

THE ACUTE EFFECT OF TRADITIONAL THAI MASSAGE ON RECOVERY FROM FATIGUE IN BASKETBALL PLAYERS

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ABSTRACT: Massage has been used as an alternative treatment for professional athletes for decades. However, it has hardly been used for rapid recovery on the sport field that always needs rapid recovery during half-time brake of competition such as basketball. This study aims to investigate the acute effects of Traditional Thai Massage on recovery in basketball players as indicated by heart rate variability (HRV) and physical fitness. A cross-over design was administered. Sixteen basketball players were randomly allocated into two groups: intervened with Traditional Thai Massage (TTM) and Control (C). Each period, the participants underwent 20 minutes of basketball-playing simulation after which they were assessed on HRV and physical fitness. Then they received either 10-minute TTM intervention or 10-minute rest, and were assessed again immediately after the interventions with 3 days washout period. The results showed that HRV and physical fitness were significantly increased ($p < 0.05$) in both groups after the interventions. HR, was significantly decreased ($p < 0.05$) in two group. There was no significant difference of LF/HF ratio (LF/HF ratio) in the control group. Compare outcome between group found that RMSSD, HF values were significantly different ($p < 0.05$) and no significant differences in the comparison of results between groups. However, the results from this study do indicate that TTM can improve recovery in basketball players by increasing HRV.

Keywords: *Traditional Thai Massage (TTM), Heart Rate Variability (HRV), Basketball Players, Fatigue, Recovery*

1. INTRODUCTION

Recovery is one of the basic principles in athletic training methodology [1]. Fast recovery from muscle fatigue is vital in sport events especially when athletes require maximum energy for better performance during competition. Frequently, an interval between matches in each competition could be varied depends on the local competition rules. Thus, it is crucial for athletes to be provided with a sufficient treatment that has an immediate effect on the muscle recovery after the highly vigorous muscle activities. The appropriate muscle recovery process must quickly reduce the fatigue. If the improper muscle treatment is applied to the athletes, it may lead to reduced physical performance, increased risk of injury, or even emotional stress during competition.

Several methods of muscle recovery have been suggested for professional athletes, including the use of hot/cold therapies, stretching techniques, and sport massage. Among various muscle recovery strategies, manual massage is considered as the most natural technique that be gently and directly applied to the injured areas to enhance the elasticity of muscle and joints while relaxing the

tendons [2]. Furthermore, manual massage could provide an increase of skin temperature which helps stimulating the blood flow [3-5], and reduces the muscle soreness [6]. In most cases, massage is used to recover the fatigued muscle, stretch the affected muscle, and improve the mood states during and after the competition [7].

Traditional Thai Massage (TTM) is a deep-tissue type of manual massage which mainly use for promote relaxation and wellbeing. In addition, it has been modified to use with athletes to facilitate recovery of fatigued muscles after the competitions such as Thai boxing, and football. The applied Thai massage used for athletes' muscle recovery consists of the massage techniques of rubbing, rolling, pressing, squeezing with fingers and palm, gently chopping with hand to stretch the joints throughout the body, including all major muscle bundles of arms, legs, and abdomen. The applied massage also focuses on stretching the ten nerve lines of Thai massage. Previous studies have shown the empirical evidence that massage arouses the temperature on the skin that can increase the blood flow [3-5]. In addition, massage can minimize soreness [2,8], enhance flexibility [2], reduce sympathetic nervous

system while increasing parasympathetic nervous system [2,9,10].

Basketball is one of the most popular sports in the world. It requires the players' use of strenuous energy as well as ultimate strength of the muscle and mobility skills throughout the game. In general, basketball players move approximately 4,500-5,000 meters in 40 minutes [11]. Every two minute, the players run, walk, spin, jump, slide, etc [12]. Fifteen percent of each game is considered as highly intense exercise [13]. Due to the heavy physical movement, the injuries often occur [14]. However, the basketball players are given with limited time off to obtain the recovery during the intervals. Thus, it is essential for the basketball players to meet these needs in order to compete at full strength and recover quickly during and after the competition.

Yet, no studies have reported the effect of Traditional Thai massage on the recovery by using HRV or other parameters to determine its efficiency in the context of intense sport, particularly Basketball. Hence, it is important to examine the acute effect of traditional Thai massage on the recovery of basketball players. The results of the study are expected to provide evidence for further sport performance improvement, and enhance the understanding in the extent of sport and sport science.

The purposes of this study are to examine the acute effects of Traditional Thai Massage on recovery in basketball players during the competition, and compare the acute effects of Traditional Thai Massage and passive rest on recovery in basketball players during the competition.

