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EFFECTIVENESS OF WOBBLE BOARD LATERAL STEP-UP vs. STABLE PLATFORM LATERAL STEP-UP IN HIP ABDUCTOR STRENG THENING ON HEALTHY SUBJECTS

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ABSTRACT

Objective of this study is to compare the effect of the wobble board lateral step-up exercise or stable platform lateral step-up exercise in strengthening of hip abductor This study concentrated on hip strengthening, especially the hip abductors is an important on dominant side stability and it may strengthened by lateral step-up exercises. Convenient sampling method was used among the students of Saveetha University Chennai, Tamil Nadu, India. Grouping was done by random block design. Sixty healthy subjects (aged between 18 – 30 years) volunteered for this study. . They were divided into 2 equal groups. One group received the wobble board lateral step-up exercise, while the other group received stable platform lateral step-up exercise. The wobble board lateral step-up exercise group demonstrated significantly greater improvement in strength of hip abductor, with a mean difference of4.701 lb ($p<0.005$)) than the stable platform lateral step-up exercise group. The study showed that wobble board lateral step-up exercise is more beneficial in improving Hip abductor muscle strength than stable platform lateral step-up..

KEYWORDS: ***Gluteus medius, strengthening, step-up, Lateral step exercises.***

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INTRODUCTION

Muscle strength is a broad term that refers to the ability of contractile tissue to produce tension and a resultant force based on the demands placed upon the muscle[12]. Muscular strength is an important factor in determining the effectiveness of the work done[44,45]The gluteus medius is described as a strong abductor and medial rotator of the hip joint. During the stance phase of gait, the gluteus medius is supported to prevent the sagging of the pelvis on the unsupported side. The action of the gluteus minimus is said to be similar to that of gluteus medius[17]. Therapeutic exercise is one of the most important interventions used by rehabilitation professionals. Therapists routinely prescribe hip abduction strengthening exercises in patients who have sustained hip injury or others who have undergone total hip arthroplasty[26]. Physical therapists use many variations of hip abductor strengthening exercises in the rehabilitation process. Many clinicians use a standard side lying hip abduction exercise[18,27,43]. Other common methods of strengthening hip abductor muscles include, the weight bearing exercises[26] were pelvic drop, weight bearing hip abduction, weight bearing with flexion abduction of contralateral hip and the non-weight bearing exercises[26] were non-weight bearing side-lying hip abduction, non-weight bearing standing hip abduction, and Non-weight bearing standing flexed hip abduction. Neumann and colleagues[32,33,34,40]reported that electromyography (EMG) activity of hip abductors during the stance phase of walking increases when carrying a load in the hand contralateral to the stand phase of hip abductor. This study intends to compare the effectiveness of weight bearing hip abduction in stable platform lateral step-up and wobble board lateral step-up in improving the strength of hip abductors[26].

MATERIALS AND METHODS

This study was conducted among the students of Saveetha University at post-graduate research laboratory in physiotherapy outpatient department. Chennai, Tamil Nadu, India. Convenient sampling method was used among the students of Saveetha University, Chennai, Tamil Nadu, India. Grouping was done by Random block design in to two groups with each group consisting of 30 subjects. Normal healthy male individuals in the age group 18-30 and the mean age of 24 years.years. Ability to performed single limb standing without any difficulties, Patients with history of any recent injury in lower limbs, any recent fracture in the lower limb, any neurological weakness in lower limb, feel difficult in single limb standing were included in the study. Limb length discrepancies were excluded. Subjects were tested in a gravity minimized supine position with a hand held dynamometer attached to a stationary device stabilized at the edge of examination couch. Right lower extremity was chosen for evaluation and data collection for all participants. subjects. The Tools used for data collection were Stable platform lateral step up height of 11cms, wobble board, Hydraulic Hand Held Dynamometer (Base line Hydraulic Hand Held Dynamometer- FEI – Irvington,NY -10533. U.S.A.), Inch tape with SI units, calibrated weight cuff (weight of 1 Kg) and waist band for fixation of subject pelvis. The hand held dynamometer was fixed on the side of the examination couch[17,37,462]. Soft foam was placed on the handle of the hand held dynamometer to provide comfort to the subjects during the participation[17]. Subjects were tested in a gravity minimized supine position with a hand held dynamometer attached to a stationary device stabilized at the edge of examination couch. Right lower extremity was chosen for evaluation and data collection for all subjects. Subjects were positioned so that the dynamometer was 5 cm proximal to the lateral femoral condyle of the right limb[17,16,23] . The same placement was used for each subject during pre and post-tests. To stabilize the pelvis, a belt was placed across the participant's anterior superior iliac spines and around the table during the testing procedure[6,17,]. Care was taken not to allow the subjects to rotate the pelvis or perform internal rotation, external rotation or flexion at the hip. Use of upper extremities to stabilize the trunk was permitted. Maximum effort was used to perform a "Make test"[17,]in which subject exerted a maximal isometric force against the dynamometer for two or four seconds on each of the pre and post-test. Three measurements were taken and average to be used as data for analysis. The subjects practiced each exercise to familiarize themselves with each task until they demonstrated proficiency. Subjects generally required 8 to 10 practice repetitions for respective exercise.

