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RESEARCH ARTICLE

MYOFASCIAL RELEASE AND SUPERFICIAL BACKLINE STRETCHING ON HAMSTRING STRAIN IN CRICKET PLAYERS: AN INTERVENTIONAL STUDY

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Abstract

Background: Hamstring Strain is common among athletes which lead to development of injury. Superficial Backline stretching for improving range of motion and flexibility. Using Tennis ball is a form of self-myofascial release results in increasing range of motion. Literature lacks studies done on self- myofascial release and superficial backline stretching. Hence my intention towards this study in comparison to find out the effect of Self Myofascial Release using tennis ball and superficial backline stretching on hamstring strain in cricket players.

Methodology: A total of 24 subjects who were between the age group of 15 -19 years were conveniently allocated based on the inclusion criteria. Subjects received self-myofascial release using tennis ball 60 sec with 3-4 repetitions and 1 min interval of rest between sessions and superficial backline stretching with different poses for 2-3 repetitions and then compared FMS score of all subjects pre and post intervention after giving the superficial backline stretches and myofascial release to all the subjects.

Outcome measure: Functional movement screen (FMS)

Results: The result shows that there is a significant difference in pre and post Score of FMS, pre-FMS score is 15.9167±2.60295 and post score increased to 19.2500±1.59483which shows thatthere is statistical and clinical difference between the pre and post intervention. Functional movement is measured as the primary outcome measure.There is an average improvement of 3.333 with t value 12.487 and $p < 0.05$.

Conclusion: The aim of the study was to compare and find out the effect of Self Myofascial Release using tennis ball and superficial backline stretching on hamstring strain in cricket players., the result showed that there is statistically significant self-myofascial release using tennis ball and superficial backline stretching.

Introduction:-

Prevention and Intervention become focal points for researchers[1]. Increasing number of injuries occurs annually results in decreased physical activity. Muscle strains, ligament sprains and contusions are common injuries seen in

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sports[1]. Cricket is a game played by 400million people involves forceful and rapid movements[2]. It is the eighth sport occurring injuries in the age group of 17 to 25 years with an incidence of 3 per 1000hrs[2]. Risk factors are important for developing preventive measures. The risk factors are classified in to extrinsic and intrinsic[1].The extrinsic risk factors are level of competition, skill level, playing surface, shoe type. The intrinsic factors are Age, Gender, Aerobic fitness, flexibility, previous injury[1].

Flexibility is vital for human function[3]. Flexibility augments safety and optimizes physical activities. The range of motion available in a joint is considered as flexibility[4]. Flexibility is influenced by factors such as Age, Gender and warm-up[5]. Lack of flexibility results early fatigue, impaired functional level and common risk factor for soft tissue injury[6]. Effects of measures of flexibility include joint laxity, muscle tightness and range of motion[1]. Tightness of musculotendinous unit decrease the ability of muscle to elongate.[7]

Muscle tightness occurs due to reducing ability of muscle to deform results decreased range of motion at joint[8]. Hamstrings are group of muscles that have ability to shorten.[9] Hamstring strain and tightness is major cause for development of injury[10]. Hamstring tightness/ strain is considered as inability to achieve greater than 160^0 of knee extension with hip at 90^0 of flexion.[10,11] Biomechanical changes adapted by hamstring muscle shortening can lead to condition such as patella femoral dysfunction, pubic pain back pain patellar tendinitis and postural abnormality[12]. More than half of injuries are sprains and strains shown by studies on athletes. Flexibility enhances prevention of strains and overuse injuries[13].

Maintenance of normal muscle length requires stretching to prevent muscle stiffness, musculoskeletal injuries and improves physical performance[3]. Stretching is recommended to enhance performance and reduce injury[14]. The benefits of stretching include increasing range of motion preventing muscular and postural imbalances, improving athlete performance[15]. Various types of stretching include static, ballistic, active and Superficial backline stretching [16]. Static stretching involves the stretching of soft tissues to the point of resistance held for a period of time. This stretch has the benefits of promoting muscle relaxation and ROM[3]. The sudden increase in the tension of muscle reduces the extent to which the muscle can be lengthened which may increase possibility of injury[6]. The static and dynamic stretches used as warm-up for preventing injury[16,17].

