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## ORIGINAL ARTICLE

**EFFICACY OF RESISTED QUADRICEPS EXERCISE ON AGEING SKELETAL MUSCLES (SARCOPENIA)**

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### ABSTRACT

**Background:** Sarcopenia is a structural and functional decline in the cells and tissues of all organs resulting in age related decreased skeletal muscle mass and strength in elderly adults. The purpose of this study is to prove that resistance exercise is an extremely effective countermeasure to reduce the severity of the skeletal muscle wasting in elderly sarcopenic individuals especially in the quadriceps muscle. Objective of the study was to identify the efficacy of resisted quadriceps exercise on aging skeletal muscles in sarcopenia patients. **Methodology:** This is an experimental study conducted in Friend in Need old age home and Cure 'n' Care physiotherapy center. Both men and women with age group between 60-75 years participated in this study. Resisted Quadriceps strengthening exercises, aerobic exercises were given as intervention for this study. **Results:** The result shows that resisted quadriceps exercise was effective in treating patients with Sarcopenia. **Conclusion:** The conclusion of the study is that quadriceps resistance training can counteract the decline in quadriceps muscle function and loss of muscle mass normally associated in sarcopenia individuals.

**Keywords:** Quadriceps, resisted exercises, skeletal muscle mass, sarcopenia

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## INTRODUCTION

The hallmark of aging is a structural and functional decline in the cells and tissues of all organs. The resulting in decreased muscle mass and strength. The natural age-related events may be influenced by sarcopenia. Sarcopenia is defined as an age related loss of skeletal muscle mass, strength and quality. It is a process characterized by neurogenic, metabolic and morphological changes that include the loss of muscle fibers, altered contractility, changes in protein synthesis and diminished capacity for myofibril regeneration<sup>1,2</sup>.

With advancing age there is reduction in muscle mass and strength of 30%-40% between the ages of 30 and 80 years. The muscle mass and strength declines at the rate of 6% per decade and 12-14% per decade for muscle mass and strength respectively after 50 years of age<sup>3,4</sup>.

Sarcopenia is more pronounced in aged population and high proportion (60%) of men and women over the age of 65 years who are inactive.

Disuse and ageing are independent factors contributing to loss of muscle mass and strength. The effects of sarcopenia produces physiological and functional changes in muscle.

Some of the changes are reduction in muscle mass, reduction in the number of muscle fiber, change in muscle fiber size, reduction in number of motor unit and size, reduction in number and diameter of axons, changes in motor neurons, decreased muscle strength and endurance and decreased speed of muscle contraction.

Resistance exercise is an effective intervention against sarcopenia leading to substantial increase in mass, strength, power and endurance of skeletal muscle. The impact of exercise is underscored by the suggestion that two months of heavy resistance strength training in sedentary 60 to 75 years men and women may be sufficient to reverse two decades of age related decline in muscle function.

Strength training or resistance exercise, is generally defined as training in which a muscle generate force which is progressively increased over time. Muscle strength has been shown to increase in response to training between 60% and 100% of the 1 RM. Strength training increase muscle size, defined as hypertrophy.

Resistance exercise programs performed two or three times per week for atleast 6 weeks have consistently produced strength gains at all ages studied, including the very old. The magnitude varies with the intensity of training, the method of measuring strength, and the initial strength values<sup>5,6</sup>.

**Aim of the study:** The purpose of this study is to prove the effect of resistance exercise is an extremely effective counter measure to reduce the severity of the skeletal muscle wasting occurring with increase in age (in elderly) especially in the quadriceps muscle<sup>7,8</sup>.

**Need of the study:** To prove that resisted quadriceps exercise has effect of ageing skeletal muscle in sarcopenia.

**Null hypothesis:** There is no significant effect of resisted quadriceps exercise in ageing skeletal muscles on sarcopenia.

## METHODOLOGY

This was a study with experimental Study design and conducted at Friend in Need old home and Cure 'n' Care physio centre. Elderly adults were the population for the study. Convenient sample method was used to include the participants for the study. Thirty subjects were collected based on selection criteria. The study conducted for a duration of 6 Weeks.

Elderly adults with age group of 60 to 75 years, both genders, osteoporotic patients with bone mass density not less than zero were the inclusion criteria for the study. Persons of age group below 60 years and frail elderly of age above 75 years, Non cooperative patients, Osteoporotic patients with bone mass density less than zero, Diabetic patients, Cardiovascular and respiratory problem, Physically and mentally challenged individuals, Persons with fever or any kind of infections were excluded from the study.

**Materials used:** Sand Bags with Velcro straps, Other suitable weights measured by weighing machine were the materials used for the study.

**Measurement tools:** De lormes scale been used to measure strength of quadriceps muscle among aged people.

**Outcome measures:** Quadriceps muscle strength among aged people.

**Statistical analysis:** Descriptive data analysis has been used for demographic data. Paired t test has been used to find the effect of resisted exercise training on strength of quadriceps muscle among aged people.

**Procedure:** Thirty subjects who fulfilled the inclusion and exclusion criteria were selected

and explained the procedure and the training programs in detail and the informed consent were obtained from each individual. All the subjects were assessed with 1RM as 1RM is a reliable tool to assess the strength of the quadriceps muscle. Pre and post test measures were recorded.