Description of the weight bearing hip abduction exercises

Group A subjects stood with both lower extremities shoulder widthe apart then they perform a lateral step-up on the 11cm height wobble board in a frontal plane following which keeping the pelvic a level position the subjects lifts the contra lateral lower extremity from the ground and abduct the leg up to 25 degrees[17,39] ,then the subject return back to starting position and repeat the same exercise for 15 repetitions of 3 sets.In group B, the subjects stood on their right lower extremity on 11cm high stable platform in a frontal plane and maintaining the pelvis in level and then were instructed to lift the contralateral extremity from the ground and to abduct to 25˚. In the both procedures, a 1 Kg sandbag was added at the ankle level at the contralateral lower extremity[26] for enhancing ipsilateral hip abductor recruitment. The frequency of exercises was three sessions for a week for four weeks duration. The subjects were asked not to indulge in any sports activity or exercise programme during the duration of the study. At the end of the fourth week the post-test dynamometric values were noted.

RESULTS

The collected data was tabulated and analyzed using descriptive statistics to assess all the parameters mean and standard deviation was used. To check the significant changes between pre and post-test by paired t-test and compare the mean value changes between the stable and wobble board exercises by t-test was used.Testing the effectiveness of wobble board lateral step-up exercise in increasing the strength of hip abductor using paired t-Test.

Table 1

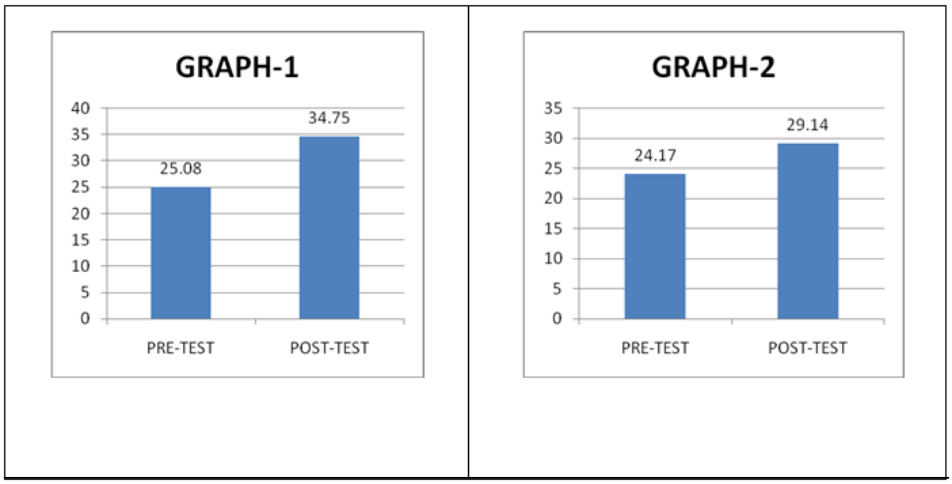
	Mean (lb)	S.D.	Mean difference (lb)	Paired t-value	p value
Pre-test	25.085	5.03			
Post-test	34.752	4.63	9.667	40.92	p=0.0001

The above table reveals that pre-test mean = 25.085 lb and S.D. = 5.03, post-test values with mean = 34.752 lb and S.D. = 4.63. The post-test values are gradually increasing with mean difference 9.667 represented in graph 1 The paired t-value (40.92) shows that there is statistically significant change at p<0.05 over the study duration using wobble board lateral step-up exercise in improve the strength of hip abductor. Testing the effectiveness of stable platform lateral step-up exercise in increasing the strength of hip abductor using paired t-Test.

Table 2

	Mean (lb)	S.D.	Mean difference (lb)	Paired t-value	p value
Pre-test	24.174	3.52			
Post-test	29.141	3.27	4.967	31.37	p=0.0001

The above table reveals that pre-test mean = 24.174 lb and S.D. = 3.52, post-test values mean = 29.141lb and S.D. = 3.27. The post-test values are gradually increasing with mean difference 4.967 represented in graph 2. The paired t-value (31.37) shows that there is statistically significant change at p<0.05 (5% level)) over the study duration using stable platform lateral step-up exercise in improve the strength of hip abductor.