The Superficial Back Line is a continuous line of connective tissue extending from the bottom of the foot up the back side of the body over the top of the head. Tension, movement patterns, trauma, or strain here tends to transmit throughout this fascial line[18]. The superficial back line (SBL) is known to have an effect on the mobility, flexibility of the posterior group of muscles and postural compensations and having seven functional movements: Deep squat, hurdle step, in-line lunge, shoulder mobility, active straight-leg raise, trunk stability push-up, rotator stability.

Any imbalance in the superficial back line can be one of the causes leading to hamstring strain[20.] The muscular portions of the superficial back line majorly consists of slow twitch, endurance fibres; whereas the fascial portion requires extra heavy sheets and bands, as the main function of SBL is to support the body in full upright extension[20.] Tension at one point along the anatomy train can lead to detrimental effects along the entire chain[21.] The capability of fascia to modify its mechanical properties and the strain transmission across the chain, influences the mechanical properties of adjacent regions[22.]

Self-Myofascial Release can be applied using variety of tools. It includes tennis balls, medicine balls, foam rollers, sticks. Foam rollers become popular in fitness and athletes. The tension in muscles activates Golgi Tendon Organ (GTO) that causes autogenic inhibition followed by muscle relaxation. The benefits of tennis ball are improving mobility and range of motion, decreased muscle tone in overactive muscles, improving quality of movement[23].

The injured athletes are less flexible than uninjured athletes[24]. Flexibility is dependent on muscle viscoelasticity[15]. Flexibility reduction causes musculoskeletal damage and impairs functional level.Lack of hamstring flexibility is the vital characteristic of hamstring injuries in athletes[12]. The goals of flexibility are to reduce injury and improve performance[25].

Flexibility can be enhanced by stretching and myofascial release[4]. Superficial backline stretching is the excellent technique[3]. It is used to improve flexibility and range of motion[21]. Myofascial release using tennis ball is another method to increase range of motion[26]. Individually, two techniques show improvement. The combined effects of tennis ball and superficial backline stretching might decrease the strain and influence in flexibility.

Literature lacks in studies found to explore the combined effect of self-myofascial release using tennis ball and superficial backline stretching for hamstring strain in Cricket players. So, the study is intended to find out the effect of Self Myofascial release and superficial backline stretching on hamstring strain in cricket player

Methodology:-

Study population:
Cricket players

Study Design:
Interventional study

Study duration:
6 weeks

Sample size:
24 subjects

Study setting: Bishop cotton boys' school, st. Joseph's boys' school

1. Selection criteria
2. Inclusion criteria:

Active Cricket players; playing since at least one year

Age:
15-19

Gender:
Male
Unilateral/bilateral hamstring strain in individuals(<3months)

Exclusion criteria:

1. Subjects with musculoskeletal, neurological pathology of low back, pelvis hip andknee.[3]
2. Previous history of Kneeinjury.[3]
3. Lesions in hamstringmuscles.[13]
4. Lower limb discrepancy
5. Any Contractures ordeformities.[13]
6. Female players
7. Players below the age of 15 years and beyond the age of 19 years

Procedure:
Twenty-four Subjects meeting the selection criteria are screened and were given self-myofascial release with a tennis ball and then superficial backline stretching.

Screening of the subjects were taken by seven components of Functional measurement Scale.

Pre and post intervention measured by FMS Scale with scoring range 0-3.

TEST		RAW SCORE	FINAL SCORE
DEEP SQUAT			
HURDLE STEP	L		
	R		
INLINE LUNGE	L		
	R		
SHOULDER MOBILITY	L		
	R		
IMPINGEMENT CLEARING TEST	L		
	R		
ACTIVE STRAIGHT-LEG RAISE	L		
	R		
TRUNK STABILITY PUSHUP			
PRESS-UP CLEARING TEST			
ROTARY STABILITY	L		
	R		
POSTERIOR ROCKING CLEARING TEST			
TOTAL			

Self-myofascial release using tennis ball
Warm-up for 5 minutes.[18,46]Myofascial release with a tennis ball for lower limb muscles (hamstrings,Gastrocnemius, plantar fascia)

Iliotibial Band/ Vastus Lateralis-
Subjects were instructed roll the ball over lateral thigh for 60 seconds on both the sides.

