Effectiveness between Static Stretching and Kneading Massage on Lowering Heart Rate among University Silat athletes

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Abstract

The purpose of this study is to determine the effectiveness of static stretching versus kneading massage in lowering heart rate (HR) recovery among silat athletes. Forty male subjects aged 18-25 years old were divided into two groups: the static stretching group (CG) and the kneading massage group (EG), both of which participated in this study. The subjects completed pre- and post-test sessions involving a 3-minute step-up box test followed by a recovery treatment program aimed at lowering heart rate, enabling the performance of heart rate monitor (HRM) tests immediately after treatment. Analysis of the recovery treatment program revealed significant differences in both groups regarding heart rate reduction. This study indicated that the percentage of heart rate recovery for the kneading massage group (EG) was 33%, compared to 21% in the static stretching group (CG). The results demonstrated that the kneading massage group (48.30 + 8.51 bpm) achieved a greater reduction in heart rate compared to the static stretching group (27.80 + 6.90 bpm) due to the respective treatments. The research concludes that kneading massage is a more effective treatment than static stretching for enhancing the recovery of silat athletes in a short period of time.

Keywords: combat sports, gayung fatani, Malay, martial arts, self-defense, exercise

1. Introduction

Silat is a competitive contact sport involving one-on-one fights in a ring (Aziz et al., 2023; Shapie et al., 2023). This combat sport determines the winner based on established rules and regulations (Anuar, 1993; Shapie et al., 2019). Contestants win matches by accumulating more points than their opponents. Silat exponents utilize all limbs to both attack and defend against opponents (Shapie et al., 2022). Therefore, this sport demands fast recovery treatment from the athletes themselves to ensure they can continue a match.

Over the past decade, physical recovery in sports has received increasing attention in research and practice, emphasizing the critical importance of optimizing the recovery state (Kellmann, 2010). Effective recovery from the high-intensity training faced by athletes can often determine success or failure. Studies have shown that enhanced recovery can help athletes train harder and improve overall fitness in related areas such as aerobics, power, and strength (Aziz et al., 2022). Athletes can only compete in a major competition when they maintain a balance between training and recovery, and this recovery process aims to optimize the athlete's performance.

Brenner (2007) reported that overuse injury is damage that occurs to tendons, muscles, ligaments, and bones due to recurring pain without adequate time to heal or proper recovery. Overuse injuries can be classified into four stages. The first level involves pain that affects a specific area after physical activity. In the next level, athletes experience pain during physical activity but without limited performance. The third level is when athletes feel pain during physical activity with limited performance. The final stage is the level at which the damage is very severe or chronic, leading to unremitting pain even when the athlete is at rest.

Based on a previous study, it is stated that success or failure in competition can be determined by the effectiveness of recovery in high-intensity training loads. The researchers suggest that proper and increased recovery treatment can enable athletes to train more and improve overall fitness. Moreover, the researchers emphasize that staff, coaches, and athletes need to acknowledge the importance of optimizing recovery and its potential

impact on athlete performance. To prevent injuries, athletes need to understand the basics of overtraining, and psychological and physical recovery must be integral parts of the training program (Kellmann, 2010). Overtraining, overload, and the recovery process present a challenging balance in training. Training is a complex equilibrium involving overload, overtraining, and recovery, as stated by Myrick (2015). These factors are crucial for individual athletes as they assess and plan for their care.

According to Campos et al. (2012), estimating energy contributions is crucial to understanding the athlete's potential performance consistency during matches. The total energy expended by athletes in competition comprises three 2-minute rounds with a 1-minute rest between each set. The energy systems utilized in this combat sport are aerobic and anaerobic lactic, both of which demand substantial oxygen. Heart rate (HR) provides continuous variability over short, medium, and even long terms, enabling the adjustment of physiological needs to the environment (Bricout et al., 2010).

Combat athletes preparing for tournaments must strike a perfect balance between training, recovery, and competition. The total recovery time and duration of rest in training should be similar to those in an actual match. This approach ensures that the body adapts to real situations; for instance, if the resting time in competition is 1 minute, the resting time in training should also be 1 minute. Employing a proper method and guideline in the recovery process ensures that the athlete's resting heart rate consistently adapts, enhancing performance in competition.

Static stretching involves stretching muscles while the body is at rest. Therefore, stretching exercises can improve the range of motion to prevent injuries before exercise and treat injured muscles. Both stretching and range of motion exercises are useful for curing dysfunction and immobilization. The pathway of muscle movement needs to be within an available range and must move equally between the muscle and joint to maintain the range of motion (Millis & Levine, 2014).

Kneading massage is a technique involving a petrissage movement, where soft tissues are compressed against the underlying bone. The tissues are rolled and lifted away, then back towards the bone with a squeezing compressing action. According to Jelvéus (2011), kneading massage can relax and soften the body before exercise. Thus, sports massage can increase tissue temperature, as the changes in muscle temperature are directly higher for massage at 1.5 to 2.5 cm below the skin than other recovery processes like ultrasound. These two techniques can reduce the heart rate (HR) of athletes, facilitating fast recovery in a short period. Athletes can maintain their physical state by utilizing plentiful treatment such as applying sports massage therapy for the recovery process, proper warm-up, and cooling down before and after training, thus increasing knowledge concerning the methodology of how to recover fast (Shapie & Intan, Nur Marliana, 2016).

