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RESEARCH ARTICLE

Effectiveness of Comprehensive Corrective Exercise Program with Swiss Ball to Improve Kyphotic Posture Among Geriatric Population

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Abstract: Thoracic Kyphosis is the postural deformity leading to the increased curvature of the spine. The study evaluated the comprehensive corrective exercise program among elderly individuals with kyphotic angles. A total of 30 participants above 60 were included in the study. The geriatric population suffers from postural abnormality due to normal aging phenomena; making it difficult to perform daily activities. The comprehensive corrective exercise program includes stretching Method: 30 subjects were taken for the study based on the inclusion and exclusion criteria. The baseline measurement was done before the treatment and after 12 weeks of continued comprehensive corrective exercise with a Swiss ball comprising 45-minute sessions for 2 days a week after the intervention period post-assessment was performed. The results showed a prominent progress in posture deformity within group A with intervention exhibiting a showing greater mean outcome with significant (p=0.001) compared to group B. From the results of the intervention study, it was observed that incorporating corrective exercises using Swiss ball can effectively counterpart traditional training programs aimed at enhancing posture and reducing kyphotic angles in elderly population.

Keywords: senile population, kyphosis, Posture correction, Swiss ball exercise.

INTRODUCTION

Human vertices are a complex and delicate mechanical system that needs stabilizing muscular movement in order to withstand large compression stresses. The back extensor muscles in particular are the main supporting muscles that keep the spine in an erect position because of their antigravity properties[1,2]. Therefore, it makes sense that the spine's deviation from ideal alignments, such as hyperkyphosis, is caused by the loss of the paraspinal muscles' ability to Maintain the spine. hyperkyphosis is an unusually high forward curve of the thoracic spine[3,4].

Although thoracic Hyper kyphosis is a frequent postural deformity in the senior population, affecting up to 40% of the elderly, it can occur at any age[5,6].While the etiology of age-related hyper kyphosis is multifactorial[7]. Sagittal plane deformity is a term for a postural condition characterized by increased thoracic curvature of the spinal column. Spinal thoracic kyphosis (TK) angles typically fall between 20° and 40°; TK angles between 45° and 50° are known as postural kyphosis, enhanced kyphosis, or hyper kyphosis[8]. While the cause of age-related hyper kyphosis is unknown, hyper kyphosis impacts 60% of senior citizens and 32% of adults[9].

Indian population is shifting from high birth rates, high fertility, and high death rates to low birth rates, low fertility; low birth rates .It is anticipated that the proportion of Indian population over 60 years will rise quickly, from 8.6%of the total in the 2011 census to 10%by 2020. For the first time since independence, the old population's decadal growth rate Increased in the census conducted in 2001 and 2011. Moreover, for the past 20 years, the total number of senior women has suppressed that of senior males[10].

Preventive exercise is the most widely used method of reducing the risk in older adults whose ability to balance is declining. Additionally, because the muscles in the trunk of the elderly are much weaker than the muscles in the limbs, lumbar area changes improve overall body function, including walking .Because Swiss ball training can enhance muscle strength, flexibility as well as perceptual balancing ability it is also used for trunk stabilization to promote physical functions and activation of the core muscles. Exercises on uneven surfaces, such as a Swiss ball, can increase activity compared to even surface exercises and help avoid musculoskeletal injuries because they enhance dynamic balance[11,12].

According to Seo et al.[13], Swiss ball exercises are a great method to help elderly women with their balance. Song et al.[14] also said that resistance and Swiss ball exercises can help scoliosis patients with their balance. Physiotherapists frequently utilize hand-held instruments called flexi curves to measure thoracic kyphosis since they are easy, quick, and economical. The kyphosis index is the main result of the flexi curve[15]. In the past, persons with kyphotic posture have demonstrated extremely high inter rater and intra rater reliability using the flexi curve index[16]. Few studies have been done on older adults with thoracic kyphosis, but for the senior population, we are utilizing a particular modified Swiss ball exercise that is easier to perform and has a lower risk of injury or fall than other resistance exercise.

MATERIALS AND METHODS:

Study design and setting:
The study was conducted in an Energy Clinic adopting pre test–post test experimental design with total participants of 30 selected using purposive sampling techniques to evaluate the effectiveness of the interventions among geriatric population with kyphotic posture.

Inclusion and exclusion criteria:
The Older adults with kyphotic posture, elderly population, showed willingness to participate in the study were the inclusion criteria and exclusion criteria includes visual and hearing impairments, patient with neurological conditions, who is diagnosed with ankylosing spondylitis or rheumatoid arthritis, who have Cognitive impairment.

Procedure:
The eligible, 30 participants were selected and an informed consent prior to participation was obtained. Participants were systematically divided into two groups Group A and Group B and both the group had an intervention of 45 minutes for 12 consecutive weeks.

- **Group A**: The selected participants received a general stretching, CCEP (Cervical and Cervicothoracic Extension Program), postural perception training, thoracic exercise program, and warm-up exercises.
- **Group B**: Received general stretching, warm-up exercises, and free exercises.

