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ASSESSMENT OF PHYSICAL FITNESS AND FUNCTIONAL MOBILITY AMONG ELDERLY WOMEN IN KERALA

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Abstract

The objective of the study was to assess the physical fitness and functional mobility of elderly women in Idukki. The study was restricted to 200 elderly women above the age group of 60 years from Idukki district. The selected variables for the study were leg strength, functional mobility, dynamic balance, and cardiovascular endurance. In order to assess the leg strength (sit to stand test), functional mobility (timed up and go test) dynamic balance (functional reach test) and for cardiovascular endurance (six minutes walk test) was conducted. In order to assess the physical fitness and functional mobility of the subjects, descriptive statistics mean, standard deviation, frequency distribution and percentile were computed.
Keywords: Physical Fitness, Functional Mobility

Introduction

Physical fitness is the body's ability to function efficiently and effectively. It consists of health-related physical fitness and skill related physical fitness which contributes to the total quality of life. Physical fitness is associated with a person's ability to work effectively to enjoy leisure time, to be healthy to avoid hypokinetic diseases and to meet emergency situations. It is related to but different from health, wellness and the psychological, sociological, emotional and spiritual components of fitness. Although the development of physical fitness is not possible, without regular exercise

Physical activity is "any bodily movement produced by skeletal muscles that result in energy expenditure", whereas exercise is a subcategory of physical activity defined as planned, the structural movement was undertaken to improve or maintain one or more aspects of physical fitness (Casperson, Powell & Chritenson, 1985).

Aging is the accumulation of changes in an organism or object over time. Aging in humans refers to a multidimensional process of physical, Psychological and social change. Aging is a process that begins from the moment one is conceived until the moment one dies. Some dimensions of ageing grow and expand over time, while another decline. Aging is generally associated with a steady decrease in muscle strength and muscle mass, often resulting in reduced functional capacity. Physical frailty and impaired mobility

The benefits of physical activity for older adults are well known. Regular physical activity and good physical fitness have been shown enhance the quality of life in many ways. Physical fitness and exercise makes one look good feel good and enjoys life. Older individuals who have remained active throughout their lives maintain much of their physical strength, endurance and stamina. Finally, exercise and fitness are methods of health and wellness promotion. They contribute to quality living associated with wellness, the positive component of good health.

Regular physical activity exerts beneficial effects on the functioning of the cardio-respiratory, vascular, metabolic, endocrine, and immune systems. In doing so it greatly reduces risk factors for coronary artery disease, the nation's leading cause of death. It may also prevent the development of, or effectively treat diseases such as noninsulin dependent diabetes mellitus, osteoarthritis, osteoporosis, obesity, colon cancer, peripheral vascular occlusive arterial disease, arthritis and hypertension (Shepared R.J.,1994).

Regular exercise reduces body fat stores increase muscle strength and endurance, strengthens bones, and importantly, improves mental health. Lack of physical is a health issue in all segments of the population, but it is more prevalent in the older adult population. Exercise programs meeting the special needs of the senior population will soon be in tremendous demand. There are several reasons. More and more information is available on the health benefits of regular exercise for seniors and the public is becoming aware of the role of exercise maintaining a positive quality of life well-advanced age.

The study was conducted for the elderly women in Idukki district. Idukki district was formed on 26th January 1972 as per Govt. Notification No. 54131/C2/71/RD dated 24th January 1972. The district consists of Devikulam, Udumbanchola and Peerumedu thaluks of the erstwhile Kottayam and Thodupuzha Taluk of the erstwhile Ernakulam district. This beautiful High range district of Kerala is geographically known for its mountainous hills and dense forests. Idukki has many unique topographical and geographical characteristics. Idukki is the largest district of Kerala with an area of 5105.22 sq.km. About 97% of the total area of the district is covered by rugged mountains and forests. There is only a strip of middle land (3%) in the western part of the district. The low land area is totally absent in the district. More than 50% of the area of the district is covered by forest. Due to the large scale of migration to the district from other parts of Kerala and from the neighbouring Tamil Nadu, Idukki is having a mixed culture. Idukki is the second largest place in Kerala where the most number of scheduled tribes and tribal ambiguities exist.