Moreover, the information and knowledge of the art of silat are not only to protect ourselves from being in a dangerous or unsafe situation, but it also helps the athletes to counterattack the exponent to obstruct the exponent from causing any injury and harm to the athlete. Athletes must organize well in attack and defense to reach the full performance that can affect the opponent to make any attacking (Shapie & Elias, 2016). Furthermore, the physiological ordinary of high-performance athletes and knowledge of physical recovery in the sport may help to assist the development of a specific training program for average performance in the sport (Aziz et al., 2002).

Based on past studies (Jelvéus, 2011; Millis & Levine, 2014; Moraska et al., 2010; Ozmen et al., 2017; Callaghan, 1993; Khumalo & Jooste, 2012, Krauss, 2017), most researchers assert that there must be a difference between these two treatments and determine which is the most effective in lowering the heart rate (HR) of athletes. The proper and correct treatment can enable silat athletes to compete and survive during competitions with fast recovery, which demands a lot of energy. The first factor is that athletes may not be able to recover quickly in a short period. The second factor is that athletes need to recognize the importance of recovery treatment. The randomized groups will be tested with different treatments; the first group will receive assistance with static stretching, and the second group will receive assistance with kneading massage before and after measuring heart rate recovery. Proper recovery treatment is crucial to ensuring athletes sustain their fitness and improve performance. The aim of the current research is to determine whether static stretching or kneading massage is the most productive way of heart rate recovery for silat athletes.

2. Method

Forty male subjects (N = 40) of 18-25 years old completed pre- and post-test sessions of 3 minutes step-up box test (60 cm height / 40 m length) followed by recovery treatment program to lower heart rate, allowing for the performance of heart rate monitor (HRM) tests immediately after treatment. All subjects were from Universiti Teknologi Mara (UiTM), Shah Alam, Selangor, Malaysia silat exponents that free from injury at least two years of involvement or experience in silat competitions. The subjects only attend one

shoot data collections with one hour per person. Ethical approval was granted by the institutional ethics committee.

The subject was randomly divided into 2 groups; independent groups which used static stretching group (CG) and kneading massage group (EG) as part of their treatment for lowering heart rate. The subjects were treated at Rehab Specialist Centre, Section 7, Shah Alam, Selangor. The actual time of data collection involves a cross-sectional or one-shot data collection for two different treatments (static stretching and kneading massage). Each participant underwent the test only once. During the testing session, all participants were instructed to wear suitable and comfortable outfits. Both groups were subjected to the same test and were tested in the same location, albeit at different times.

The pre-test was performance of HRM test. Heart rate is the measured of a heartbeat by the number of contractions of the heart per minute (bpm). The first whistle was blown that indicated the beginning of 3 minutes step-up box test. This test is a measurement test of cardiovascular (aerobic) to measure your fitness level according on how fast your heart rate will recover to a normal rate. The subject performed this for 3 minutes without stopping. Once the 3 minutes were up, subjects were given recovery treatment program to lower heart rate according to their group (CG and EG). The post-test was performance of HRM test.

Kneading massage is technique of petrissage movement which the movement involved compressing the soft tissues against the underlying bones. For the kneading massage group, the subjects received petrissage massage on athlete's body part for 1 minute. Static stretching is muscle stretch while the body is at rest and not moving too much. For static stretching group, the subject did the lower body static stretching such as triangle stretch, calf stretch, butterfly stretch, pretzel stretch, and quadriceps stretch respectively for 12 seconds for each stretching technique.

The data were collected from each group before and after the 3 minutes step-up box test followed by recovery treatment program to lower heart rate and statistically analyzed by using SPSS version 21.0 (IBM, New York, USA). Paired t-tests were used to determine the pre-test and post-test between static stretching and kneading massage on lowering heart rate. The normality test for all the pre and post tests using the Shapiro-Wilk test showed that it is normally distributed as the *p* value is more than 0.05. Independent t-test was used to compare the improvement HR between CG and EG.

3. Results

Table 1 shows the post-test (M = 105.45, SD = 21.89) had a lower HR reading than the pre-test (M =133.45, SD = 20.65) in CG. A paired-samples t-test revealed a t-statistic of 17.99, with df=19 ($p < .05$). The effect size was large, with Cohen's *d* of 4.02.

The post-test (M = 97.70, SD = 15.98) had a lower HR reading than the pre-test (M =146.00, SD = 12.62) in EG. A paired-samples t-test revealed a t-statistic of 25.38, with df=19 ($p < .05$). The effect size was large, with Cohen's *d* of 5.68.

