

MASSAGE COMBINED WITH MUSCLE ENERGY TECHNIQUE COULD IMPROVE HEIGHT OF SEPAKTAKRAW SERVES

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ABSTRACT: Flexibility of hamstring muscles is very important in the height of Sepaktakraw serves. The most beneficial type of stretching of lower limb muscles for this sport has not been verified. This study aimed to evaluate the effects of applied Thai massage combined with muscle energy technique (ATMMET) versus passive static stretching technique (PSST) on hamstring flexibility and the height of a Sepaktakraw serve. One hundred and eight healthy Sepaktakraw amateur athletes were randomly allocated to 3 comparison groups. Subjects in the ATMMET group and the PSST group received a 10 min session of corresponding intervention, whereas the subjects in the control group sat on a chair without intervention for the same period of time. Passive straight leg raise test (PSLR) and the height of Sepaktakraw serves were measured at 3 consecutive periods, consisting of pre-test, post-test, and 24 hours after intervention. An analysis of two-way repeated measures ANOVA found that there was a statistically significant difference in hamstring flexibility and the height of Sepaktakraw serves in both intervention groups but not in the control group. However, no significant differences were found between the three groups ($p > 0.05$). We conclude that both ATMMET and PSST may improve hamstring flexibility and the height of a Sepaktakraw serve immediately.

Keywords: *Applied Thai massage, Muscle energy technique, Static stretching, Hamstring flexibility, Sepaktakraw serves*

1. INTRODUCTION

Sepaktakraw is a popular sport in Southeast Asia. This sport has competed in both the SEA Games and the Asian Games [1]. There are 5 players on each team (3 players on the court and 2 substitutes), and each player in the team has a different role, depending on their position. First, “the striker” is responsible for kick, jump kick, or head the Sepaktakraw ball over the net, to fall into the opponent’s area. Second, “the feeder” is responsible for setting the Sepaktakraw ball near the net in their team’s area for the striker. Finally, “the server” has a duty to serve or kick the Sepaktakraw ball to go over the net and fall into the opponent’s area [2].

Serving skill is very important in the modern game of Sepaktakraw, as it is the main reason for attacking and scoring points. Serving with high efficiency helps to win the game easily which this requires the greatest flexibility of lower limb muscles. The main anatomical motion for the serving highest kicking consists of hip flexion, hip abduction, and knee extension [3]. In an earlier study, Rezaei et al. investigated lower limb motion in Sepaktakraw elite athletes, they found that the server players had a greater range of hip motion than did strikers and feeders [4]. In addition, the height of the exposed balls was correlated with the Sepaktakraw serve speed [5]. Therefore, the

flexibility of lower limb muscles is an important factor for increasing the efficiency of the serve.

Massage is one of the treatments used in sports medicine to increase the performance of the athlete through its mechanical, physiological, and psychological effects. Massage has been used in many cultures and has been employed in sports for a long time [6]. Techniques of massage therapy include acupressure, rubbing, friction, kneading and muscle stretching [7]. In Thailand, Traditional Thai massage (TTM) has been used for heal and relax the body since ancient times. TTM has the appearance of deep massage, with brief sustained pressure on the muscles. The TTM therapist use body weight to press down on the muscles through thumbs, palms, elbows, knees, and feet [8]. The therapist often uses feet to press on large muscles, such as the gluteus muscle group, gastrocnemius muscles, and hamstring muscles.

Moreover, muscle energy technique (MET) is another method that can be used in the treatment of shortened muscle, restricted joints, and weakened muscles [9]. Ballantyne et al. showed that 32 seconds of MET produced a significant immediate increase in passive knee extension. The prominent point of TTM is that it provides muscle relaxation resulting from deep massage or pressure on muscle, whereas the prominent point of MET is to lengthen muscle within a short period of time. Therefore, the

combination of two techniques may provide a better way to increase the flexibility of muscle as much as possible without any injury [10].