Review of Literature

Beam, S.et al. (1999) examined the effects of 10-week low intensity (age = 73, n = 9) resistive training program of steadiness of the quadriceps muscle in elderly subjects. There were six measures of steadiness including standard deviation and coefficient of variation,9 elderly control objects were tested 10 weeks after the initial test and revealed no significant changes in steadiness ($p>0.5$). This showed that exercise training improves quadriceps muscle steadiness independent of exercise intensity.

Bemben, M.G. et al (1998) examined the strength and flexibility of 21 elderly women (age =73 +7 years) following a 16-week Dyanband resistance programme of 10 - 15 repetitions for eight muscle groups representing the upper and lower body. The result of this study suggests that all strength measures improved following training and also flexibility increased. Increasing the range of motion ranging from 5% (transverse shoulder extension) to 23% (plantar flexion)

Shigematsu, R. et al (1999) conducted a study on 14 community-dwelling old women, (mean age 79.5) to evaluate the effect of Aerobic dance programme for 60 minutes. 3 days, a week for a period of 12 weeks. The study indicated that the Aerobics exercise programme improves balance and walking speed in old women.

Lesniewski, L.A. and Sinning, W.E. (1999) conducted a study to examine the relationship between strength and muscle fatigue in the vastus medialus and erector spine muscles during the 30-second chair stand test in younger and older adults. The subjects were 9 younger men (age 23.1 +- 3.1 years) 8 younger women age (21.4 +- 3.7 years) 8 older women (65.9 +- 5.9 years). Knees, hip and back isokinetic and isometric extensor strength were assumed respectively. Muscles electrical activity was recorded in the vastus medialus and erector spines during a 30-second chair stand test. The root mean square and mean frequency was calculated for the beginning and end of the test and used as markers of fatigue. Significance was set at the 0.05 level. No significant correlation was found between strength or muscle electrical activity parameters and test performance. The younger subjects displayed a greater erector spine root mean square and mean frequency than the older subjects. This showed that fatigue does not appear to be a factor in the performance of chair stand test in older adults.

Sherwood, H.S. et al (1999) investigated the effect of dumbbell and resistance band training on functional ability in older African American women. Sixteen women (age 74.8 + 8.8 years: mean + SD) participated in exercise training and 6 women (age = 74.7 + 4.5 years) served as controls. Training was given for 4 weeks, 3 days a week. Functional ability was measured before and after training. The results revealed that the training resulted in significant ($P<0.05$) improvements in the functional ability of the experiment group.

M. Egana B. Dome (2004) conducted a study on physiological changes following 12 weeks gym based on stair climbing, elliptical trainers and treadmill running programme in female, 22 moderately active females were randomly assigned to treadmill running (n=7) elliptical trainer (n = 8), on stair - climber (n=7) groups and trained 3 days, week, initially at 70-80% maximum heart rate for 30 min, progressing to 80-90% HR max for 40 min. Subjects performed the incremental exercise to volitional exhaustion using an electronically loaded cycle ergo meter before and upon completion of the program. In addition, subjects performed sub maximal fixed load tests t 0,4,8 and 12 weeks, using ergo meters specific to their exercise group. No significant inter group differences were recorded for pre-training VO2 max. Significant (LPO.05) post-training increase in cycling VO2 max and VE max were observed for treadmill elliptical trainees and stain climber modalities, however, the increase was not significantly different between different groups. For all groups, submaximal HR significantly decreased from week 0 to 4 and from 4-8.

King, et al (1993) conducted on the Beck depression inventory scores improved often one year exercise, whether the exercise was of moderate intensity (63%-70% of peak exercise heart rate) or of higher intensity (73%-88% of peak exercise heart rate) or whether the exercise was done 3 times a week for one hour or 5 times a week for 30 minutes. However, the depression scores of the older adults who experienced a much shorter, 4 months exercise program did not change after the program.

