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EFFECTS OF DIFFERENT DURATION OF TRADITIONAL THAI MASSAGE ON PARASYMPATHETIC NERVOUS SYSTEM

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ABSTRACT: Routine practice of TTM may last 1 - 2 hours depending on available time of clients. We doubt that 1 hour and 2 hours may yield different results. Therefore, the purpose of this study was to investigate the immediate effects of different duration of treatment of traditional Thai massage (TTM) on stress, heart rate variability (HRV) and autonomic nervous system (ANS) function. Seventeen healthy participants were randomly allocated to receive either 1 hour of TTM (1-TTM) group or 2 hour of TTM (2-TTM) group after which they were swabbed to receive the other one with a 2 – week washed out period. Stress, HRV, and ANS function were measured before and immediately after the TTM treatment. Within-groups comparison demonstrated that stress index was decreased ($p<0.05$) in both groups. Stress resistance, the standard deviation of the normal-to-normal intervals (SDNN) and root mean square of successive differences (RMSSD) were increased ($p<0.05$) in both groups. Low frequency per high frequency (LF/HF) ratio was decreased ($p<0.05$) in 1-TTM group. HF and ANS activity were increased ($p<0.05$) in 1-TTM group whereas LF and ANS balance status were not changed in both groups. However, all of them were not significant difference for between groups comparison. We concluded that a single session of either 1 or 2 hours of TTM could decrease stress and increase heart rate variability whereas only the 1-hour TTM could increase ANS function.

Keywords: Massage, Stress, Heart Rate Variability, Autonomic Nervous System

1. INTRODUCTION

Massage is an alternative treatment and may provide many benefits on health. Many previous studies found that massage could increase skin temperature and blood flow [1]-[3], decrease anxiety [4]-[7], depression [7] and pain, improve sleep quality [5], [8], increase renal blood flow [9], decrease sympathetic nervous activity and **increase parasympathetic activity [10]-[11] and weight gain** in infant [12] and decrease cortisol levels [10], [13], and stress [14]-[15].

Traditional Thai massage (TTM) is a deep acupressure type of massage that has been commonly used in Thailand because it is simple to practice and suitable for Thai culture. The previous studies showed that TTM could decrease spasticity, increase functional ability, improve quality of life [16], increase bone formation [17], decrease anxiety, pain [18]-[19], and muscle tension [18], increase flexibility, and parasympathetic activity [19]. Routine practice of TTM may last 1 - 2 hours depend on available time of clients. Since this is a time consuming method of treatment, we doubt that 1-hour and 2 hours may yield different results in terms of mental stress, heart rate variability (HRV), and autonomic nervous system (ANS) function. Therefore, this study aimed to examine the immediate effects of different duration of treatment by TTM on stress, HRV, and ANS function in healthy subjects.

2. MATERIAL AND METHOD

This study was a crossover randomized controlled trial, approved by the Ethical Committee of Mahasarakham University, Thailand (272/2557). Twenty participants were recruited in this study but three of them dropped out at the beginning of the study because of illness. The remaining participants consisted of seventeen healthy participants including 6 males, 11 females with the average age of 20.53±1.37 years who completed all the procedures. They were randomly allocated into either a 1-hour of TTM (1-TTM) group or a 2-hour of TTM (2-TTM) group after which they were swabbed to the other one with 2 weeks washed out period. Each of them gave written informed consent to participate in this study. The participants were excluded from the study if they had any kind of medication or other medical treatments, moderate to severe muscle or joint pain, impaired skin sensation or hypersensitivity to massage, history of serious disease that must be treated by a doctor. The participants were advised to refrain from eating, drinking alcohol, smoking, and foods containing caffeine, at least 2 hours before participating in this study. Mental stress parameter consisted of stress index and stress resistance. Heart rate variability (HRV) consisted of the standard deviation of the normal-to-normal intervals (SDNN), root mean square of successive differences (RMSSD), low

frequency per high frequency (LF/HF) ratio, HF, and LF. Autonomic nervous system (ANS) function consisted of ANS activity; and ANS balance status was measured at before and immediately after the TTM treatment.

2.1 Procedure and Protocol

The participants received a 1-hr or a 2-hrs session of the TTM which was applied along the Thai meridian lines (Fig. 1) with moderate thumb and palm pressure on each of the body parts including lower limbs, back, neck, head, and upper limbs. The massage was performed in supine, side lying on the left, and on the right positions. Passive stretch for the corresponding muscle groups was performed at the end of massage for each body part.

