International Journal of Educational Research and Studies
www.journalofeducation.net
Online ISSN: 2664-6811, Print ISSN: 2664-6803
Received: 05-09-2021, Accepted: 22-09-2021, Published: 06-10-2021
Volume 3, Issue 4, 2021, Page No. 1-3

Short term effect of therapist assisted muscle energy technique versus Self assisted muscle energy technique in glenohumeral internal rotation deficit (GIRD) in badminton players: A comparative study

Kimaya Dhongade[1], Sonam Jain[2]
[1] BPTh, PES Modern College of Physiotherapy, Pune, Maharashtra, India
[2] Assistant Professor, MPT in Community Physiotherapy, P.E.S. Modern College of Physiotherapy, Pune, Maharashtra, India

Abstract
The overhead smash in Badminton challenges the posterior cuff of the shoulder, causing posterior shoulder tightness and subsequent Glenohumeral internal rotation deficit (GIRD). Muscle Energy Technique (MET) is defined as a manual therapy intervention used to stretch the muscles and fascia that lack flexibility. The aim of this study was to compare the short term effect of therapist assisted MET and self-assisted MET on GIRD in badminton players. 64 players (age 18-28yrs, with GIRD=8o or more) were randomly assigned to Therapist assisted MET for the horizontal abductors and Self assisted MET group (for 4 consecutive days). Both the groups showed extremely significant improvement post the intervention (P= <0.0001). The mean comparison of post-intervention findings of both the groups were not statistically significant (P=0.2486). The findings suggest that Therapist assisted MET and self-assisted MET are equally effective in reducing the Glenohumeral internal rotation deficit in badminton players in a period of 4 days.

Keywords: gird, badminton players, met, self-assisted met

Introduction
Badminton is a high-paced game and is considered one of the fastest racquet sports. It is played with predominantly overhead shots and hence competitive badminton requires excellent fitness [1, 2, 3]. The game requires extreme overhead motion with shoulder abduction and external rotation. Prevalence of shoulder pain in badminton players is >50% in recreational and elite badminton players.[3,4] Overhead badminton shots place a high degree of load on the shoulder joint, and an increase in the range of the shoulder mobility is a characteristic demand of this sport. Internal rotation of the shoulder is an essential component of an effective smash. In events where players are required to perform short and sudden movements along with sudden change in the direction of play, they have to face the risk of injuries to joints and muscle-tendon unit [1]. A study conducted by International Badminton Federation in 2002, 30% of the total shots played in Badminton is over-head shots [5]. Even if being a non-contact, injuries are very common which also comprises overuse injuries and acute traumatic events. The game requires complex repetitive upper and lower extremity movements with constant postural variations and poses a high risk of overuse injuries to both the appendicular and axial musculoskeletal systems. The repetitive overhead forehand and backhand strokes in badminton are executed with a very short hitting action and while incorporating deception, apply excessive stress on the upper extremity, especially the shoulder. Rotator Cuff tendinopathy has been one of the most common diagnoses, wherein even international players have reported most common site of pain has always been the shoulder in the upper limb [1, 2, 4, 6]. Overhead throw can be defined as action produced by use of the internal rotators with the arm separated from the trunk and the extension from the elbow as a major upper limb action to hurl an object into the open space. The mechanics which are taken into consideration for overhead stroke or serve in racquet sports are equivalent to overhead throwing where the shoulder has to be lax enough to allow the extra degrees of ER necessary for an adequate serve and at the same time has to be stable enough to prevent any subluxation [7, 8, 9]. The phases of overhead stroke in badminton are: 1) Windup 2) Early cocking 3) Late Cocking 4) Acceleration 5) Deceleration 6) Follow Through