Tanja, et al (2004) conducted a study on the development and pilot evaluation of a physiological intervention program for patients with age-related muscular degeneration. This intervention program was based on 6 modules carried out in 5 weekly group sessions. These modules included (a) progressive muscular relaxation, (b) exchange of disease-related experiences, (c) understanding the connections among thought, emotion and behaviour, (d) description and emphasis on the use of available resource, (e) improvement of general problem-solving skills, (f) information exchange on ARMD-related treatment and rehabilitation options. A preliminary evaluation of this intervention program was performed with the aid of preintervention-postintervention comparison group research design which included 14 individuals (mean age of 73.1 years) in the intervention group and 8 participants (mean age of 72.6 years) in the comparison group. The pre-intervention post-intervention assessment addressed a set of emotional (eg. Positive and negative effect) as well as behavioural (eg. Limitations to activities and instrumental activities of daily living) The results revealed that a statistical analysis comparing the intervention group with the comparison group revealed that the intervention group benefited from the program in five out of six outcome measures. Psychological group intervention is a promising approach to improve the quality of life in patients suffering from ARMD.

Tarek, M. et al (1994) conducted a study to determine the efficacy of two different types of physical restoration regimes - active and passive - in improving the performance of elderly persons with chronic pain conditions. Dom elderly persons admitted or back and pain rehabilitation to the Comprehensive Pain And Rehabilitation Centre (CPRC) at the University of Miami are presented. The active approach consisted of the aggressive rehabilitation program at the CPRC, a 4-week program of daily physical therapy, occupational therapy, behavioural modification and counselling. Treatment goals were improved strength, flexibility, posture, balance, gait, and overall wellbeing. The passive approach was based on the use of Functional Electric Stimulation (FES) as an adjunct

treatment to strengthen lower extremity muscles weakened by desire. To evaluate the effectiveness of these approaches to physical restoration, ergonomic assessment of subjects functional abilities, including static strength and range of motion was performed. The results of this suggest that both methods were valuable in physical restoration in the elderly. Specifically, FES proved effective strengthening weak muscles in the lower extremities and shows great potential for neuro muscular conditioning in the older cohort.

Elsie Hui (2008) conducted a study to determine the effects of dancing on the health status of older persons. A pool of 111 community-dwelling subjects was allocated to either an intervention group (IG), which included 23 sessions of dance over 12 weeks or a control group (CA). All participants were assessed at baseline for 12 weeks. Physical outcome measures included the 6-min. timed walking test (6 MWT), trunk flexibility, body composition, lower limb endurance and strength, balance, the timed up-and-go test (TUG), resting heart rate and blood pressure. Quality of life was assessed by the medical outcome survey short from the questionnaire (SF 36). The IG's views toward dancing were also evaluated at 12 weeks. Significant differences were observed between the groups in 5 outcome measures mean change in reacting heart rate, OMVT, TUG, lower limb endurance and the 'general health' and 'bodily pain' domains of SF-36. the result of this study reveals that dancing has physical and psychological benefits and should be promoted as a form of leisure activity for senior citizens.

Toraman, N.F. and Ayceman, N. (2005) conducted a study to examine the effects of age on functional fitness after six weeks of detraining. The subjects were elderly subjects aged 60-80 years, completed a 9-week multicomponent exercise training program. The senior fitness test every 2 weeks during the 6-week detraining period and the responses of 12 young- old subjects (1/0, aged, 60-73 years) and nine elder subjects (0, aged 74-86 years) were compared. The results of this study indicated that the functional fitness improved during the exercise training period. Performance in the chair stand and six-minute walk for the 0 group had significantly declined compared with the post-training value after two weeks of detraining ($p<0.01$), whereas there were no significant changes in the 1/0 groups.