The most common technique is used to increase muscle flexibility is the static stretch. Rosario and Feletto compared 4 different static stretching treatments: 10 minutes of passive static stretching performed in 3 sessions over 3 consecutive days; 20 minutes' walking combined with 30 seconds of passive stretching; 10 minutes' warming of the hamstrings by microwave diathermy combined with 30 seconds of passive static stretching; and 30 seconds of passive static stretching. The results showed that 10 minutes of passive stretching performed in 3 sessions over 3 consecutive days was the most effective. However, there are relatively few studies on the acute effects of passive static stretching for 10 min in only 1 stretching session [11].

While static stretching has also been found to be an effective method to increase muscle flexibility but there is no scientific evidence about the most effective method for this purpose. Therefore, we aim to compare the effect of Thai massage in combination with muscle energy technique (ATMMET) with the passive static stretching technique (PSST) on both hamstring flexibility and the height of the Sepaktakraw serve.

2. MATERIAL AND METHOD

2.1 Design and Setting

The research design of this study was a randomized controlled trial with a blinded measurer, approved by the KhonKaen University Ethics Committee for Human Research (approval number 582221).

2.2 Participants

One hundred and sixty healthy college students aged between 18 - 25 years from Roi Et province, Thailand, were recruited in this study. Firstly, the participants had to complete a questionnaire providing general information, experience in Sepaktakraw sport, and history of injuries. After that, all the participants received a passive straight leg raise test (PSLR) [12]. The remaining participants consisted of one hundred and eight healthy college students because of 5 participants had played Sepaktakraw for less than 1 year, 10 participants had incurred hamstring muscle injuries within the last 3 months, and 37 participants had PSLR tests of equal or greater than 120 degrees. The remaining participants were randomly divided into 3 groups by using the software at <http://www.randomizer.org>, 36 people in each group. The

measurers were unaware about the groups' assignment to reduce bias (Fig.1).

2.3 Procedure

On the first day, all participants warm up before testing begins about 5 minutes by jogging without any stretch to prevent injuries. After that, they undertook the passive straight leg raise test (PSLR) [12] for measuring hamstring flexibility followed by the height of Sepaktakraw serve test (pre-test), which was recorded by a digital video camera and using a movement analysis program (Kinovea version 0.8.15) [13].

On the second day, the participants in ATMMET group received 8 min of ATM from an experienced trainer and then received 2 min of MET. The participants in PSST group received 10 min of PSST on both sides of their legs. And the participants in control group carried out activities of daily living without intervention. They sat on a chair for 10 min. Participants in all groups were received PSLR test and the height of Sepaktakraw serve test immediately after the intervention (post-test1).

On the third day, 24 hours after intervention (post-test2), all participants were tested as well as pre- and post-test for determining chronic effects. All measurements were done at the same time of day between 08.00 AM and 12.00 PM.

2.4 Interventions

2.4.1 Applied Thai massage (ATM)

The participants received 8-minutes of the ATM by using moderate foot pressure on the calf, the rear legs and the bottom area on both sides in the prone position by the experienced massage trainers which trained by professional Thai massage therapists and receive a certificate [8].

2.4.2 Muscle energy technique (MET)

MET was performed in the supine position and hamstring muscles were stretched to the point of discomfort. And then they were instructed to contract muscles with moderate isometric contraction (approx. 75% of maximal) for 5 seconds in every 4 repetitions and rest between repetitions for 3 seconds [10].

2.4.3 Passive static stretching technique (PSST)

The subjects were placed in the supine position and hamstring muscles were stretched at below the pain threshold level by lifting one leg for 10 minutes [11].

2.5 Outcome Measurements

The height of the Sepaktakraw serve was measured by digital video camera recording and

analyzed by using the software Kinovea version 0.8.15 (Fig.2) [13]. The reliability and criterion-related validity of the software are 0.95 and 0.99, respectively [14].

Hamstring flexibility was measured by PSLR [12]. The subjects were placed supine on the bed, and they raised one leg with knee extension and held it for 3 s. Subsequently, the goniometer pro

application (trial version) on a smartphone was used to measure ROM of hip flexion (Fig.3). In-house tests have shown tolerances of $\pm 0.2^\circ$ and $\pm 0.3^\circ$ depending on device [15].