2. METHODS

2.1 Study Design and Participants

This study was a crossover randomized controlled trial, approved by the ethics committee of Khon Kaen University, Thailand (HE602113). The included participants were 16 males (mean age 20.13 ± 1.31 years), with a mean age of 20.13 ± 1.31 years, average of 72.69 ± 11.25 kilograms, average body mass index of 177 ± 6.68 cm, and average body mass index of 24.05 ± 5.79 kg/m². They were 3-year experienced basketball players with no history of serious disease. Before participating in this study, the participants were advised to refrain from eating, drinking alcohol, smoking, and consuming caffeine for at least 2 hours.

2.2 Procedure and Protocol

The participants were basketball players of

Sakon Nakhon Rajabhat University. They were provided with orientation to understand the criteria of the research and consent to participate in the study. The participants will divide into two groups. The first group was intervened by traditional Thai massage (TTM), receiving massage for ten minutes. The second group is controlled group (C), allowed to gain passive rest for ten minutes. This research is a crossover randomized controlled trial. All participants were examined for two times. That is, an individual participant would receive traditional Thai massage; then passive rest.



Fig. 1 Diagram of study protocol and variable measured. TTM and C group: 10 minute for each protocols, 1 trial per protocol, wash out 3 day. TTM: Traditional Thai Massage.

2.3 Heart Rate Variability (HRV)

The participants sat on a comfortable chair with a backrest, with eyes opened. HRV parameters were measured three minutes by using the device, called Ubio macpa, Korean version. The values of HR, RMSSD, SDNN, HF, LF, and LF / HF ratio were used to evaluate HRV (Fig 2).

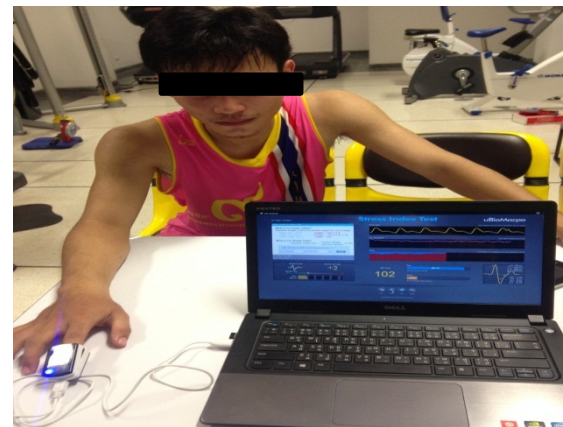


Fig. 2 Data collection on HRV.

2.4 Physical Fitness

2.4.1 Sit and reach test (SRT)

They were measured as described by [15]. Subjects sit with the soles of their feet against the box, and with their hips flexed to about 90° to assume an upright sitting position. And then subjects flex their hip joints and vertebral column (with possible contributions from shoulder joint

flexion and scapular elevation) to reach forward as far as possible. A centimeter scale is printed on the top surface of the box.

2.4.2 Grip strength test (GST)

They were measured using a Grip dynamometer (TKK 5401, Japan). The participants gripped the dynamometer with four fingers, except the thumb, and controlled the width of the handle. The arms were naturally lowered. Maximum strength was applied to the dynamometer without touching the body. [16].

2.4.3 Back strength test (BST)

Back strength of the participants was measured using a Back-leg-chest dynamometer. The participant was positioned with body erect and knees bent so that the grasping hand rests at proper height. Then, by straightening the knees and lifting the chain of the dynamometer, pulling force was applied on the handle. The body would be inclined forward at an angle of 60 degrees for the measurement of back strength [17].

2.4.4 Leg strength test (LST)

Leg strength was also measured using a back-leg-chest dynamometer. The participant was asked to stand erect with knees bent so that the grasping hand rests at proper height. The individual then lifted the handle of the dynamometer, bending his legs, and then straightened the legs [17].

2.5 The Third Outcome Measurements (RLT)

The level of relaxation and satisfaction are rated after receiving treatment using questionnaire for measurements in TTM group and C group.

2.6 Traditional Thai Massage (TTM) and Passive Rest

The participants in Traditional Thai Massage group are given 10 minutes of massage whereas the controlled group are given 10 minutes to rest. In the room, the temperature is controlled at 25-26 °C. In the TTM group, Thai traditional and Effleurage massage techniques are applied throughout the body of the participants including biceps and triceps (arms), deltoid (shoulders), latissimus dorsi, thoraco-lumbar fascia, trapezius (back), and stretching muscles which consist of hamstrings, rectus femoris, arms, and back. In the C group, the participants are provided with a regular passive rest (half time).