Comprehensive Corrective Exercise Program
Data collection:
Baseline data were collected through an initial interview, which included demographic and health-related information such as age, sex, educational level, profession, employment status, duration of hyperkyphotic posture.

Statistical Analysis
The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 22. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

RESULTS:

The comparison of Flexi-Curve Test scores between Group A and Group B at baseline and post-intervention is presented in **Table 1**. The pre-test values showed no significant difference between the two groups ($p = 0.872$, $p > 0.05$. However, the post-test values demonstrated a highly significant improvement in Group A compared to Group B ($p \leq 0.001$). This values suggests that the intervention administered in Group A was more effective than Group B in improving kyphotic posture as measured by the Flexi-Curve Test refer Figure 1.

Table-1 Comparison of Flexi Curve Test between Group A & Group B in Pre and Post Test

FLEXI CURVE TEST	**GROUP – A**		**GROUP – B**		t - TEST	Df	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D			
PRE-TEST	171.85	8.88	172.92	6.03	-0.38	14	.872*
POSTTEST	200.31	19.01	173.88	5.01	4.65	14	.000***

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and p-value between (Group A) & (Group B) significance is highlighted in value of p **(*- P > 0.05), (***- P ≤ 0.001)**

Figure -1 Comparison of Flexi Curve Test between Group A & Group B in Pre and Post Test

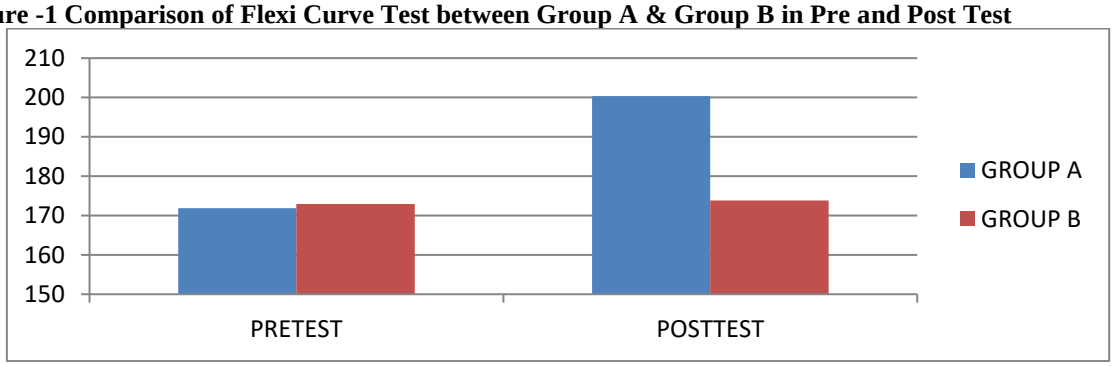
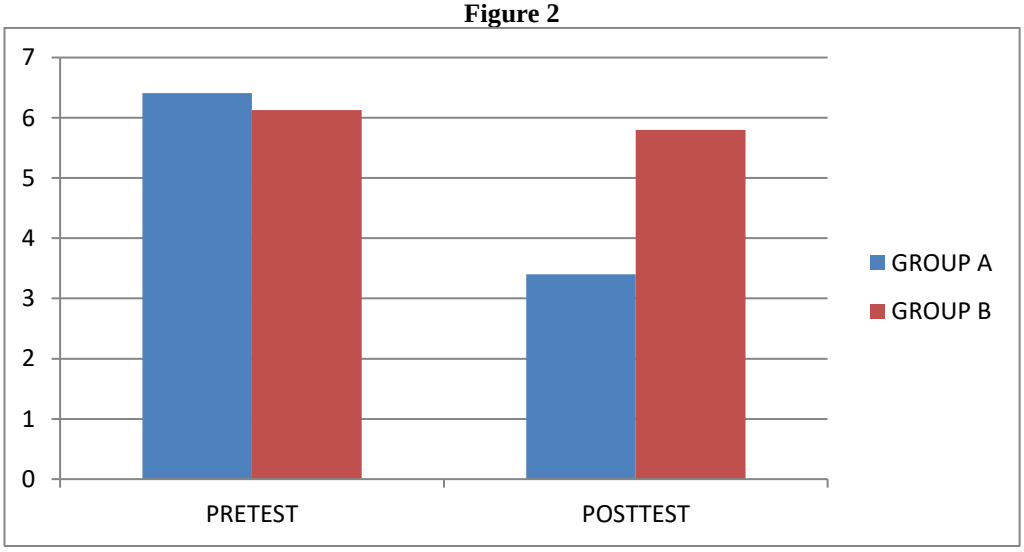


Table 2 presents the comparison of Open working time between the two groups. The pre-test values showed no significant difference between Group A and Group B ($p = 0.437$, $p > 0.05$). Post-test values, however, revealed a highly significant difference between the groups ($p \leq 0.001$), with Group A showing greater reduction in OWT values, reflecting an improved posture outcome compared to Group B refer Figure 2.