Data Analysis
Statistical Methods:
Descriptive statistical analysis has been carried out in the present study. Out Come measurements are measured for Scapular distance LSST, Muscle Strength SRT, Pain using NPRSSignificance is assessed at 5 % level of significance with p value 0.05 less than this is considered as statistically significant difference.

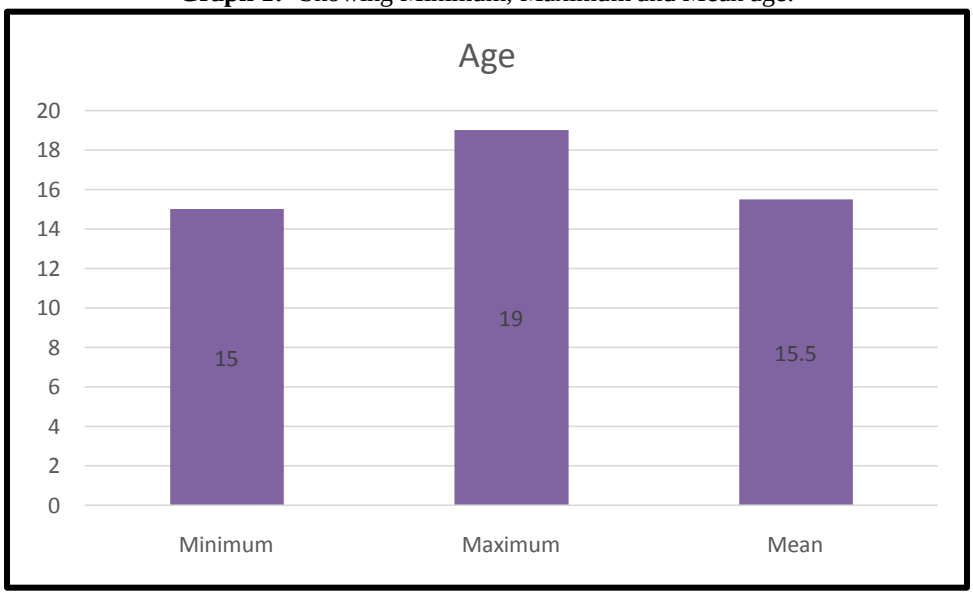
Statistical tests:
1. **Pearson Chi-Square test** and has been used to analyze the significant of basic characteristic of age.
2. **Paired 't' test** as a parametric and **Wilcoxon signed rank test** as a non-parametric test have been used to analysis the variables pre-intervention to post-intervention with calculation of percentage of change.
3. **Independent 't' test** as a parametric and **Mann Whitney U test** as a non-parametric test have been used to compare the means of variables between groups with calculation of percentage of difference between the means

Results:-

General Characteristics Of The Subjects:
Table 1:- Showing Mean and SD of age.

	Minimum	Maximum	Mean	Std. Deviation
AGE	15.00	19.00	15.5	1.693

Graph 1:- Showing Minimum, Maximum and Mean age.