The height of Sepaktakraw serves and hamstring flexibility was measured before, immediately after intervention, and 24 hours after intervention.

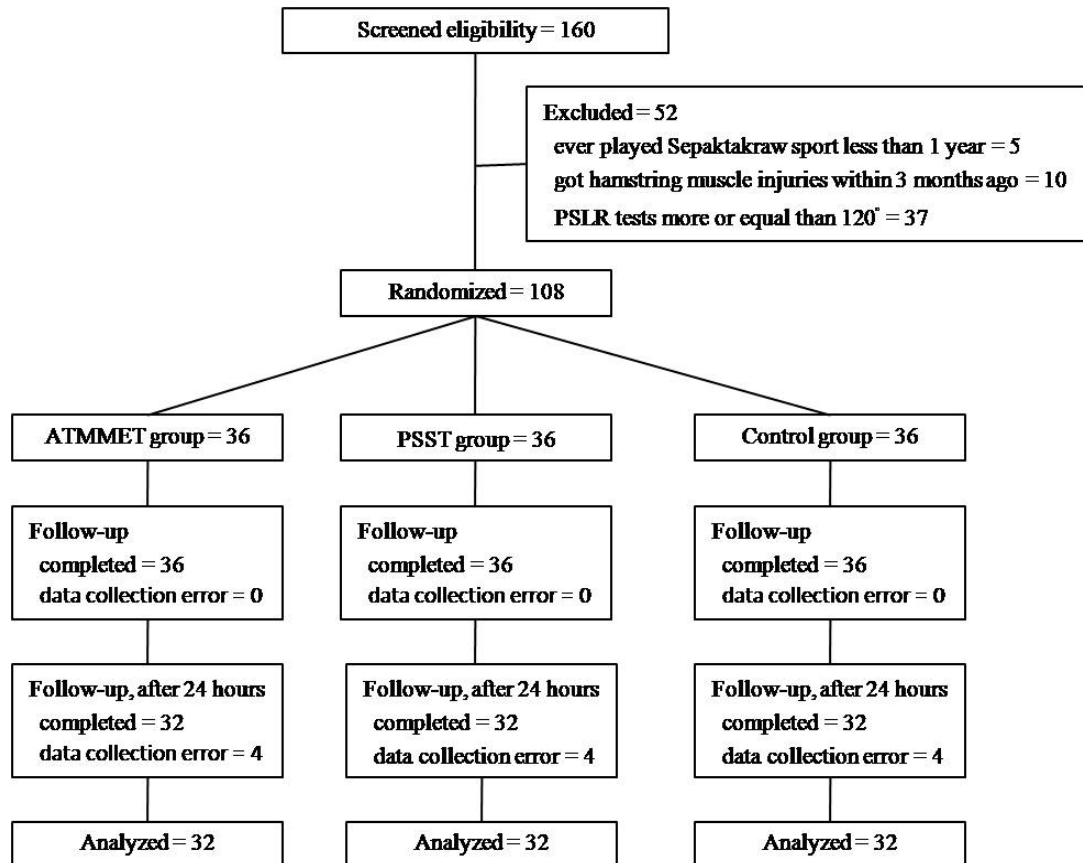


Fig.1 Flow chart for study participation

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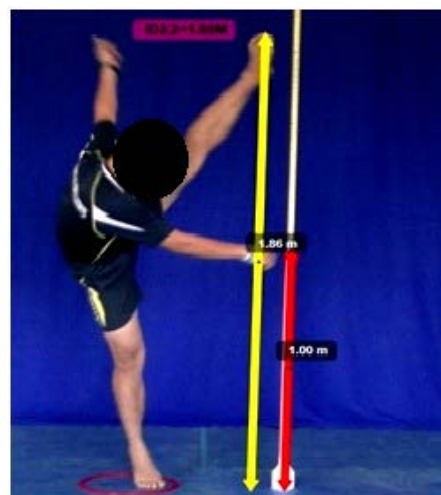


Fig.2 The Sepaktakraw serve test by using the software Kinovea.



