

Effectiveness of Muscle Energy Technique on Improving Hamstring Muscle Flexibility in High School Level Kabaddi Players

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ABSTRACT

Introduction: Kabaddi is one of the most popular games, which makes it our national pride. Kabaddi requires a lot of power, strength, flexibility, agility, speed, breath control and wariness. The game comes under contact sports and hence injuries are common. Muscle Energy Technique (MET) is a form of manual therapy used to relax the muscles via autogenic or reciprocal inhibition and lengthen the muscle, which uses muscle's own energy in the form of gentle isometric contraction. The purpose of this study is to find out the effectiveness of MET on improving hamstring muscle flexibility, active knee extension (AKE) range, and agility in high school level kabaddi players.

Subjects: 30 female amateur kabaddi players

Methodology: 30 high school level Kabaddi players were assessed and selected based on the inclusion and exclusion criteria, and assigned into two groups. Group A (experimental n=15) received MET along with conventional exercises and Group B received Conventional flexibility exercises alone for 5 consecutive days. Pre-post and a follow-up measurement of hamstring flexibility, AKE and agility was taken using flexometer, 90-90 test and agility T-test.

Results: Statistical analysis was done using paired and unpaired t-test. In paired t-test, the hamstring muscle flexibility improved significantly on day 5, on follow-up day 8 measurement it showed reduction in flexibility but not significant for both groups. The AKE of right and left knee joint has significantly improved on day 5 and there was significant reduction on day 8. Whereas the agility for both groups has significantly improved on day 5 and

8. On unpaired t-test, there is significant difference between both groups for all 3 outcomes.

Conclusion: The Muscle energy Technique is effective on improving hamstring muscle flexibility, Active knee extension range and agility in 5 day MET programme. Therefore, concluded that Muscle Energy Technique is effective and can be administered on-field prior to sports events, and thereby improve player's performance.

Keywords: MET, Kabaddi, Hamstring injuries, Flexometer test, active knee extension test, agility T-test.

INTRODUCTION

The Kabaddi is a traditional outdoor game played with minor variations in all regions of India - in fact, in most parts of Asia. It is an ancient backyard and homegrown game. Kabaddi requires tremendous physical stamina, agility, individual proficiency, neuromuscular coordination, lung capacity, quick reflexes, intelligence and presence of mind on the part of both attackers and defenders. It is a contact team sport, played between two teams of seven players each. The objective of the game is for a single player on offence, referred to as "raider", to run into opposing team's half of a court, tag out as many of their defenders as possible, and to return to their own half of a court, all without being tackled by the defenders, and in a single breath.

Common Injuries and its Prevention

Kabaddi players are subjected to injuries during training as well as during competition. Stress injuries account maximum four percentages of injuries which an athlete encounters. Wrong technique, mishap or overloads are some of the factor responsible for these injuries.

Knee injury is the most common type of injury sustained by both “Raiders” and “Stoppers/Defenders”. Sudden turning and twisting movements are required by a Raider to free him/her from the stoppers. Thirty seconds of time limit for a raid also creates a pressure to reach the home court within allotted time in case of a raider and to keep the raider in his/her home court for a stopper. Quick reflexive actions that come into play during this time period make knees highly vulnerable to injuries. ⁽¹⁾ According to Dhillon M S et al the knee joint is one of the most commonly injured joints in Kabaddi. It highlights the fact that the morbidity associated with knee injuries in Kabaddi is high. ⁽²⁾ The hamstring muscle flexibility plays an important role in preventing knee injuries. The players (raiders/defenders) usually assume a semi flexed knee posture throughout the match. This position can be called as an active waiting position from which player must react to another player by either fully extending his/her knee to touch the defender or may twist and turn the knee to change direction and help himself escaping from defender or raider. The hamstring muscle plays an important role here and the tightness of this muscle may increase the chance of injuries.