Table 2 shows there was significant difference in HR improvements for EG (M = 48.30, SD = 8.51) and CG (M=27.80, SD = 6.90; t (40) = -8.36, p = .0001). The effect size was large, with Cohen's d of 2.65.

Table 1. Pre and post test results of HR in static stretching and kneading massage groups. Results are shown as mean (sd), t, df and p-value.

Groups		Mean (SD)	t	df	*p*
Static Stretching Group (CG)	Pre-Test	133.45 (20.65)	17.99	19	.0001*
	Post-test	105.65 (21.89)			
Kneading Massage group (EG)	Pre-Test	146.00 (12.62)	25.38	19	.0001*
	Post-test	97.70 (15.98)			

**Significant difference between the category ($p < 0.01$)*

Table 2. Comparison of improvement of HR between static stretching and kneading massage group. Results are shown as mean (sd), t, df and p-value.

Groups		Mean (SD)	t	df	*p*
Static Stretching Group (CG)	20	27.80 (6.90)	-8.36	38	.0001*
Kneading Massage group (EG)	20	48.30 (8.51)			

**Significant difference between the category ($p < 0.01$)*

4. Discussion

The primary findings of this study highlight the comparison between static stretching and kneading massage on lowering heart rate among university Silat athletes. Significant changes were also observed for both treatments pre and post treatments. There were significant changes of HR for both treatment but based on demographic data it

shown that kneading massage had significant decrement HR compared to static stretching as that is proven by the result.

Kneading massage demonstrated a 33% better heart rate (HR) recovery compared to static stretching (21%), as proven by the results. Moraska et al. (2010) reported that sports massage therapy is the most satisfactory treatment to prevent fatigue, increase blood circulation, achieve relaxation, and promote normal recovery. Ernst (1998) stated that massage is an effective way of treating the onset of muscle soreness and can also enhance an athlete's performance. Massage therapy has been proven to increase mental calmness and reduce the production of edema. The researcher also indicated that this treatment could improve blood flow and reduce muscular tone. The current findings align with Callaghan (1993), who reported that kneading massage, also known as petrissage, is one of the best types of massage compared to others because kneading involves a deeper stroke or technique and is directed straight towards the muscle. The author also mentioned that this technique can enhance blood circulation. Thus, massage therapy can delay muscular fatigue during the short-term recovery between matches.

Weerapong et al. (2005) reported that massage is one of the treatments that can reduce the delayed onset of muscle soreness by helping athletes reduce edema and pain, ultimately increasing lymph and blood flow. Another researcher, Krauss (2017), reported that massage can provide positive feedback on anxiety levels, significantly decreasing depression and anxiety levels after massage therapy. The author also stated that many cultures have various forms of massage designed to assist athletes in different and specific situations. Thus, massage can relax the body and make it more pliable before exercise. In this context, sports massage can stimulate the parathyroid gland to release hormones that aid in digestion, muscle tissue health, and growth development.

Ozmen et al. (2017) stated that physical activity has many superiorities, thus static stretching is one of the effectual ways to treat the athletes to improve the performance before and after the training. Based on the current athlete's performance, both treatments give a positive response, but EG showed better decrement compared to CG to lower the HR after the treatments. Nevertheless, compared to the current study that found a 21% improvement in the static stretching group, Moss et al. (2011) reported that static stretching could result in several power and strength deficits. The authors stated that static stretching does not alter pre- and post-landing muscle activity because there is no significant difference found between these two groups. Thus, static stretching has resulted in a shortage in force production that can be held up to 120 minutes. The finding of this study shown that both treatment of physical recovery which is static stretching and kneading massage has given significant difference of result. The result shown that kneading massage is more effective than static stretching in decreasing the resting heart rate in silat athletes.

The outcome of the current study is useful as Brenner (2007) stated that in overtraining and recovery, there are three main things that can decrease the performance of the athlete: physiological, psychological, and hormonal changes. Elite athletes may become exhausted and lose passion for tournaments and training, making it difficult to complete the usual routine. However, following a proper recovery pattern and guidelines can help athletes stay focused and avoid burnout. The researcher also reported that a guideline to prevent overtraining organizes sports participation for one or two days every week, allowing the body enough time to rest. An overuse injury is damage that occurs to tendons, muscles, ligaments, and bones, recurring with pain without adequate time to heal or undergoing the recovery process. Overused injuries can be classified into four levels. Level one involves pain that affects a specific area after physical activity. The next level is when the athlete feels pain during physical activity but without limited performance. Meanwhile, the third level is when the athlete feels pain during physical activity with limited performance. The last stage is the level where the damage is very severe or chronic, causing unremitting pain even when the athlete is at rest.

5. Conclusion

Current research found that kneading massage shows greater effectual and effectiveness in lowering heart rate reading during training compared to static stretching. The treatment of kneading massage before, after and during training was the most effective treatment for silat athletes and can be included in the athletes training regime. This research concluded that the treatment gives a positive impact and feedback on lowering heart rate. The study gives a significant increment on lowering heart rate from vigorous activity.

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