Fig.3 Passive straight leg raise test (PSLR)

2.6 Statistical Analysis

The data were presented as mean $\pm$ SD. Kolmogorov - Smirnov test was used to verify the normality of the data. Kruskal Wallis test or one-way analysis of variance (ANOVA) statistics were used to compare outcome variables between the three groups in baseline characteristics. Friedman test or two-way repeated measures ANOVA by using the Bonferroni test were used to compare

outcome variables within the group and between groups. The significance level was set at the $p \leq 0.5$.

3. RESULTS

Kolmogorov test - Smirnov test showed that the data are distributed normally. There was no significant difference between the three groups in baseline characteristics. None of the subjects had sustained hamstring injuries in last 3 months. Four subjects in each group were excluded from this study because of data collection errors (Table 1). So, the remaining ninety-six participants were used to analyze the data. Within-groups comparison of the means between pre-test and post-test1 found that hamstring flexibility and height of Sepaktakraw serves were significantly increased in PSST and ATMMET groups ($p < 0.05$). Comparison of the means between pre-test and post-test2 found that hamstring flexibility was significantly increased in PSST and ATMMET groups ($p < 0.05$). The only height of Sepaktakraw serves was significantly increased in ATMMET group ($p < 0.05$). But the parameters were not changed in the control group. However, all parameters showed no significantly different between groups comparison (Table 2).

Table 1 Baseline characteristics

	Control Group (n=36)	PSST Group (n=36) ^a	ATMMET Group (n=36) ^b	p-Values ^c
Age (years)	21.28(0.70)	21.67(0.86)	21.89(1.63)	.076
Weight (kg)	64.69(11.95)	64.93(10.16)	64.71(10.45)	.994
Height (cm)	168.64(7.01)	170.94(6.55)	170.69(7.22)	.305
Playing Sepaktakraw (years)	2.56(1.48)	2.75(1.48)	2.89(1.43)	.626
SLR test (degree)	111.00(12.25)	106.56(11.23)	108.83(10.49)	.256
Past hamstring injuries (number)	0	0	0	
Data collection error (number)	4	4	4	

Note: ^a PSST, passive static stretching technique.

^b ATMMET, applied Thai massage combined with muscle energy technique.

^c One-way ANOVA

4. DISCUSSION

The study showed that treatment with PSST and ATMMET for 10 min could increase hamstring flexibility and height of Sepaktakraw serves. The findings of this study correspond to previous studies, they found that stretching of soft tissue could increase tissue elasticity [7], [9], [11-12], [16-17] leading to increased hamstring flexibility. The effect of using multiple massage techniques on flexibility was studied. It found that Thai massage, deep massage and hand massage could increase the muscles flexibility [16-20]. Some previous study demonstrated that MET could

increase hamstring flexibility [9], [21-22]. They concluded that MET affects shortened muscle, restricted joints, and weakened muscles. For this reasons, it can be concluded that both PSST and ATMMET could increase hamstring flexibility. Furthermore, this study found that both techniques could maintain hamstring flexibility for 24 hours after intervention (Fig.4).

This study demonstrated that both techniques could increase the height of the Sepaktakraw serve as a result of increasing hamstring flexibility. After 24 hours post-intervention, the height of the Sepaktakraw serve with both techniques decreased continuously but only the

Table 2 Mean and Standard Deviation of PSLR test and Sepaktakraw serve test.