Majority of the Kabaddi players (57.89%) are forced to leave the sport due to knee injury with amateurs giving up more readily. ⁽²⁾ This study conducted in high school level Kabaddi players who are more prone to injuries like pulling muscle, strain, ligament tears etc. thus aiming to prevent the futuristic injuries in young players. There is a scarcity of literature concerning muscle energy technique on improving hamstring flexibility in high school level

Kabaddi players. This study emphasis on filling up the desolate in literature and it could set a good foundation for these amateur Kabaddi players that will allow them to succeed further down the road.

Muscle energy technique can be used for improving muscles flexibility. According to study conducted by Wassim et al 2009 ⁽³⁾, it is said that the extension of study on to athletic and female populations can be done in future. To that end I choose amateur female Kabaddi players and improving their hamstring muscle flexibility for a better level of performance.

MATERIALS AND METHODS

STUDY DESIGN:

Two group pre-test post-test
Experimental study.

STUDY SETTING:

Sapthagaruda Kabaddi club
Njarackal Cochin.

STUDY DURATION:

3 months

SAMPLING

❖ Sampling Method:

- Convenient sampling

❖ Sampling Size

- N = 30
- 15 in each Group (Group A and Group B)

❖ Inclusion Criteria •

- Age – 12 to 16 years Gender – Females
- Tight hamstring muscle (inability to achieve greater than 1600 of knee extension with hip at 900 of flexion)
- BMI – less than or equal to 25.

❖ Exclusion Criteria

- Acute or chronic low back pain
- Acute or chronic hamstring injury
- Inability to actively extend knee fully in sitting position.

OUTCOME MEASURES

FLEXOMETER: for measuring hamstring muscle flexibility

ACTIVE KNEE EXTENSION TEST: for measuring knee extension range of motion.

AGILITY T-TEST: for measuring agility.

PROCEDURE

Thirty participants were included from Saphthagaruda Kabaddi Club Njarackal Cochin between the age of 12 to 16 years were taken for the study. The participants were not having any acute or chronic low back pain, hamstring injury, or any active extension lag in sitting position. The study was conducted at Saphthagaruda Kabaddi club Njarackal Cochin fulfilling the inclusion criteria were selected for the study. The total study duration was of 3 months. Participants were divided into two groups:-

- ❖ Group A – Experimental Group of Muscle Energy Technique and Conventional exercises – 15 participants.
- ❖ Group B – Control Group of Conventional exercises alone – 15 participants.

MUSCLE ENERGY TECHNIQUE FOR HAMSTRING MUSCLE

5 second isometric contraction of hamstring muscle is followed by 3 second relaxation (rest period), which is repeated 4 times of a total. In this study the muscle energy technique is administered for 5 consecutive days along with conventional exercises. The outcome scales are measured on 1st, 5th and a follow-up measurement was taken on 8th day.

A number of studies are there supporting the above protocol and has shown good results in muscle flexibility. A similar study is conducted among Indian collegiate males with hamstring muscle tightness and there was a significant improvement among subjects who were treated with MET compared to that of control group.

CONVENTIONAL EXERCISES

The flexibility program which follows the FIDM recommendations from ACSM is given for 5 consecutive days.

RESULTS

Total 30 players were divided randomly into Group A and Group B. Data analysis was done by SPSS Version 20.0.

Since data was in normal distribution, parametric test are used to analyze the data within group using paired t test and between groups using unpaired t test. The significant level kept $p < 0.05$.

The descriptive profile of players is illustrated in table 1.

Table 1; Descriptive profile of players.