Scores on the functional fitness tests declined further between 2 and 4 weeks of detraining in both of the groups ($p<0.01$). In the 1/0 group, there were significant losses in performance on the chair stand, the chair sits and reach and six-minute walk tests, and in the 0 group on the chair stand up and go tests after six weeks of detraining compared with after 4 weeks of detraining($p<0.01$). The components of functional fitness most affected by detraining were lower extremity flexibility after two and four weeks of detraining and agility dynamic balance after six weeks of detraining. Changes in lower extremity, flexibility, up and go, and six-minute walk performances in response to six weeks of detraining are affected by age in elderly adults.

Materials & Methods

The objective of the study was to assess the physical fitness and functional mobility of elderly women in Idukki. The study was restricted to 200 elderly women above the age group of 60 years from Idukki district. The study was carried out in the descriptive research design and adopted multi-stage random sampling for the sample selection. The selected variables for the study were leg strength, functional mobility, dynamic balance, and cardiovascular endurance. In order to assess the leg strength(sit to stand test), functional mobility (timed up and go test) dynamic balance (functional reach test) and for cardiovascular endurance (six minutes walk test) was conducted.

Table 1 Tester Competency for Test Re-Tests of Selected Physiological Variables

Variables	Coefficient of correlation
Leg strength	0.95
Functional mobility	0.96
Dynamic balance	0.96
Cardiovascular endurance	0.95

Reliability of subjects

Test items were administered on five randomly selected subjects and their performance recorded on two consecutive days at the same time. The consistency of results was obtained by product movement correlation. The coefficient of correlation thus obtained is presented in table 2.

Table 2 Reliability Co-Efficient of Test Re-Test Scores

Variables	Coefficient of correlation
Leg strength	0.96
Functional mobility	0.96
Dynamic balance	0.96
Cardiovascular endurance	0.96

Criterion measures

1. The criterion measures chosen were:
2. Leg strength measured with sit to stand test to the nearest $1/10^{th}$ of a second.
3. Functional mobility measured with timed up and go test to the nearest $1/10^{th}$ of a second.
4. Dynamic balance measured with functional reach test to the nearest centimetre.
5. Cardiovascular endurance was measured by six-minute walk test and recorded to the nearest km.

Findings

Mean, standard deviation and percentile were computed for leg strength, functional mobility, dynamic balance and cardiovascular endurance to determine the status of physiological variables of elderly women of various parts in Idukki.

Table 3: General Health Background of Elderly Women

Health Problems	Percentage
High blood pressure	56%
High cholesterol	19.5%
Heart trouble	3.5%
Diabetes	30.5%
Rheumatoid arthritis	43%
Chronic asthma, Emphysema or Bronchitis	14%
Back problems	73.5%
Foot problems	69.5%
Stomach problems	18.5%
Skin problems	16%
Allergies	15%
Trouble hearing	33.5%
Trouble seeing	43%
Trouble controlling bladder	10%
Stroke Cancer	9%
Hyperparathyroidism	6%
	12%

Table 3 reveals the general health background of the elderly women. 73.5% had back problems, 69% had foot problems, 56% had high blood pressure, 43% had trouble in seeing and 33.5% had trouble in hearing. 43% were suffering from Rheumatoid arthritis and 30% of them were having Diabetes.

Table 4: Mean and Standard Deviation of Leg Strength, Functional Mobility, Dynamic Balance and Cardiovascular Endurance in Elderly Women

	N	Minimum	Maximum	Range	Mean	Standard deviation
Leg strength	200	1.49	10.11	8.62	4.256	1.83668
Functional mobility	200	6.50	38.64	32.14	14.9154	5.17791
Dynamic balance	200	1.00	4.00	3.00	2.2050	.61225
Endurance test	200	25.00	509.00	484	183.3500	90.41344

Table 4 reveals the mean, standard deviation and percentile value of leg strength, functional mobility, dynamic balance and cardiovascular endurance of the elderly women in Idukki district. In the case of leg strength of the subjects, the mean score was 4.2256, with a standard deviation of 1.83668 and the range is 8.62. In the case of functional mobility of the subjects mean score was 14.9154, with a standard deviation of 5.17791 and the range being 32.14. In the case of dynamic balance of the subjects mean score was 2.2050, with a standard deviation of .61225 and the range is 3.00. In the case of cardiovascular endurance of the subjects mean score was 183.3500, with standard deviation of 90.41344 and the range being 484.