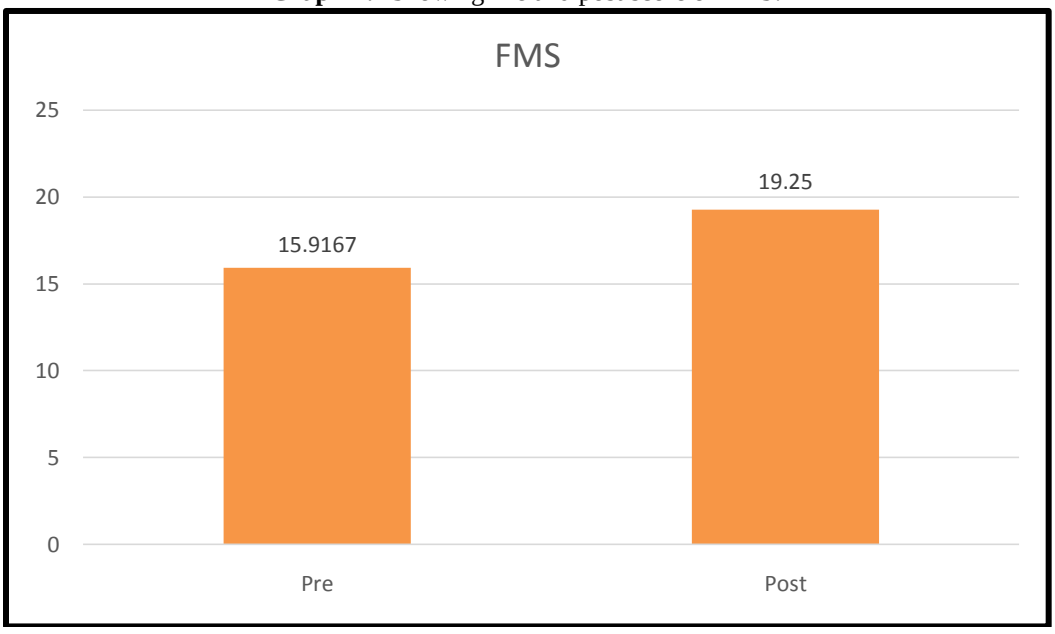


The study includes sample of average age 15.5 ±1.693 years with least age 15 and highest 19 years.

Table 2:- Mean and SD of FMS score.

FMS		Mean	Std. Deviation
	Pre	15.9167	2.60295
	Post	19.2500	1.59483

Graph 2:- Showing Pre and post score of FMS.



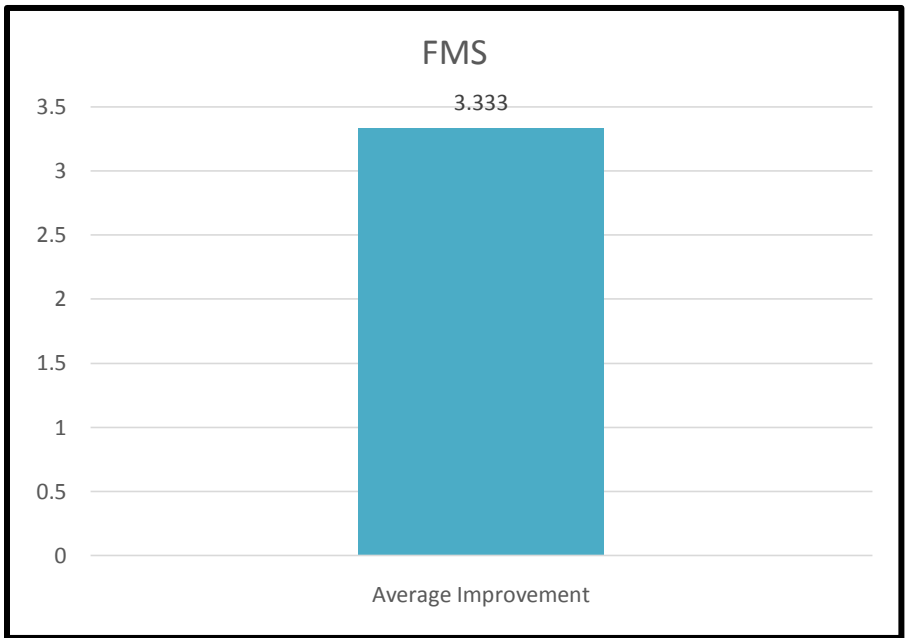
The above table shows pre-FMS score is 15.916±2.6029 and post score increased to 19.25±1.594

Table 3:- Showing pre post comparison in FMS.

	Average improvement	t value	P value	Result

FMS		3.333	12.487	0.000	P<0.05 sig

The above table shows pre-FMS score is 15.916±2.6029 and post score increased to 19.25±1.594 there is an average improvement of 3.333 with t value 12.487 and p<0.05. which indicates there is significant improvement in FMS after the treatment



Interpretation Of Results:
The result shows that there is a significant difference in pre and post Score of FMS, pre-FMS score is 15.9167±2.60295 and post score increased to 19.2500±1.59483. The pre-FMS score is 15.916±2.6029 and post score increased to 19.25±1.594, there is an average improvement of 3.333 with t value 12.487 and p<0.05. which indicates there is significant improvement in FMS after Self myofascial release and superficial backline stretching. The effect size is mainly calculated to know the effectiveness of pre and post interventions.

There is significant improvement in the FMS from baseline to 6 weeks. However, independent sample t-test for FMS between the pre and post confirmed that there is statistically significant difference in FMS at the end of 6 weeks.