	Group A		Group B	
	Mean	SD	Mean	SD
Age	13.67	1.35	13.73	1.67
Height	153.53	6.98	152.8	10.65
Weight	45.33	7.53	45.47	9.26
BMI	19.09	1.59	19.24	1.56

Table 2; within group comparison of Group A

OUTCOME MEASURES	GROUP A											
	PRE-TEST				POST-TEST				t value		P value	
	Mean		SD		Mean		SD					
Hamstring flexibility	24.9		4.27		29.31		4.48		13.86		P<0.001	
Active knee extension	R	L	R	L	R	L	R	L	R	L	R	L
	126.07	127.6	5.2	5.8	140.8	141.67	5.57	4.65	12.37	13.5	P<0.001	P<0.001
T-test	18.72		2.49		14.74		1.04		7.25		P<0.001	

Table 3; within group comparison of Group B

OUTCOME MEASURES	GROUP B											
	PRE-TEST				POST-TEST				t value		P value	
	Mean		SD		Mean		SD					
Hamstring flexibility	22.9		4.56		24.93		3.39		2.67		P>0.05	
Active knee extension	R	L	R	L	R	L	R	L	R	L	R	L
	126.4	127.87	5.73	5.51	132.53	133.4	7.2	6.28	6.52	8.28	P<0.001	P<0.001
T-test	18.59		2.18		16.15		1.02		3.75		P<0.01	

Table 2 shows within group comparison of group A i.e.; experimental group and group B (control). The hamstring

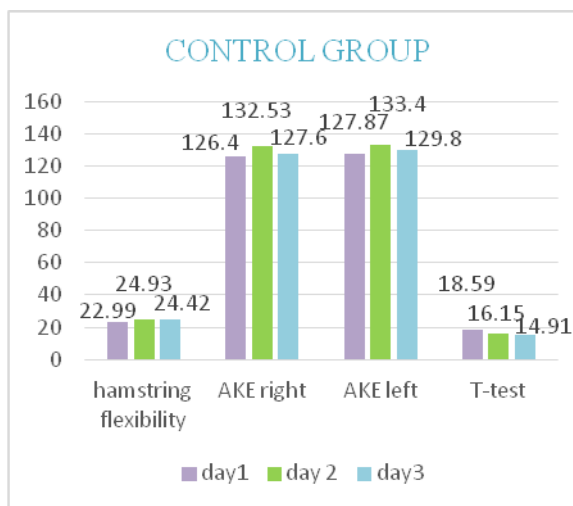
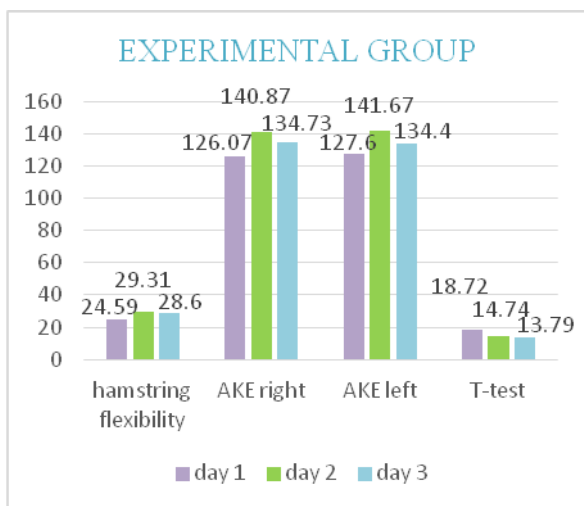
flexibility, Active knee extension test on right and left knees and agility T-test improved significantly among both groups

on day 5. And on day 8, follow up measurement there is reduction in hamstring muscle flexibility which is not significant but comparison between day 1 and 8 shows significant improvement among experimental ($p < 0.001$) and control ($p < 0.05$) groups.

The Active knee extension test of right and left knee joint has improved on day 5 and there is significant reduction on day 8 for both groups. But the comparison between day 1 and 8 shows significant improvement among experimental ($p < 0.001$) and control ($p < 0.05$) groups. The Agility for both groups has significantly improved on day 5 and day 8. The comparison between day 1 and 8 shows significant improvement among both groups

($p < 0.001$). There is significant change within groups among all three parameters.