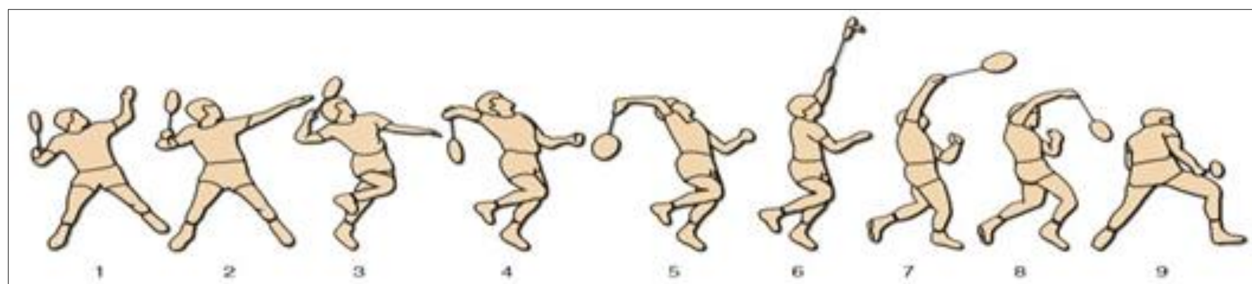

Fig 1: Phases of overhead smash

In late cocking phase, anterior capsule undergoes significant strain to resist anterior translation of the humerus [7, 8, 9,]. As Overhead activity increases, there is continuous strain on the posterior cuff as it decelerates rapidly during the follow through phase which leads to muscular fatigue and thus larger transfer of stress to the posterior capsule, causing micro-trauma to the posterior capsule [7, 8, 9]. The Postero-inferior capsule resists distractive forces of up-to 750N on the shoulder joint during the follow through phase of an overhead motion. Posterior Capsule undergoes micro trauma due to repetitive loading which causes hypertrophy and increase in fibroblastic activity during the healing. This leads to contracture and thickening of the posterior capsule. Due to the reduced capsular pliability, internal rotation, extension and horizontal adduction is restricted [8, 9]. Total arc of motion of Glenohumeral joint is equal to 180o (internal rotation=90o, external rotation=90o). A loss of Glenohumeral internal rotation as compared with the contralateral side is termed as GIRD. With continuous overhead activity players demonstrate posterior capsule contracture resulting in decrease in internal rotation leading to GIRD [7, 8]. Biomechanically it is the osseous adaptation (humeral retroversion) which also contributes to posterior capsule tightness and further leads to GIRD [7, 9, 10]. It has been proven that GIRD values of more than 25o-30o is related to labral injuries. In a study conducted by Khushboo Bathia, *et al*, a minimum difference of 8o was observed in the badminton players and injuries were found in the players with similar measurements of GIRD as mentioned in the previous statement [7]. The prevalence of GIRD in overhead athletes was found to be 29.1% [9]. GIRD causes alterations in biomechanics such as scapular "wind-up" or alteration of glenohumeral joint kinematics, which can in turn lead to clinical findings of several musculoskeletal injuries including superior labral anterior-posterior (SLAP) lesion, internal impingement, ulnar collateral injury, and subacromial impingement [7, 11, 12, 13, 14,] hence, failure to recognize GIRD can put the shoulder at risk for injury. Posterior shoulder tightness has been proved to be one of the factors leading to GIRD [7, 8, 13, 14]. A better awareness and understanding of the condition is needed, which may contribute towards reduced risk of injury and improved performance in badminton players. “Muscle energy technique (MET) is a form of soft tissue, or joint manipulations or mobilizations, deriving from osteopathic medicine, employed in the treatment of musculoskeletal dysfunction” according to Lean Chaitow Muscle Energy Technique [5]. MET is a manual therapy intervention that can be used to stretch or lengthen muscles and fascia that lack flexibility [13, 15, 17, 18]. In Muscle Energy Technique the subject has to create a force by activating the targeted muscle tendon unit against the counterforce applied by the therapist, followed by relaxation and a passive stretch [13, 15, 17, 19, 20]. According to a study by Sonakshi Sehgal et.al, MET is an effective treatment for increasing the ROM and strength of internal rotation at the glenohumeral joint in asymptomatic overhead athletes [19]. It has been proven that a single application of MET for GH joint horizontal abductors in baseball pitchers resulted in increased GH joint horizontal adduction and internal rotation [17]. Athletes with posterior shoulder tightness with muscular limitations showed improved results in both internal rotation and horizontal adduction ROM when treated with MET for horizontal abductor muscle group of the shoulder [13, 17]. In a study by Stephanie Moore, et.al, it was demonstrated that a single application of MET for the GHJ horizontal abductors provides immediate improvements in many asymptomatic collegiate baseball player In both the GHJ horizontal adduction and internal rotation ROM. No significant improvement was noticed in horizontal adduction or internal rotation ROM after single application of MET to the GHJ external rotators [13, 21]. Thus, application of MET for the horizontal abductors may be useful to gain ROM in overhead athletes. One application of MET may consist of 3 to 5 contractions, held for 5-10 seconds each, with a stretch following each contraction that ranges from 3 to 5 seconds to 30 to 60 seconds [13, 21]. Although there have been studies on comparison between supervised exercise program versus home exercise program in various conditions, there have been no studies comparing effects of therapist assisted MET and self MET on GIRD. The aim of this study was to compare the short term effect of therapist assisted MET and self MET on glenohumeral internal rotation deficit in badminton players.

