.39	-1.42 ± 2.28	-7.58	0.000	-0.82
Up and Go Test	21.57 ± 7.95	17.20 ± 4.85	4.88	0.000	0.63

Table 4: Comparison of post-test values of senior fitness test in experimental and control group

Measure	Group A Test Mean and SD	Group B Test Mean and SD	T value	P value
Post Chair Stand	12.17 ± 2.16	10.18 ± 2.01	6.75	0.00
Post Arm Curl	13.13 ± 2.22	12.52 ± 2.90	1.66	0.10
Post 2 Min Step Test	41.69 ± 6.28	41.16 ± 15.20	0.32	0.75
Post Chair SIT Reach	0.55 ± 2.63	1.24 ± 4.33	-1.36	0.17
Post Back Scratch	-1.37 ± 1.91	-1.42 ± 2.29	0.14	0.89
Post Up and Go Test	14.35 ± 3.99	17.32 ± 4.74	-4.79	0.00

DISCUSSION

This study aimed to determine the efficacy of telemonitoring group exercise programs for institutionalized elderly individuals. Both groups participated in the same exercise regimen for 12 weeks—one group was supervised through in-person training, while the other was supervised via telemonitoring. The results demonstrated considerable improvements in the Senior Fitness Test for both groups, indicating that telemonitoring is neither inferior nor superior to in-person exercise training. There were no significant differences in the results of the two-minute step test, arm curl test, chair sit and reach, and back scratch test within the Senior Fitness Test battery.

The study also explored how a telemonitoring group Otago exercise program might enhance lower limb muscular strength, improve balance, reduce fall risk, and increase overall

mobility among the elderly. Telemonitoring programs encourage consistent physical activity, which in turn boosts adherence to the training regimen. Karly O.W. Chan and colleagues reported that tele-exercise programs improved physical abilities such as muscle strength and function in elderly individuals at risk of falling. Additionally, following up on exercise sessions is simpler in telemonitoring compared to in-person training[14].

After 12 weeks of the Otago exercise routine, the telemonitoring group showed improved physical fitness among institutionalized elders. Participants, aged 60 and above, also demonstrated an increased willingness to continue with the telemonitoring exercise throughout the study. Marie Hutchinson and colleagues found an overall adherence rate of 98.5%, with enjoyment scores among residents increasing from 75% at the end of the first week to 100% by the sixth week[15]. Their study also revealed that telemonitoring enhanced physical capacity and improved health-related quality of life in the elderly. Roberto Antonicelli and colleagues provided evidence that home telemonitoring could be a valuable tool for the rehabilitation of elderly people, helping to prolong the benefits of physical activity[16].

Telemonitoring group exercise for institutionalized elderly offers several benefits, including cost-effectiveness, time efficiency, ease of adherence, peer group support, and reduced travel requirements. This type of program can be easily integrated into elderly care facilities using Information and Communication Technology (ICT). Implementing such activities in the community can enhance the fitness and quality of life for elderly individuals, especially those who are unable to access traditional care. Additionally, ICT can provide personalized supervision alongside group exercise, making telemonitoring a viable option in semi-urban and rural locations.

However, this study faced limitations due to the lack of readily available ICT technology in some of the facilities used for the program. Training and educating caregivers during telemonitoring sessions and follow-ups proved to be time-consuming and challenging.

Furthermore, the nursing homes selected for this study were located in semi-urban and rural regions, excluding urban areas. Future research should focus on implementing a prescribed exercise protocol tailored to the physical capacities of individuals or groups across all geriatric facilities in the state. Establishing a study network connecting geriatric homes could further investigate exercise capacity, peer group engagement, and the enhancement of mental well-being in the elderly.

This framework allows us to effectively present our findings within the broader context of geriatric exercise research, while also setting practical and scholarly directions based on the results of this study.

CONCLUSION

The 12-week telemonitored exercise program led to improvements in lower body strength and overall fitness among senior participants. However, the program did not show a significant impact on aerobic capacity, upper body strength, or flexibility. These findings suggest that while telemonitoring can be effective in enhancing certain aspects of physical fitness in seniors, future interventions may benefit from a more targeted approach to address areas where no significant improvements were observed.

CONFLICT OF INTEREST

The authors declared nil in this investigation

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