Table 5 Percentile Value of Leg Strength on Elderly Women

Percentiles	5	2.1205
	10	2.2520
	20	2.7800
	30	3.0900
	40	3.4100
	50	3.9650
	60	4.2360
	70	4.6270
	80	5.2080
	90	6.9580

Table 5 reveals the percentile value of leg strength of the elderly women. In the case of the leg strength the value secured at the fifth percentile was 2.12 second, at the 10^{th} percentile 2.25 sec, at the 20^{th} percentile 2.78 sec, at the 30^{th} percentile 3.09, at the 40^{th} percentile 3.41 sec, at the 50^{th} percentile 3.96 sec, at the 60^{th} percentile 4.23 sec, at the 70^{th} percentile 4.62 sec, at the 80^{th} percentile 5.20 sec, at the 90^{th} percentile 6,95 sec.

Table 6 Percentile Value of Functional Mobility (Secs) in Elderly Women

Percentiles	5	8.1010
	10	9.2010
	20	10.3120
	30	11.5200
	40	12.7400
	50	13.8100
	60	15.2920
	70	17.3080
	80	19.1140
	90	22.1860

Table 6 reveals the percentile value of functional mobility of the elderly women in Idukki. In the case of functional mobility the value secured at the 5^{th} percentile was 8.10 secs, at the 10^{th} percentile 9.20 sec, at the 20^{th} percentile 10.31 sec, at the 30^{th} percentile 11.52 sec, at the 40^{th} percentile 12.74 sec, at the 50^{th} percentile 13.81 sec, at the 60^{th} percentile 15.29 sec, at the 70^{th} percentile 17.30 sec, at the 80^{th} percentile 19.11 sec, and at the 90^{th} percentile 22.18 sec.

Table 7 Percentile Value of Dynamic Balance of Elderly Women

Percentiles	5	1.0000
	10	1.1000
	20	2.0000
	30	2.0000
	40	2.0000
	50	2.0000
	60	2.0000
	70	2.7000
	80	3.0000
	90	3.0000

Table 7 reveals the percentile value of the dynamic balance of elderly women in Idukki.

In the case of balance at the 5^{th} percentile, the score was 1 cm, at the 10^{th} percentile the score was 1.10cm, at the $20^{th,}$ 30^{th}, 40^{th}, 50^{th}, 60^{th}, 70^{th} percentile the score was 2cm, 2cm, 2cm, 2cm, 2cm, and 2.7cm respectively. At the 80^{th} and 90^{th} percentiles, the score was 3cm respectively.

Table 8 Percentile Value of Cardiovascular Endurance in Elderly Woman

Percentiles	5	.55
	10	.80
	20	.110
	30	.130
	40	.150
	50	.180
	60	.190
	70	.210
	80	.258
	90	.300

Table 8 reveals the percentile value of cardiovascular endurance in an elderly woman in Idukki. In case of the cardiovascular endurance, the value at the 5th percentile was .55km, 10th percentile .80km, 20th percentile .110 km, 30th percentile .130km, 40th percentile .150km, 59th percentile .180km, 60th percentile .190km, 70th percentile .210km, 80th percentile .258km, and at the 90th percentile the score was .30

Discussion of the findings

The subjects of this study were aged women above the age of 60; most of the subjects went outside for some sort of physical activity rather than staying back at home. In the case of leg strength, 60% of women had above a score of 4.23 sec, 40% above 3.40, 20% above 2.78 and 10% above 2.22.