Materials and Methods

Participants

The study began after getting ethical clearance. 87 badminton players, irrespective of their gender [7] and experience in the sport, from various badminton clubs in and around the city, were approached, explained of the study and internal rotation ROM of bilateral shoulder joint was compared. In the present study, the measurement of the ROM of internal rotation was done in the supine lying position, as this position is more reliable and comfortable for the subject. Scapular stabilization is optimum in supine lying position and hence reduces the errors during examination. The arm being tested was kept in 90o of abduction, elbow in 90o of flexion and the forearm in mid prone position. Elbow was not supported by the examining table and the humerus was in level with acromion process of the shoulder. Goniometer was aligned in the same way for every participant to minimize error. (Center of fulcrum- Over olecranon process, proximal arm-perpendicular or parallel to the floor and distal arm- Aligned with Ulna.) [22] The shoulder was medially rotated by moving the forearm anteriorly maintaining the shoulder in 90o of abduction and elbow in 90 degrees of flexion [21, 22]. Glenohumeral internal rotation deficit was calculated by subtracting the internal rotation (IR) range of the playing shoulder from the IR range of the non-playing shoulder.

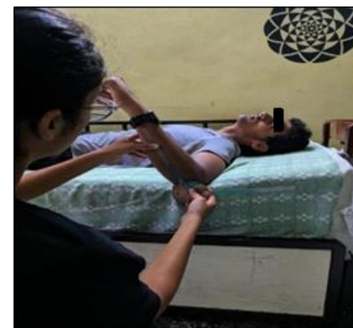

Fig 2: Measurement of internal rotation ROM

Players with GIRD of ≥ 8o were included in the study. All players were free from any musculoskeletal problems related to the playing shoulder, recent fractures (up to 6 months) of playing humerus/scapula/ clavicle/spine and a hyper mobile playing

shoulder joint. The players were currently in practice and performed training sessions as per their schedules. Testing took place before the players started their training and all participants were informed of the protocol prior to signing a consent form to participate in the study.

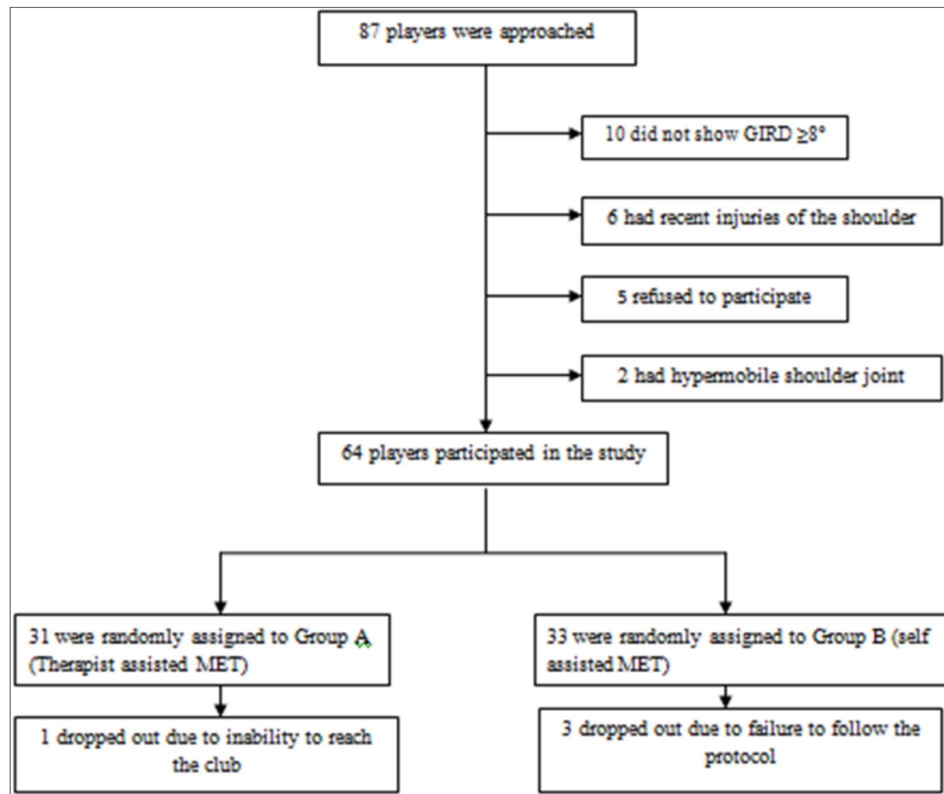

Fig 3: Flowchart of methodlogy

Protocol: group A-Therapist assisted Met for horizontal shoulder abductors [21]