Discussion:-

In the present study an interventional study design of 24 subjects were assigned for the study. The purpose of the study is to find out the effect of self-myofascial release using tennis ball and superficial backline stretching on hamstring strain in Cricket players. Subjects were given myofascial release with tennis ball for lower limb muscles (hamstrings,

Gastrocnemius, plantar fascia) and superficial backline stretching in which five different steps of stretching received by the subjects such as standing forward bend, seated forward bend, downward facing dog pose, thunderbolt pose. The outcome measure used was functional movement screen (FMS) in which seven fundamental components i.e., Deep Squat, Hurdle Step, In-line Lunge, Shoulder Mobility, Active Straight-leg Raise, Trunk Stability Push-up, Rotary Stability are used to screen the subjects in which total score is given between 0 to 21 based on the performance and the functional movement screen interpretation is broken into four categories 0,1,2 and 3. The mean post functional movement screen increased from score 1 to 3.

The pre-FMS score is 15.9167±2.60295and post FMS score increased to 19.2500±1.59483 after the intervention of self-myofascial release and superficial backline stretching. The study results show pre-FMS score and post score increased to 19.25±1.594. there is an average improvement of 3.333 with t value 12.487 and p<0.05. which indicates there is significant improvement in FMS after the treatment. A significant increase in FMS score from base line in time of completion of the test from baseline to 6 weeks can be noted.

The athletic trainers, strength and conditioning specialists using the FMS in professional Cricket have casually observed that players with lower scores were more likely to be injured. Basic statistical procedures were used to test this observation. Those players with a score of less than 14 were found to have a substantially greater chance ofinjury over the course of one competitive season than those scoring greater than14.

The findings of this report suggest that cricket players with dysfunctional fundamental movement patterns (as measured by lower scores on the FMS are more likely to suffer a time-loss injury or strain, but cannot be used to establish a cause-effect relationship. Some additional limitations of this study should be noted. Because this review only male players, selection bias is a limitation.

In accordance with the results of the study, an increase in the functional movement screen score is noted, myofascial release using tennis ball could be due to decrease in overactive myofascial tissues and application of pressure to the trigger points causing the Golgi tendons organs to elicit an inhibitory effect on the muscle, allowing it to become less tense and ultimately leading to decrease hamstring strain and improved flexibility. Multiple theories are available in our literature. One of the theories explains about the property of fascia which states that if rolling friction is applied to the fascia, it generates heat and the fascia becomes more gel like allowing for a greater flexibility[18,19,22]

Superficial backline stretching includes different poses which improves flexibility and range of Atef Khalil Rashad et al shows rates of ROM ranged between 19.69% and 308.6% in contract relax, while range was between 6.72% and 168.48% in static stretch.

One more explanation for increased flexibility could be due to the seated forward bend caused by stretch duration. This investigation supports the results of Zakaria[5] et al on improvement in hamstring flexibility by using backline stretching with duration of 30 seconds for 3-4 repetitions. There is a hypothesis that an increase in muscle tension in one part of the body causes excessive tension in other parts of the body due to the continuity of the body. This continuity of the fascia can cause stress on not only the muscles but all the structures that are surrounded and supported by the fascia. Based on this hypothesis and anatomy, Myers supported the increase in the Toe Touch test when the plantar fascia at the end of the SBL was released.[21,23] However, some clinical effects were claimed and there were no formal studies. Therefore, the purpose of this study was to find the effect of superficial backline stretch on hamstring strain.

Results of the present study shows that the self-myofascial release and superficial backline stretching are statistically significant in hamstring strain improvement. These exercises are simple and convenient to be inculcated in the treatment sessions of subjects. In comparison between pre and post FMS score after intervention self-myofascial stretching and superficial backline stretching) it shows significant changes in FMS score $p<0.05$. In this study it concludes that self-myofascial release with tennis ball and superficial backline stretching is effective on hamstring strain in cricket players.

Limitations

1. This study includes male cricket players only, unable to generalize the results to whole population.
2. Convenient sampling method used without randomization.
3. Sample size is small in thisstudy.
4. Study was performed on non-elite athletes.

Conclusion:-

This study concluded that self-myofascial release using tennis balland superficial backline stretching is effective in improvement of hamstring flexibility among cricket players. On combination of self-myofascial release and Superficial backline stretching is a good technique for relieving the hamstring strain and improving flexibility but when we talk about comparison with other soft tissue release techniques, more research is supposed to be done to give strong evidence regarding its effectiveness.

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