2.7 Statistical Analysis

The data were presented as mean \pm SD. Shapiro-Wilk test was used to verify normality of

data. Crossover study design analysis was employed. The paired t-test statistic was used to compare the mean between the groups. The independent sample t-test statistic was used to compare mean between groups. Statistical significance value was set at $p < 0.05$.

3. RESULT

Table 1 shows the comparison of the statistic values in each group. The results of RMSSD, SDNN, HF, LF, SRT, GST, BST, LST, and RLT were significantly increased ($p < 0.05$). HR, was significantly decreased ($p < 0.05$) in two group. However, the LF/HF ratio increased significantly ($p < 0.05$) only in the TTM group. RMSSD, HF values were significantly different ($p < 0.05$), and no significant differences in the comparison of results between the groups (Table 2).

A Comparison of RMSSD between TTM and passive rest reveals that RMSSD values were significantly different between the groups (Table 2).

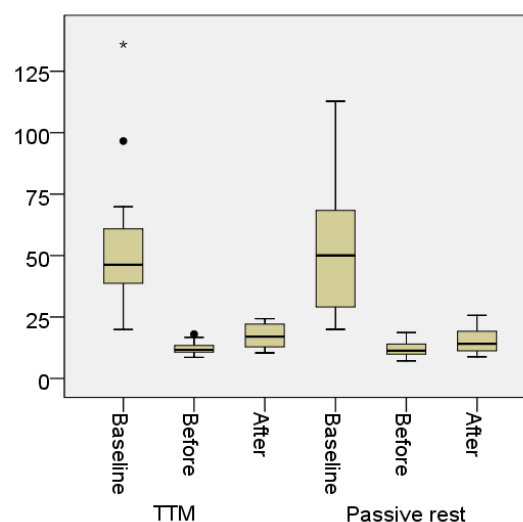


Fig. 3 A Comparison of RMSSD between TTM and Passive rest.

4. DISCUSSION

The result showed that Traditional Thai massage has acute effect on recovery from fatigue in basketball. According to the HRV and physical fitness results. The positive result on recovery in the group treated by Traditional Thai massage was considered as the process that body systematically reacts to the massage, including the biochemical processes in cellular, tissue and organ level. It was found that body relaxation contributes to lower blood pressure because the stimulation of Table 1 Comparison of the results in each group.

Results	Baseline (n=16)		TTM (n=16)		Passive rest (n=16)	
	TTM	Passive rest	Before	After	Before	After
RMSSD(ms)	34.98 ±18.18	33..93 ±18.81	12.23 ±2.65	15.63 ±4.76*	12.08 ±3.21	14.93 ±2.93*
SDNN (ms)	50.69 ±17.87	53.13 ±21.65	38.83 ±13.15	46.43 ±13.01*	41.56 ±9.47	46.08 ±11.4*
HR (bpm)	71.41 ±6.47	73.15 ±10.83	130.53 ±10.54	98.86 ±6.95*	134.74 ±8.12	104.6 ±8.04*
HF (ms ²)	6..88 ±0.79	6.75 ±0.78	6.56 ±0.76	7.95 ±0.77*	6.34 ±0.84	7.57 ±0.67*
LF (ms ²)	8.05 ±0.92	8.27 ±0.78	7.86 ±0.9	8.84 ±0.78*	7.86 ±1	9.2 ±0.86*
LF-HF ratio	1.18 ±0.09	1.23 ±0.08	1.18 ±0.04	1.25 ±0.08*	1.17 ±0.05	1.19 ±0.11
SRT (cm)	12.06 ±5.42	12.19 ±5.47	11.56 ±5.05	13.13 ±5.06*	12.19 ±5.02	12.13 ±5.03*
GST (kg)	41..29 ±5.22	41.82 ±6.70	39.66 ±4.96	40.6 ±5.46*	39.28 ±6.58	38.74 ±6.25*
BST (kg)	131.34 ±15.53	133.69 ±24.11	127.94 ±18.65	143.47 ±20.12*	131.72 ±25.06	138.42 ±22.21*
LST (kg)	156.5 ±27.46	159.94 ±32.17	150.41 ±26.97	162.63 ±27.22*	154.59 ±34.33	161.36 ±31.71*
RLT	8.25 ±0.77	8.25 ±0.77	2.81 ±0.66	6.75 ±0.58*	2.88 ±0.72	6.5 ±0.52*

Data are expressed as mean ±SD. TTM – traditional Thai massage; RMSSD – the square root of the mean squared differences of successive normal R-R intervals; SDNN – the standard deviation of the normal-to-normal intervals; HR – heart rate; HF – high frequency; LF – low frequency; LF/HF ratio – low frequency per high frequency ratio; SRT - Sit and reach test; GST - Grip strength test; BST - Back strength test; LST - Leg strength test, RLT - The level of relaxation. Significant change within group, * p<0.05

Table 2 Comparison of the results between two groups.