The players were in supine position on a plinth with the lateral border of their scapula stabilized and arm flexed to 90o with the elbow flexed. The shoulder was horizontally adducted to the first point of tissue stretch. They were instructed to perform 7 seconds isometric contraction at approximately 25% of maximal effort in direction of horizontal abduction, against an opposing force applied by the therapist at the distal humerus. After this the therapist applied 30 seconds active assisted stretch during which the participant was instructed to relax and a new movement barrier was engaged. This was performed for a total of three repetitions and 4 sessions were completed.

Fig 4 and 5: Therapist assisted MET for horizontal shoulder abductors

Protocol: Group B self Met for horizontal shoulder abductors players lied down supine with affected arm flexed 90o, elbow flexed and scapula stabilized by

The plinth. They were taught and instructed to perform a 7 seconds isometric contraction at approximately 25% of maximal effort in direction of horizontal abduction, against an opposing force applied by the player at the distal humerus of the affected arm. After this they were instructed to apply 30 seconds active assisted stretch with the other hand during which they had to relax the affected arm and acknowledge the new movement barrier achieved. This was performed for a total of three repetitions and 4 sessions were done.

Fig 6: Self assisted MET for horizontal shoulder abductors

Data Analysis

In this study, 64 subjects participated and were randomly divided into two groups: A (Therapist assisted MET) and B (Self assisted MET). Group A had 31 subjects whereas group B included 33 subjects. 1 player dropped out from group A while 3 players dropped out from group B. The data was analysed using Graph Pad t-test software. Mean and standard deviation of pre and post Intervention variables were calculated. The data was then subjected to statistical analysis. The average relative GIRD values recorded at the beginning of 4 days of intervention, of group A was compared with group B and analyzed using unpaired-t test (For baseline matching). Paired t-test was done for pre and post intervention results of both the groups. Similarly, the average relative difference in the GIRD values recorded at the end of 4 days of intervention, of group A was compared with group B and analyzed using unpaired-t test.

Results

Mean comparison of pre intervention GIRD values

Table 1: Mean Comparison of Pre Intervention GIRD values

Pre-intervention	Mean	SD	T value	P value	Significance
Therapist assisted	19.7	7.72	0.684	0.4967	Not statistically
Self assisted	18.3	8.13			Significant

Mean Comparison of Therapist assisted Pre-intervention GIRD and Post-Intervention GIRD values

Table 2: Mean comparison of therapist assisted Pre-intervention GIRD and Post-intervention GIRD values

Therapist assisted	Mean	SD	T value	P value	Significance
Pre-intervention	19.7	7.72			
Post-intervention	3.03	5.99	13.4967	<0.0001	Extremely significant

Mean Comparison of Self assisted Pre-intervention GIRD and Post-Intervention GIRD values

Table 3: Mean Comparison of Self assisted Pre-intervention GIRD and Post-Intervention GIRD values

Self assisted	Mean	SD	T value	P value	Significance
Pre-intervention	18.54	8.37			
Post-intervention	1.14	6.36	13.4688	<0.0001	Extremely significant

Mean Comparison of Post-Intervention GIRD values

Table 4: Mean Comparison of Post-Intervention GIRD values

Post-intervention	Mean	SD	T value	P value	Significance
Therapist Assisted	3.03	5.99	1.1659	0.2486	Not Statistically
Self assisted	1.14	6.36			Significant

The difference between the pre and post GIRD values were compared in both the groups and analyzed using paired–t test. The pre and post GIRD values in Group A, showed a p value<0.0001 which is extremely statistically significant and thus Therapist assisted Muscle Energy Technique is effective in improving glenohumeral internal rotation range of motion. The pre and post GIRD values in Group B, showed a p value <0.0001 which is statistically significant and thus Self assisted Muscle Energy Technique is effective in improving glenohumeral internal rotation range of motion. Comparing the post intervention GIRD values of Group A and Group B self-assisted MET are equally effective.