Table 2 Comparison of Open working time value between Group A & Group B in Pre and Post Test

Open working Time	**GROUP – A**		**GROUP – B**		t - TEST	df	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D			
PRETEST	6.41	0.99	6.13	1.30	-0.78	PRETEST	.437*
POSTTEST	3.40	0.63	5.80	0.67	-10.0	POSTTEST	.000***

Figure 2



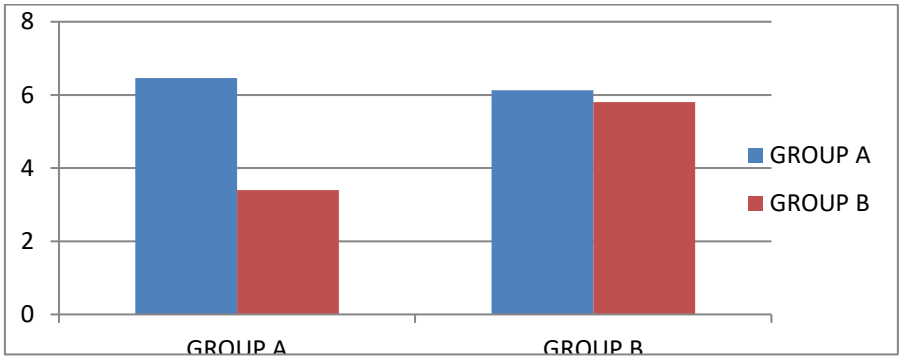
The within-group analysis shown in Table 3 indicated that Group A demonstrated a highly significant reduction in Open Working Time values from pre- to post-test ($p \leq 0.001$).

Table-3 Comparison of OWT between Group A & Group B in Pre and Post Test

OWT	GROUP – A		GROUP – B		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
GROUP- A	6.46	0.99	3.40	0.63	0.789	.000***
GROUP- B	6.13	1.30	5.80	0.67	-2.40	.034*

The above table reveals the Mean, Standard Deviation (S.D), t-test and p-value between (Group A) & (Group B) significance is highlighted in value of p **(*- P > 0.05), (***- P ≤ 0.001)**

Figure 3



This further supports the effectiveness of the intervention provided to this group. Conversely, Group B showed no statistically significant change between pre- and post-test OWT values ($p > 0.05$), again suggesting limited effect of the control intervention refer Figure 3.

DISCUSSION:

The study's was performed to find out how a comprehensive corrective exercise (CCEP) regimen can help in kyphotic posture among patients with thoracic kyphosis. The results of our study revealed that CCEP had significantly decreased the thoracic kyphosis when compared to the control group. Beyond just rehabilitation, Swiss ball exercise improves muscle strength, endurance, flexibility, coordination, and perceptual balance. It is used to enhance general posture and avoid injuries to the neck and waist in addition to treating these conditions. Corrective exercise programs for TK are used to protect the spine during static/dynamic loading and to achieve ideal spinal alignment[17]. A study by Gardner and Briggs (2017) in the SHEAF suggested that the older adults undergoing an exercise and posture training program showed significant improvement in kyphotic curvature. A similar study was conducted by Kang and colleagues revealed that combining scapular stabilization with thoracic extension exercises would show significant improvement in head posture among office workers[18, 19].

Adjusting posture and treating and preventing neck and waist ache are among the rehabilitative uses of Swiss ball training. Along with enhancing perceptual balance, it can also increase muscle strength, endurance and flexibility. Exercise using swiss ball to stabilize the trunk can help enhance bodily process and core muscle activation. According to Seidal et al[20] correcting the kyphosis angle in older person's required total corrective exercise, which was found to be substantially more successful than compared to less intensive corrective exercise (LCEP).the study concludes that CCEP had a great effect in correction of postural hyper-kyphosis[21].

Apart from the reduction of thoracic kyphosis, the exercise program improved postural stability. This suggests that the exercises enhanced the ability to keep a stable posture, which is essential for everyday activities and general physical health, in addition to correcting the upper back's curvature. A randomized control study was conducted among adolescents in a private school though the study was a comparison between Thoracic Exercise Program (TEP) and CCEP[22] the CCEP showed remarkable improvement in the thoracic kyphosis angle and recommended as a good method and in our study the target group was older patients.

Poor postural awareness is closely associated with habitual posture issues. Prolonged sitting of adaptation of an improper postures during day today activates would diminish the individual's capacity to perceive and restore a neutral spinal alignment. Hence, it is mandatory to create a postural awareness for effectively correcting maladaptive postural patterns[23, 24]. In the present study

we have adapted a CCEP method of the geriatric population with 30 patients and swiss ball was the main exercise tool used in the study. I really worked for geriatric population. The CCEP method showed promising results suggesting that the targeted exercise can help improve posture and alignment of the spine in raising the thoracic kyphosis angle.

CONCLUSION:

It is a comprehensive corrective exercise program to conducted among the geriatric population with a small sample size. Kyphosis, an excessive curvature of the spine, significantly improved after participants underwent a thorough corrective exercise program. This study involved two groups, who underwent 12 weeks of training aimed at enhancing postural awareness and providing detailed instruction on corrective exercises was evident by the CCEP method. However further studies are required to prove its effectiveness with a long period of time.

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