The comparison between both the experimental and control groups shows that there is significant difference with mean difference 4.38 on day 5 ($p < 0.01$) and 4.18 on day 8 ($p < 0.01$). In AKE also there is significant difference between two groups with mean difference 8.34 and 8.27 for right and left knees ($p < 0.001$) on day 5. On follow-up day 8 there is significant difference among two groups with mean difference 7.13 for right ($p < 0.01$) and 4.6 for left ($p < 0.05$) knee joint. The difference in agility T-test score is significant with mean difference 1.41 on day 5 ($p < 0.001$) and 1.12 on day 8 ($p < 0.05$).



Graph 1 and 2: Pre, post and follow up measurements of Experimental group and Control group

DISCUSSION

Kabaddi is chosen as the national game of India. The Indian kabaddi team is the most successful team and has won 3 titles so far in the Kabaddi world cup. Recently this rural sport has drawn international attention. Because of its worldwide recognition, more youngsters and kids are now considering Kabaddi as a serious game. The amateurs in this field need more wariness so that their professional footing can be set strong. Though kabaddi is a contact game, injuries are common. The knee joint is the most injury prone area. If the muscles around knee joint are strong enough to withstand stress, the incidence rate of injuries can be

reduced. The Muscle Energy Technique can be used for improving muscles flexibility.

Here the results were analyzed using t-test: paired t-test was used to compare the change within the group and unpaired t-test was used to compare results between the groups.

In paired t-test, the Hamstring muscle flexibility is improved significantly among both experimental ($p < 0.001$) and control ($p < 0.05$) group on day 5. The flexibility of hamstring muscle is found to be reduced, but not significantly between day 5 and 8th for experimental ($p > 0.05$) and control ($p > 0.05$) group. And when compared day 1 with 8, there is significant change with $p < 0.001$ for experimental group

and $p < 0.05$ for control group which shows that the effect of MET and conventional exercise continues on day 8. Using unpaired t-test it is found that in hamstring flexibility, the mean difference between experimental and control groups are 4.38 on day 5 ($p < 0.01$) and 4.18 on day 8 ($p < 0.01$). Hence we can conclude effect of MET is superior to the conventional exercise alone to improve hamstring muscle flexibility.

The isometric contraction causes lengthening of viscoelastic and plastic changes in myofascial connective tissue. The post-isometric relaxation can principally be a biomechanical event; i.e.; combination of plastic change and viscoelastic creep in series and parallel connective tissue elements of the muscle.⁽⁴⁾ MET has been explored as a treatment focusing on increasing extensibility of soft tissues. Certain series of studies are validating the use of MET by observing the effects on different segments and directions of trunk motion^{(5), (6)} and hamstring extensibility⁽⁷⁾. During autogenic inhibition, the Golgi Tendon Organ (GTO) response plays an important role in flexibility. The strong muscle contraction against equal counterforce triggers the Golgi tendon organ. The GTO inhibits the agonist muscles contraction and allows the antagonist muscle to contract more readily, thus the muscle can be stretched further and easier.^{(8), (9)}

It was found that in paired t-test, the Active knee extension range among right and left knee joint shows significant improvement on day 5 among both experimental and control group ($p < 0.001$). There is also significant reduction in AKE between day 5 and 8 ($p < 0.001$). And also the comparison between day 1 and 8 shows a significant change in experimental and control groups ie; $p < 0.001$ and $p < 0.05$ respectively. Which shows that the effect of MET and conventional exercises continues on day 8, even though experimental group that received MET shows significant improvement overall when compared with the control group that received conventional

exercise alone. Using unpaired t-test it is found that, in active knee extension range on day 5, there is significant difference between experimental and control groups with mean difference 8.34 for right ($p < 0.001$) and 8.27 on left ($p < 0.001$) knee and on follow-up day 8 there is significant difference among experimental and control group AKE with mean difference 7.13 for right ($p < 0.01$) and 4.6 for left ($p < 0.05$) knee joint.