Discussion

The aim of the study was to compare the short-term effect of Therapist Assisted MET versus Self Assisted MET on glenohumeral internal rotation deficit in Badminton Players. Different badminton centers were visited and subjects were selected on the basis of inclusion criteria and divided into 2 groups- Group A (Therapist Assisted MET) and Group B (Self Assisted MET). The pre-intervention GIRD values of both the groups were calculated and compared for baseline matching (p=0.4967). The pre and post intervention GIRD values for Group A (p<0.0001) and Group B (p<0.0001) were calculated and found to be statistically significant. On comparing the post intervention GIRD values for both the groups, it was seen that both the groups were equally effective in reducing the glenohumeral internal rotation deficit in badminton players (p=0.2486).

A study by Khushboo and Charu (2013) suggested that the mechanism underlying the improvement in the ROM in MET group could be because of reflex muscle relaxation and tissue texture changes following MET [23]. Muscle relaxation following isometric contraction is claimed to be mediated by the golgi tendon organ with its inhibitory influence on the α-motor neuron pool and by reciprocal inhibition from contraction of a muscle antagonists [21, 23]. Physiologic changes occur following MET which include Golgi tendon organ activation which results in direct inhibition of agonist muscles, a reflexive reciprocal inhibition occurs at the antagonistic muscles, and as the patient relaxes, agonist and antagonist muscles remain inhibited allowing the joint to be moved further into the restricted range of motion [21, 23].

Another study by, Greenman (1989) depicts that Muscle Energy Technique helps to regain the mobility of the hypomobile joints by restoring normal length tension relationships which are shortened and by strengthening the weakened muscles and reduce edema by pumping action for lymphatic system [13].

Both the groups in the study were equally effective in reducing the GIRD values at the end of the 4-day intervention period. This suggests that MET is a relatively simple technique to replicate for the subjects by themselves and the results derived are almost similar. In the past research, it was demonstrated that a single application of MET for the GHJ horizontal abductors results in greater post treatment GHJ horizontal adduction and internal rotation ROM immediately following treatment [13]. MET is a skilled technique which requires precise application of force by the physiotherapist as per the subject's need. But, MET applied for shoulder horizontal abductors is relatively easy and the subject can estimate the force required as per his needs. As MET has shown significant effect in a short intervention period, it is easier for the players to follow the protocol thoroughly with less chances of dropping out. Due to the Covid-19 pandemic, a larger Sample size could not be included. In the future, long term effects of the same 4-day intervention protocol can be assessed. Effect of protocol of longer duration can be observed and can be compared with the current study. Combination of MET with other techniques can be applied and analysis can be done accordingly.

Conclusion

Findings of this study indicate that the short term effect of therapist assisted MET and self-assisted MET for glenohumeral internal rotation deficit was equally effective in badminton players. Whenever the players go for tournaments, the physiotherapist might always not be available. In such situations, this technique is easy to replicate where the players can perform it by themselves and can still obtain significant results. This can help them in reducing shoulder injuries which could have been caused due to restricted internal rotation range. Hence, we conclude that both the groups are equally effective.