Mental stress, HRV, and ANS function were measured by SA-3000P (Medicore Co., LTD., Korea) using standard procedure recommended in the SA-3000P operation manual version 2.8. The participants sat on a comfortable chair with a backrest and eyes opened and breathed normally throughout the 5 minutes of the data collection.

Stress parameters including stress index and stress resistance were used to assess ANS function. Stress index presents the level of stress in the body. Stress resistance indicates the adaptability of the body against the stress. HRV parameters consisted of the standard deviation of the normal-to-normal intervals (SDNN), root mean square of successive differences (RMSSD) were used to assess ANS activity. High frequency (HF) reflected parasympathetic tone, whereas low frequency (LF) reflected the combination of both sympathetic and parasympathetic tones. LF responded to the increase in baroreflex function [20]-[21], which increased baroreflex causing an increase in parasympathetic activity and a decrease in sympathetic activity for maintaining homeostasis in the body. Increasing or decreasing of HF and LF reflects the ability of the body to maintain ANS balance [22].

The low frequency per high frequency (LF/HF) ratios was used to assess ANS balance. ANS activity and ANS balance status were used to determine ANS function [22]-[23].

Increased stress resistance, SDNN, RMSSD, HF, and ANS activity, decreased stress index, and LF/HF ratio indicated an increased parasympathetic activity. On the other hand, decreased stress resistance, SDNN, RMSSD, HF, and ANS activity, increased stress index, and LF/HF ratio indicated an increased sympathetic activity [22]-[23].

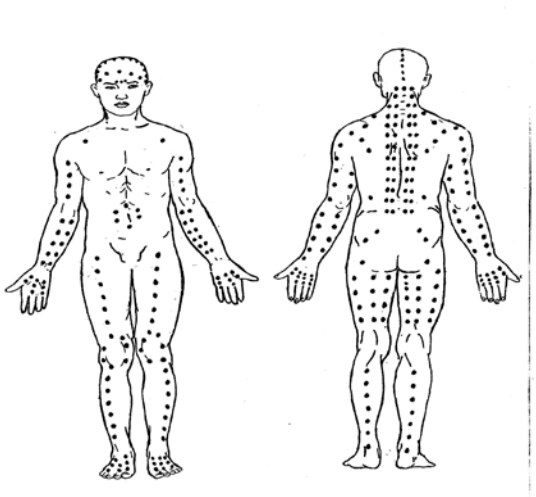

Fig. 1 The massage points on the meridian lines of TTM as depicted by Wichai Eungpinichpong [24]

2.2 Statistical Analysis

The data were presented as mean ± SD. Shapiro-Wilk Test was used to verify normal distribution. Paired t-test and Wilcoxon Sign Rank-Test were used to compare the outcome variables of before and after TTM treatment within group. Unpaired t-Test and Mann Whitney U-Test were used to compare outcome variables between groups. Statistical significance was set at the $p < 0.05$.

3. RESULTS

Within-groups comparison of the means between before and after TTM treatment revealed that stress index was significantly decreased after massage ($p = 0.026$ and $p = 0.019$ in 1-TTM and 2-TTM groups, respectively). Stress resistance was significantly increased ($p = 0.033$ and $p = 0.021$ in 1-TTM and 2-TTM groups, respectively). SDNN was significantly increased ($p = 0.047$ and $p = 0.006$ in 1-TTM and 2-TTM groups, respectively). RMSSD was significantly increased ($p = 0.001$ and $p = 0.001$ in 1-TTM and 2-TTM groups, respectively). However, the authors also found significant decrease in LF/HF ratio ($p = 0.017$), significant increase in HF ($p = 0.001$), and significant increase in ANS activity ($p = 0.03$), only in the 1-TTM group whereas the LF and ANS balance status were not changed in both groups (Table 1). All parameters showed no significant differences between the groups comparison.