Leg strength was found to be above average in the elderly mean. As the mean is 4.2260% of the female were able to perform with 4.22 sec. this may be due to the topography of the district whereby these women have to climb the hills which act as a form of resistance program during their normal routine. This which would have resulted in an increase in the leg strength In the case of functional mobility, 58% of women had above 14.65 sec, 40% had above 12.68 sec, and 20% above 10.31 secs.

The functional mobility was found to be above average. This may be due to the increased physical efficiency and taking up of the family responsibilities. Increase in the strength may also contribute to an increase in functional mobility. The elderly women as they have been actively involved in walking in the mountainous region would have resulted in an increase in the lower limb strength which has resulted in an increase in the functional mobility. In case of dynamic balance, 60% of the women had a score of 2cm, 29.5% had a score of 3cm and 20% had a score of 1cm.

Dynamic balance was found to be average. It might be because of the reason that the women are still practising the traditional household chores and work. Most work is done by sitting down which will increase the strength of the muscles that support the knees has been associated with increased balance also resulting in a neurocognitive function that is a risk of factors for falls.In the case of cardiovascular endurance 55% above had a score of .182 km, 35% had a score of .138 km, and 8% of them had a score of .65km.

Cardiovascular endurance was found to be above average in the elderly women. In research studies, the cross-sectional and longitudinal data indicate that the expected rate of decline in ageing can be reduced by roughly one half, by maintaining older individuals physical activity compared to those of young ones. As Idukki district covers more of hilly areas these women have to take more effort in their daily routine which might have resulted in being active thus resulting in an improved cardiac efficiency.

Conclusion

Ageing is the accumulation of changes in an organism or object over time. Aging in humans refers to a multidimensional process of physical, psychological and social change. Aging is a process that begins from the moment one is conceived until the moment one dies. Some dimensions of ageing grow and expand over time, while another decline. Aging is generally associated with a steady decrease in muscle strength and muscle mass, often resulting in reduced functional capacity. Physical frailty and impaired mobility

The benefits of physical activity for older adults are well known. Regular physical activity and good physical fitness have been shown enhance the quality of life in many ways. Physical fitness and exercise make one look good, feel good and enjoy life. Older individuals who have remained active throughout their lives maintain much of their physical strength, endurance and stamina. Finally, exercise and fitness are methods of health and wellness promotion. They contribute to quality living associated with wellness, the positive component of good health. The purpose of the study was to assess the physical fitness and functional mobility of elderly women in Idukki.The study was restricted to 200 elderly women above the age group of 60 years from Idukki district.

The selected variables for the study were leg strength, functional mobility, dynamic balance, and cardiovascular endurance. In order to assess the leg strength(sit to stand test), functional mobility(timed up and go test) dynamic balance(functional reach test) and for cardiovascular endurance(six minutes walk test) was conducted. In order to assess the physical fitness and functional mobility of the subjects, descriptive statistics mean, standard deviation, frequency distribution and percentile were computed.

In the case of leg strength of elderly women minimum and the maximum recorded score was 1.49 sec and 10.11 sec. The value secured at the 30^{th} percentile was 3.09 sec, at the 50^{th} percentile 3.96 sec and at the 80^{th} percentile 5.10 sec. In the case of functional mobility of elderly women minimum and the maximum recorded score was 6.50 sec and 38.64 sec. the value secured at the 30^{th} percentile was 11.52 sec, at the 50^{th} percentile 13.81 sec and at the 80^{th} percentile 19.11 sec. In the case of dynamic balance of elderly women minimum and the maximum recorded score was 1cm and 4 cm. The value secured at the 30^{th} percentile was 2cm, at the 50^{th} percentile 2cm and at the 80^{th} percentile 3cm. In the case of cardiovascular endurance of elderly women minimum and the maximum recorded score was .25km and 509km. The value secured at the 30^{th} percentile was .130km, at the 50^{th} percentile .180km and at the 80^{th} percentile .258km.

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