References

1. Pardiwala DN, Subbiah K, Rao N, Modi R. Badminton injuries in elite athletes: A review of epidemiology and biomechanics. Indian journal of orthopaedics,2020:54(3):237-45.
2. Ogiuchi T, Muneta T, Yagishita K, Yamamoto H. Sports injuries in elite badminton players. Japanese J Orthop Sports Med,1998:18:343-8.
3. Arora M, Shetty SH, Khedekar RG, Kale S. Over half of badminton players suffer from shoulder pain: is impingement to blame? Journal of Arthroscopy and Joint Surgery,2015:2(1):33-6
4. Hensley LD, Paup DC. A survey of badminton injuries. British Journal of Sports Medicine,1979:13(4):156-60.
5. Hensley LD, Paup DC. A survey of badminton injuries. British Journal of Sports Medicine,1979:13(4):156-60.
6. Fahlström M, Yeap JS, Alfredson H, Söderman K. Shoulder pain–a common problem in world-class badminton players. Scandinavian journal of medicine & science in sports,2006:16(3):168-73.
7. DeBenedette V. Rotator cuff problems among top athletes. The Physician and sportsmedicine,1989:17(5):184-6.
8. Bathia K, Sewani L, Sawantdesai P. Glenohumeral internal rotation deficit (GIRD) in asymptomatic collegiate cricket bowlers and badminton players,2017:11(3):51. Website: www. ijpot. com.
9. Tyler TF, Nicholas SJ, Roy T, Gleim GW. Quantification of posterior capsule tightness and motion loss in patients with shoulder impingement. The American journal of sports medicine,2000:28(5):668-73.
10. Wilk KE, Macrina LC, Fleisig GS, Porterfield R, Simpson CD, Harker P *et al*. Correlation of glenohumeral internal rotation deficit and total rotational motion to shoulder injuries in professional baseball pitchers. The American Journal of Sports Medicine,2011:39(2):329-35.
11. Osbahr DC, Cannon DL, Speer KP. Retroversion of the humerus in the throwing shoulder of college baseball pitchers. The American journal of sports medicine,2002:30(3):347-53.
12. Dabhokar A, Gazdar M, Dabholkar T, Chiddarwar V. Assessment of upper extremity stability, GIRD (Glenohumeral internal rotation deficit)/GERG (Glenohumeral external rotation gain) ratio and strength of internal rotators (IR) and external rotators (ER) in badminton players. International Journal of Physical Education, Sports and Health,2018:5(2):137-42.
13. Gowitzke BA, Waddell DB. Biomechanical studies of badminton overhead power strokes: A review. Biomechanics in sports,1991:9:267-72.
14. Moore SD, Laudner KG, Mcloda TA, Shaffer MA. The Immediate effects of muscle energy technique on posterior shoulder tightness:a randomized controlled trial. Journal of orthopaedic& sports physical therapy,2011:41(6):400-7.
15. Borsa PA, Dover GC, Wilk KE, Reinold MM. Glenohumeral range of motion and stiffness in professional baseball pitchers. Medicine and science in sports and exercise,2006:38(1):21-6.
16. Kini KV, Rathod D, Kumar A. Comparison of Muscle Energy Technique vs Mulligan to Improve Gird in District Level Cricket Bowlers.
17. Clarsen B, Bahr R, Andersson SH, Munk R, Myklebust G. Reduced glenohumeral rotation, external rotation weakness and scapular dyskinesis are risk factors for shoulder injuries among elite male handball players: a prospective cohort study. British journal of sports medicine,2014:48(17):1327-33.
18. Reed ML, Begalle RL, Laudner KG. Acute effects of muscle energy technique and joint mobilization on shoulder tightness in youth throwing athletes: a randomized controlled trial. International journal of sports physical therapy,2018:13(6):1024.
19. Lenehan KL, Fryer G, McLaughlin P. The effect of muscle energy technique on gross trunk range of motion. Journal of osteopathic medicine,2003:6(1):13-8.
20. Sehgal S, Sen S, Dhawan A. Effects of muscle energy technique in increasing range of motion and strength of glenohumeral internal rotator, in athletes with glenohumeral internal rotation deficit. American Journal of Sports Science,2016:4(2):43-8.
21. Gibbon J. Introduction to muscle energy technique. International Therapist,2011:97:26-8.
22. Bathia K, Eapen C, Zulfeequer CP. Effectiveness of Muscle Energy Technique and Passive Stretching on Posterior Shoulder Tightness in Cricket Bowlers-A Randomized Clinical Trial. International Journal of Science and Research (ISJR),2016:5(8):354-60
23. Norkin, Cynthia C. Measurement of Joint Motion: A Guide to Goniometry. Philadelphia: FA. Davis, 1995.
24. Yeole P, Deodhar D. Effect of Muscle Energy Technique and Passive Stretching Versus Mobilization and Passive Stretching On Posterior Shoulder Tightness in Inswing and Leg Spin Bowlers-A Comparative Study.
25. Stausholm MB, Baun M, Bjordal JM, Nielsen D, Aagaard H, Magnusson SP et al. Shoulder Rotational Strength Profiles of Danish National Level Badminton Players. International Journal of Sports Physical Therapy,2021:16(2):504.
26. Dabholkar A, Attili S. Does glenohumeral external rotation gain and glenohumeral internal rotation deficit predict shoulder injury in novice and elite badminton players. Medical Science,2020:24(105):3696-704.
27. Contractor ES, Agnihotri DS, Patel RM. Effect of spencer muscle energy technique on pain and functional disability in cases of adhesive capsulitis of shoulder joint. IAIM,2016:3(8):126-31.