Group	Time	Sepaktakraw serve test (Cm)	PSLR test	
			ROM (Degrees)	Torque (N.m)
Control	Pre-test	175(2.26)	115(2.13)	12.87(4.49)
	Post-test1	174(2.12)	116(2.01)	12.87(4.49)
	Post-test2	174(2.14)	116(2.01)	12.87(4.49)
PSST	Pre-test	178(2.26)	109(2.13)	12.22(4.73)
	Post-test1	180(2.12)*	115(2.01)*	12.30(4.85)
	Post-test2	179(2.14)	113(2.01)*,**	12.25(4.71)
ATMMET	Pre-test	176(2.26)	113(2.13)	11.87(3.88)
	Post-test1	179(2.12)*	120(2.01)*	12.70(3.79)
	Post-test2	178(2.14)*	119(2.01)*,**	12.17(3.78)

Note:

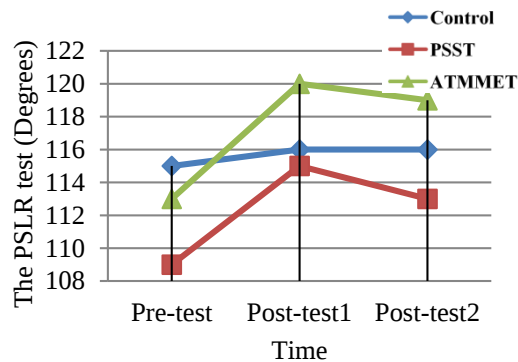
* The mean is significantly different compared to pre-test and post-test1 ($P < 0.05$).** The mean is significantly different compared to pre-test and post-test2 ($P < 0.05$).

Fig.4 Change in hamstring flexibility (degrees) by the PSLR test during pre-test, post-test1, and post-test2.

ATMMET group still maintained the performance of the Sepaktakraw serve. It could be concluded that the ATMMET technique for 10 minutes could maintain the performance of the Sepaktakraw serve (Fig.5).

However, there were no significant differences between the three groups in hamstring flexibility and the height of the Sepaktakraw serve. This might be because the subjects received only 1 intervention session, which may not be enough.

Our suggestion for further research is to add up the intervention session, increase the duration of intervention, and use more than one test for measuring hamstring flexibility and the height of the Sepaktakraw serve.

5. CONCLUSION

In summary, the ATMMET and the PSST treatment could immediately significantly increase hamstring muscle flexibility. Moreover,

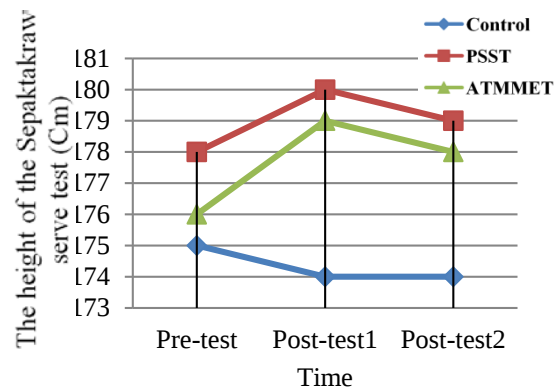


Fig.5 Change in the height of Sepaktakraw serves (Cm) during pre-test, post-test1, and post-test2.

24 h post-intervention, both techniques could maintain hamstring flexibility.

Furthermore, the ATMMET and the PSST treatment could immediately significantly increase the height of the Sepaktakraw serve. At 24 h post-intervention, only ATMMET could maintain the height of the Sepaktakraw serve. No significant differences were found in the control group, both in hamstring muscle flexibility and the height of the Sepaktakraw serve.