The strengthening exercise program for the elderly is recommended to have an order of exercise as following :

1. Warm Up exercise, 2. Aerobic Exercise, 3. Resistance Training, 4. Cool Down Exercise.

**Warm Up exercise:** This consists of the range of motion exercise for the knee joint(knee flexion and Extension) and the session is for 5 minutes.

**Aerobics Exercise:** This comprises of Walking on a level ground for 5 minutes.

**Resistance Exercise:** From the first day of exercise period, the subjects were made to perform the resistance exercise. Subjects were made to be in the semi-reclined position using a wedge to perform the strengthening exercise for Quadriceps. The resistance was given according to the exercise schedule, number of sets, and duration of rest periods, with 80% of 1RM.

**Cool Down Exercise:** This comprises of range of motion exercises, same as warm up session. After 6 weeks the post test was done and the results were recorded. The patient after effective treatment may get DOMS as a result of activity. For those patients stretching of muscles are taught to keep the muscle healthy and free from pain due to DOMS.

**RESULT**

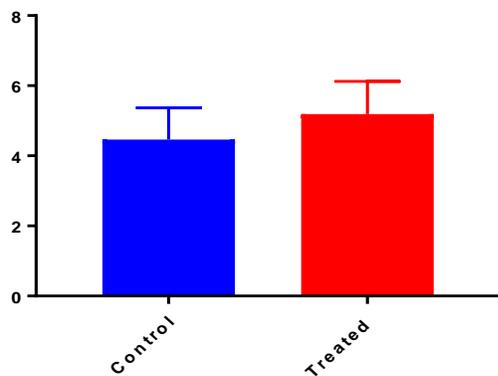
Subjects	Number of Pairs	Mean Diff.	SD SEM	95% CI
Age	30	67.9	4.73 0.86	66.13 to 69.67
1 RM weight	30	3.55	0.74 0.13	3.278 to 3.829
% of 1RM Resisted Exercise	30	80	0	80 to 80

**Table 1:** frequency distribution of age, 1 RM weight and % of 1RM resisted exercise

Subjects	Number of Pairs	Mean Diff.	SD SEM	95% CI	df	t	P value	Sig. different (P < 0.05)
De Lormes Pre-Post	30	0.73	0.196 0.036	0.653 to 0.8	29	20.26	.0001	Significant

**Table 2:** Pre- post test for strength of quadriceps muscles

**Paired t test for quadriceps strength**



**Graph:1** Graphical representation

According to the statistical analysis the mean values of 1 RM for pre and post test is 4.46 and 5.19 respectively, which is highly significant.

Therefore, resisted quadriceps exercise was effective in treating patients with Sarcopenia.

**DISCUSSION**

The myriad of studies shown that resistance exercise is an effective intervention against sarcopenia, leading to substantial increase in muscle mass, strength, power and endurance of skeletal muscles. The impact of exercise is underscored by the suggestion that two months of heavy resistance strength training in sedentary 65 to 75 year old men and women may be sufficient to reverse two decades of age related decline in muscle function<sup>9</sup>.

Latham et al., 2004 and Morse et al., 2007 states that Progressive resistance training has consistently been shown to counteract many of the age-related physiological changes in healthy elderly individuals. Klitgaard et al. (1990) found that elderly endurance-trained men had muscle size and strength similar to sedentary individuals<sup>10</sup>.

Muscle weakness and atrophy are probably the most functionally relevant and reversible parameters related to exercise in the elderly population. Importantly, only overloading of muscle with weight-lifting exercises has been shown to counteract the loss of muscle mass and strength observed with aging. Furthermore, an abundance of data demonstrate that strength training also induces neuromuscular changes in the elderly<sup>11,12</sup>.

Results from the resistance training in elderly individuals indicate that it is the intensity of stimulus, not the underlying fitness or frailty of the individual, that determines the magnitude of the gains in strength and muscle size. For example, when the intensity of the exercise is low, older persons achieve only modest increases in strength. Whereas, if given an adequate training stimulus (>60% of 1 RM), older men and women show similar or greater strength gains compared with the young individuals as a result of resistance training<sup>13</sup>.

The muscle hypertrophy and increased strength, along with the changes in the body composition and hormonal and nervous system adaptations associated with strength training, have substantial impact on the daily activities of living, and functional independence of the elderly. These increases in muscle size and strength were associated with clinically significant improvement in gait speed, balance and functional independence<sup>14</sup>.

Resistance training is therefore an effective way to increase energy requirements, decrease body fat mass and maintain metabolic active tissue mass in the older people. Resistance training may be an important adjunct to weight loss intervention in addition to its effects on energy metabolism; it also improves insulin action in older adults.

## CONCLUSION

From this study it is concluded that Quadriceps muscle in sarcopenia individuals respond very well to resisted exercise and consequently, this type of intervention should be recognized as one of the key factors in the knee rehabilitation of sarcopenia individuals. Furthermore, there is increasing evidence that quadriceps resistance training can counteract the decline in quadriceps muscle function and loss of muscle mass normally associated in sarcopenia individuals.

**Limitations:** Small sample size, patients with physically and mentally challenged individuals, Osteoporosis, diabetic, over weight patients were not included.

**Conflict of interest:** No conflict of interest to do this study.

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