Table 1 Comparison on the stress, HRV and ANS function between before and after TTM treatment in 1-TTM group.

outcome	1-TTM group (n = 17)	
	before	after
	mean±SD	mean±SD
Stress index	91.20±13.94	85.53±8.92*
95%CI	83.48, 98.92	80.59, 90.47
Stress resistance	106.33±23.68	113.40±17.86*
95%CI	93.22, 119.45	103.51, 123.29
SDNN	55.65±26.03	69.06±21.96*
95%CI	42.26, 69.03	56.90, 81.23
RMSSD	44.40±19.33	60.78±24.01**
95%CI	34.46, 54.34	48.43, 73.12
LF	6.55±1.04	6.54±0.80
95%CI	5.98, 7.13	6.10, 6.99
HF	5.94±0.75	6.45±0.83**
95%CI	5.55, 6.33	6.02, 6.87
LF/HF ratio	2.28±1.83	1.26±0.88*
95%CI	1.27, 3.30	0.77, 1.75
ANS activity	98.51±13.35	108.75±14.10*
95%CI	91.12, 105.91	100.95, 116.56
ANS balance status	42.49±32.07	43.93±39.86
95%CI	24.73, 60.24	21.85, 66.00

Note: HRV=heart rate variability, ANS=autonomic nervous system, 1-TTM=one hour of traditional Thai massage, SDNN=the standard deviation of the normal-to-normal intervals, RMSSD=root mean square of successive differences, LF=low frequency, HF=high frequency

*Significant difference at *p*-value <0.05

**Significant difference at *p*-value <0.01

4. DISCUSSION

The present study showed that both one and two hours of TTM could decrease stress index, increase stress resistance, SDNN, and RMSSD. Only one hour of TTM could increase HF and ANS activity and decrease LF/HF ratio whereas LF and ANS balance were not significantly changed in both groups. However, all of these measures were found not significant difference when the groups were compared. The findings of the present study demonstrated that TTM could increase parasympathetic activity indicated by increased SDNN, RMSSD, HF, ANS activity, decreased LF/HF ratio. Also, decreased sympathetic activity was indicated by decreased stress index and increased stress resistance. The results of this study were consistent with the previous studies [4], [10], [11], [19]. They found 20 minutes of light pressure of hand massage, a 30-minute session of TTM on to the back muscles, 80 minutes of touch massage (stroking) of the hands and feet, and a 5-minute hand holding could increase parasympathetic activity and decrease sympathetic activity, respectively.

Table 2 Comparison on the stress, HRV and ANS function between before and after TTM treatment in 2-TTM group.

outcome	2-TTM group (n = 17)	
	before	after
	mean±SD	mean±SD
Stress index	93.80±9.21	87.47±11.07*
95%CI	88.70, 98.90	81.34, 93.60
Stress resistance	100.20±14.19	110.13±15.64*
95%CI	92.34, 108.06	101.47, 118.80
SDNN	48.61±17.04	64.50±18.74**
95%CI	39.85, 57.37	54.13, 74.88
RMSSD	41.23±18.27	52.26±17.19**
95%CI	31.83, 50.62	43.42, 61.10
LF	6.30±0.96	6.45±0.66
95%CI	5.77, 6.83	6.08, 6.82
HF	5.92±0.67	6.16±0.82
95%CI	5.58, 6.26	5.74, 6.59
LF/HF ratio	1.90±1.23	1.70±1.29
95%CI	1.22, 2.58	0.99, 2.41
ANS activity	99.58±20.08	103.56±18.87
95%CI	88.46, 110.70	93.11, 114.01
ANS balance status	40.74±29.68	45.64±33.01
95%CI	24.30, 57.18	27.36, 63.92

Note: HRV=heart rate variability, ANS=autonomic nervous system, 2-TTM=two hours of traditional Thai massage, SDNN=the standard deviation of the normal-to-normal intervals, RMSSD=root mean square of successive differences, LF=low frequency, HF=high frequency

*Significant difference at *p*-value <0.05

**Significant difference at *p*-value <0.01

The current study found that HF and ANS activity were increased and LF/HF ratio was decreased in only one hour of TTM but not in two hours of TTM. It could be explained that all of the participants were people who are healthy and a two-hour of TTM was long enough for the body to rebalance the functions of the autonomic nervous system to return to the normal state. Therefore, it can

be seen that one hour of massage provides more effective than two hours of massage.

The LF and ANS balance status were not significantly changed after both TTM treatments for maintaining the balance between sympathetic and parasympathetic activity.

5. CONCLUSION

The present study demonstrated that a single session of either 1-hr or 2-hrs of TTM could increase parasympathetic activity and decrease sympathetic activity as indicated by decreased stress and increased HRV. However, only 1-hr session of TTM could increase ANS function. We suggest that 1-hr session of TTM is sufficient to provide favorable results on reducing mental stress and increasing ANS activity.

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