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7. REFERENCES

- [1] Mutalai P. (February 19, 2014). History of Sepaktakraw. Available: <http://www.sepaktakrawworld.com/index.php/2014-01-17-04-10-40>
- [2] SepaktakrawO. (2014, 04 August). How to Play the Game. Available: <http://www.sepaktakraw.org/about-istaf/how-to-play-the-game/#.VAeRbfmSwgM>
- [3] Suwat S., Chatchadaporn Pitaksathienkul, Biomechanical Analysis of Sepak Takraw Serves in 24th SEA GAMES, a journal of Bureau of Sports Science, Office of Sport and Recreation Development, 2009.
- [4] Rezaei M., Paziraei M., Haghani M., and Hariri S., The Comparison of some lower limb's motion range parameters in Sepaktakraw elite athletes with an emphasis on talent identification, International Journal of Sports Studies, vol. 4, 2014, pp. 1462-1465.
- [5] Nadzrin H., Factors Correlated With Sepak Takraw Serve Speed in 30th Annual Conference of Biomechanics in Sports, Melbourne, Australia, 2012, pp. 413-416.
- [6] Hemmings B. J., Physiological, psychological and performance effects of massage therapy in sport: a review of the literature, Physical Therapy in Sport, vol. 2, 2001, pp. 165-170.
- [7] Calder A.1998, Recovery: Restoration and Regeneration as Essential Components within Training Programs. Available: <https://swimmingcoach.org/recovery-restoration-and-regeneration-as-essential-components-within-training-programs/>
- [8] Tapanya S., Traditional Thai Massage. Bangkok, Thailand: Duang Kamol, 1993.
- [9] Fryer G., Muscle energy technique: An evidence-informed approach, International Journal of Osteopathic Medicine, vol. 14, 2011, pp. 3-9.
- [10] Ballantyne G. F., P. McLaughlin, The effect of muscle energy technique on hamstring extensibility: the mechanism of altered flexibility, Journal of Osteopathic Medicine, vol. 6, 2003, pp. 59-63.
- [11] Rosario J. L. and Foleto A., Comparative study of stretching modalities in healthy women: heating and application time, J Bodyw Mov Ther, vol. 19, 2015, pp. 3-7.
- [12] Toby M. H., Catherine M. and Jeremy W., Effects of the mulligan traction straight leg raise technique on a range of movement, Journal of Manual and Manipulative Therapy, vol. 9, pp. 128-133, 2001.
- [13] Kinovea. (2016, 3 August). Kinovea. Available: <http://www.kinovea.org/>
- [14] Deeminoi A., Reliability and criterion-related validity of 2d motion analysis system: Kinovea computer program for measuring the height of sepaktakraw serves in amateur athletes, A pilot study, in International Conference, Ergogenic Aids and Nutritional Supplement for Health and Sports, Centara Hotel & Convention Centre, Khon Kaen, Thailand, 2016.
- [15] 5fuf5. (2015). Goniometer Pro (trial version) - Android app on Google Play. Available: <https://play.google.com/store/apps/details?id=co.m.FiveFufFive.GoniometerProPreviewAndroid&hl=th>
- [16] Buttagat V., Eungpinichpong W., Chatchawan U. and Kharmwan S., The immediate effects of traditional Thai massage on heart rate variability and stress-related parameters in patients with back pain associated with myofascial trigger points, J Bodyw Mov Ther, vol. 15, 2011, pp. 15-23.
- [17] Forman J., Geertsen L. and Rogers M. E., Effect of deep stripping massage alone or with eccentric resistance on hamstring length and strength, J Bodyw Mov Ther, vol. 18, 2014, pp. 139-44.
- [18] Hopper D., Conneely M., Chromiak F., Canini E., Berggren J. and Briffa K., Evaluation of the effect of two massage techniques on hamstring muscle length in competitive female hockey players, Physical Therapy in Sport, vol. 6, Aug 2005, pp. 137-145.
- [19] Uraiwon C., Therapeutic effectiveness of deep massage (Traditional Thai massage) on patients with back pain associated with myofascial trigger points, Thesis (Ph.D.), Public Health, Graduate School, Khon Kaen University, 2005.
- [20] Chatchawan U., Thinkhamrop B., Kharmwan S., Knowles J. and Eungpinichpong W., Effectiveness of traditional Thai massage versus Swedish massage among patients with back pain associated with myofascial trigger points, Journal of Bodywork and Movement Therapies, vol. 9, 2005, pp. 298-309.
- [21] Ballantyne F., Fryer G. and McLaughlin P., The effect of muscle energy technique on hamstring extensibility: the mechanism of altered flexibility, Journal of Osteopathic Medicine, vol. 6, 2003, pp. 59-63.
- [22] Mehdikhani R. and Okhovatian F., the Immediate effect of muscle energy technique on latent trigger point of the upper trapezius muscle, Clinical Chiropractic, vol. 15, 2012, pp. 112-120.

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