The improvement in active knee extension (AKE) range is seen throughout the treatment (5 days) and is gradually reducing after day 5, which shows the improvement in AKE range achieved through MET is only short term. The effects of MET is also said to be transient and last only less than 15 minutes.⁽¹⁰⁾ RCT done by More et al. on posterior shoulder tightness in basketball players found immediate effect of Muscle energy technique. There was improvement in shoulder internal rotation and horizontal adduction ROM⁽¹¹⁾. Similarly the control group also exhibited a significant reduction between day 5 and 8, where they received only conventional exercise. This change may be due to duration and frequency of stretching exercises⁽¹²⁾. The duration of exercise plays an important role in physiological changes ie; remodeling of collagen and elastin molecules. These changes can be due to increased muscle elasticity through hysteresis. The increase in duration of exercise may help in maintaining the active knee extension range of motion. However the reduction in AKE is much less in experimental group compared to control group. Hence we can say MET can be applied prior to sports participation, so that the results can be made long lasting when immediately followed by their sports activity.

In paired t-test, the agility is improving significantly on day 5 ($p < 0.001$), in both experimental and control group. There is significant reduction in agility T-test values of experimental and control group when comparing day 5 with day 8 ($p <$

0.001, $p < 0.01$) and day 1 with day 8 ($p < 0.001$). There is significant change in agility among both experimental and control groups from day 1 to day 8. Using unpaired t-test it is found that there is significant difference in agility among kabaddi players with mean difference 1.41 on day 5 ($p < 0.001$) and 1.12 on day 8 ($p < 0.05$). The t-test score is significantly less on experimental group which shows the agility is improving on experimental group. Therefore it is clear that the effect of MET is greater than conventional exercise.

Norris et al 1999, pointed out that the tightness and weakness together in muscle imbalance alters alignment of body segment. These alignment alterations causes weight bearing stresses on joint surfaces, and also results in further contraction of already shortened tissues. This imbalance reduces segmental control with chain reactions of compensation⁽⁹⁾. The Muscle Energy Technique has already shown significant change ($p < 0.002$) in agility on a study conducted by Kiran Anil Mendhe et al⁽¹³⁾ on female cricket players, which is also in favor of this study.

CONCLUSION

The study results show that the Muscle Energy Technique is effective on improving hamstring muscle flexibility, active knee extension range and agility when compared to control conventional group. And there is significant improvement in hamstring muscle flexibility, active knee extension range and agility in 5 day MET programme. Therefore, I concluded that Muscle Energy Technique (MET) is effective and can be administered on field prior to sports events, and thereby improve player's performance.

Strength Of The Study

- Number of participants was equal in both groups
- Female participants
- Participants independently committed to exercise session and

were regularly present. Cost-effective program

- Time efficient

Limitation Of The Study

- As the measurements were taken manually, this may introduce human error, which could threaten the study's reliability
- Participant may exert either greater or lesser pressure than 75% of maximum in each isometric contraction.
- Small sample size
- Only amateur players are included in this study.

Future Research

- The sample size of subjects should be increased; hence it may lead to a better valuable result.
- The treatment sessions of the study be increased. It may lead to better and valuable result.
- Future investigation can be conducted in different sports and age group.
- Can be implemented to professional Kabaddi players in future.
- A follow-up study could ensure the long term effect of the treatment program.
- Future studies can be done with large group and longer follow up.
- Another outcome measuring tool can be used.
- Other parameters such as muscle power, speed, and performance could be checked.

Acknowledgement

Authors would like to thank all kabaddi players who were part of this study.

Conflict of Interest: None

Source of Funding: None

Ethical Approval: Approved

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How to cite this article: Harry A, George SA. Effectiveness of muscle energy technique on improving hamstring muscle flexibility in high school level kabaddi players. *International Journal of Research and Review*. 2021; 8(6): 133-139. DOI: <https://doi.org/10.52403/ijrr.20210616>