Results	Baseline (n=16)		Before (n=16)		After (n=16)	
	TTM	Passive rest	TTM	Passive rest	TTM	Passive rest
RMSSD(ms)	34.98 ±18.18	33..93 ±18.81	12.23 ±2.65	12.08 ±3.21	15.63 ±4.76	14.93 ±2.93*
SDNN (ms)	50.69 ±17.87	53.13 ±21.65	38.83 ±13.15	41.56 ±9.47	46.43 ±13.01	46.08 ±11.4
HR (bpm)	71.41 ±6.47	73.15 ±10.83	130.53 ±10.54	134.74 ±8.12	98.86 ±6.95	104.6 ±8.04
HF (ms ²)	6..88 ±0.79	6.75 ±0.78	6.56 ±0.76	6.34 ±0.84	7.95 ±0.77	7.57 ±0.67*
LF (ms ²)	8.05 ±0.92	8.27 ±0.78	7.86 ±0.9	7.86 ±1	8.84 ±0.78	9.2 ±0.86
LF-HF ratio	1.18 ±0.09	1.23 ±0.08	1.18 ±0.04	1.17 ±0.05	1.25 ±0.08	1.19 ±0.11
SRT (cm)	12.06 ±5.42	12.19 ±5.47	11.56 ±5.05	12.19 ±5.02	13.13 ±5.06	12.13 ±5.03
GST (kg)	41..29 ±5.22	41.82 ±6.70	39.66 ±4.96	39.28 ±6.58	40.6 ±5.46	38.74 ±6.25
BST (kg)	131.34 ±15.53	133.69 ±24.11	127.94 ±18.65	131.72 ±25.06	143.47 ±20.12	138.42 ±22.21
LST (kg)	156.5 ±27.46	159.94 ±32.17	150.4 ±26.97	154.59 ±34.33	162.63 ±27.22	161.36 ±31.73
RLT	8.25 ±0.77	8.25 ±0.77	2.81 ±0.66	2.88 ±0.72	6.75 ±0.58	6.5 ±0.52

parasympathetic from the massage [18]. In this study, the basketball players significantly noticed the mental and muscle tension, refreshment and power boost to play more effectively in another half of the game. This result was consistent with the previous studies that stated that massage can increase HRV [2], reduce sympathetic activity, and increase parasympathetic activity [19,20]. Even with the different types of massage, the result showed the decrease of HR and increase of RMSSD, SDNN, LF, HF, and LF-HF Ratio. Thus, the results indicated that Traditional Thai massage can reduce sympathetic activity and increase parasympathetic activity which contributes to the greater recovery rate in basketball players.

Traditional Thai massage dilates the blood vessels [4,5], [21], which helps remove oxygenated blood and waste from the muscle e.g. lactic acid; as a consequence, the acidity in muscles is diminished. This leads phosphofructokinase - an enzyme that controls process of glycolysis - to generate the energy to the muscles, and improves the binding of protein myosin and actin in muscle contraction; as a result, the muscles work effectively [22]. Moreover, Traditional Thai massage helps the blood vessels to transport oxygen to the muscles so that the muscles can perform better. In addition, Traditional Thai massage at the arms, legs, and back helps tissues around these organs improve flexibility, especially when they contract [23]. All these effects of massage may contribute to improve overall performance of the basketball players.

For Traditional Thai massage, the mechanical pressure is used by pressing on the muscle tissues to increase muscle flexibility for several benefits: to reduce the tension at the joints and muscle, and increase the degree of movement and elasticity [24]. The mechanism of massage has an effect on autonomic nervous system resulting in better mental relaxation because the massage can reduce the process of sympathetic activity while increasing parasympathetic activity [25]. This reduces the cortisol level, which in turn, lowers anxiety, eventually leading to relaxation [24,26]. This result was in accordance with the previous studies of [2,27] indicating that massage helps reduce the anxiety. Likewise, [5] revealed that massage alleviates muscle tightness and heals the sore muscle after intense exercise.

5. CONCLUSIONS

The results of this study showed that Thai traditional massage has more acute effect on the recovery of basketball players than the passive rest.

Hence, Thai traditional massage is an effective approach for muscle recovery since it improves the performance of basketball players during the competition. This method of Thai traditional massage could be applied to the basketball players during the breaks of the game, or even to other types of sports that are held with the breaks during the competition e.g. football, Sepak takraw, volleyball, etc. Therefore, sport massage as an alternative recovery method for athletes, trainers or interested parties could be applied in sports for greater performance and success.

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