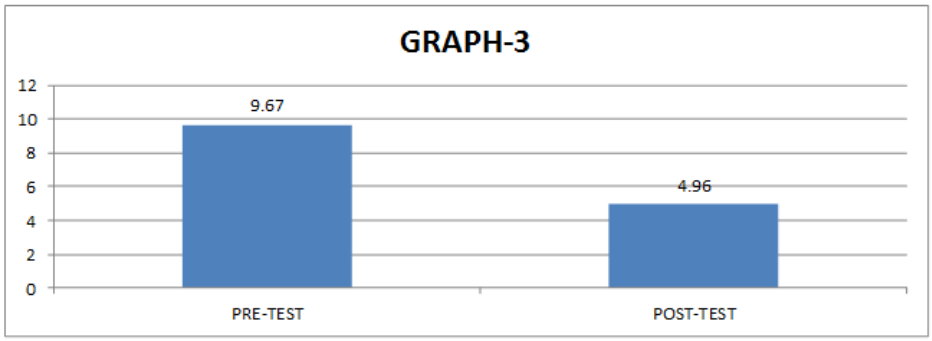


Comparing the effectiveness of wobble board lateral step-up with stable platform lateral step-up in increasing the strength of the hip abductor.

Table 3

Intervention	Mean (lb)	S.D.	Mean difference (lb)	t-value	p value
Wobble board lateral step-up	9.67	1.29	4.701	16.53	p=0.0001
Stable platform lateral step-up	4.96	0.86			

The above table reveals that the wobble board lateral step-up with mean improvement of = 9.67 lb and S.D. = 1.29, the stable platform lateral step-up values with mean improvement of = 4.96 lb and S.D. = 0.86. The wobble board lateral step-up exercise mean (9.67 lb) is greater than the stable platform lateral step-up exercise (4.96 lb) represented in graph 3 The t-value (16.53) shows that there is statistically significant difference at p<0.05 (5% level) between wobble board lateral step-up exercise and stable platform lateral step-up exercise. The comparison shows that there is significant increase in the strength of hip abductor using wobble board lateral step-up than using stable platform lateral step-up exercise.



DISCUSSIONS

This study concentrated on to improve the strength of hip abductor muscle by using wobble Board Lateral Step-up and stable platform lateral Step-up Exercise, among 60 subjects, 30 subjects received wobble Board Lateral Step-up hip abductor exercise and other 30 received the stable platform lateral step-up hip abductor exercise. . Nawoczenski and Neumann (2002) have defined an internal torque as the effect of a force tending to move a body segment about a joint's axis of rotation[5,13,42] with its magnitude dependent on the applied external torque. In this programme, the external torque produced by gravity on head, arms, trunk and contralateral lower extremity (approximately 84% of body mass)[26]contracted by internal forces of gluteus musculature. Exercise in weight bearing generates very high torque for hip abductor muscle than non weight bearing hip abductor exercises. Hence exercise in weight bearing would be more beneficial in gluteal muscle strengthening and rehabilitation[3,19,21] . Lateral step-ups on unstable platform (wobble board) have not been described in literature. This study focused on strength improvements due to unstable platform lateral step-ups. In this exercise with wobble board lateral step-up improved better than stable platform lateral step-up. This may be attributed to inducing neuromuscular adaptations of stretch reflex, elasticity of the muscle and sensory system of the joint [1,23,28,35],. Weight bearing exercises induce co-contraction of agonist and antagonist muscle synchrony in maintaining joint stability by increased joint compression. Wobble board lateral step-up may have enhanced sensory motor training of the hip abductor muscle in contribution to improved muscle performance. The results of this study are evidenced in previous study by Alagesan and Ramadass [3] . The study noted that there is significant improvement in the strength of abductor in the both groups. This may be due to specific training of hip abductor muscle due to body weight resistance in lateral step-up exercises. Clinically, many study reveals that these exercises are very helpful in late – phase of exercise program in conditions like total hip arthroplasty, after fracture immobilization, ankle sprains, iliotibial band friction syndrome, and knee joint dysfunction condition and also sporting activities, like basket ball, and soccer, required movements in lower limbs. The main operational difficulty faced during this study was the regular follow-up of the subject which needed repeated reinforcements to the subjects. In an over all view in this study states that exercises are better effective in strengthening hip abductors during late phase of rehabilitation.our limitation were difficult to maintain the regularity of the participants, and it may be experienced in pathological conditions hip and knee joint

CONCLUSION

This present study suggests that wobble board lateral step-up exercise is better effective in improving the muscle strength of hip abductor than the stable platform lateral step-up exercise. So, the wobble board lateral step-up exercise may be used in orthopedic rehabilitation for improving the strength of hip abductor muscle.

CONFLICT OF INTEREST

Conflict of interest declared none.

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