

Immediate Effects of Traditional Thai Massage on Heart Rate Variability in Major Depressive Disorder Patients

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ABSTRACT

Introduction: Depression can affect people of all ages around the world. Patients with major depressive disorder always have stress and anxiety as their common symptoms. Traditional Thai Massage (TTM) is one of the most popular alternative treatments in Thailand to relieve psychological stresses and anxiety which may be reflected by increased Heart Rate Variability (HRV).

Aim: To preliminarily examine the immediate effects of TTM on Heart Rate (HR) and HRV in patients with major depressive disorder.

Materials and Methods: The study was conducted at two psychiatric departments in Thailand. A single group pre-post design was applied. Twenty-four patients (3 males and 21 females, aged 34.54 ± 11.08 year) who were diagnosed with major depressive

disorder participated while they were on standard medication. HRV, resting HR, and Blood Pressure (BP) were assessed before and immediately after having a session of TTM. Paired t-test was used to compare the outcomes between the pre and post-treatment procedure.

Results: There was significant increase in HRV especially for time domain {the Standard Deviation of all Normal to Normal intervals (SDNN) (31.27 ± 10.45 vs 37.76 ± 11.55 , $p < 0.01$)} and the root mean square of successive differences: RMSSD (24.23 ± 11.69 vs 34.49 ± 16.51 , $p < 0.01$) while there were no change in HR and BP.

Conclusion: A single treatment of TTM could increase HRV in this patient population. Further investigation with a larger sample size with a randomised controlled trial is suggested.

Keywords: Alternative medicine, Anxiety, Depression, Stress

INTRODUCTION

The number of people suffering from depression has increased to 18.4%, from 2005 to 2015 [1], followed by a slight increase from 2011-2016 and proportionately increased in the age groups. The total number of people who have been living with depression in the world was estimated 322 million [2]. The highest depression prevalence was found in adults who were older than 80 years [3].

Autonomic dysfunction is one of cardiovascular predictors of mortality [4]. Enhanced depression care for patients with Acute Coronary Syndrome (ACS) was associated with greater satisfaction, and a greater reduction in depressive symptoms [5]. People who suffered from depression were showed with overall reduced high-frequency HRV [6]. HRV is the beat-to-beat variation of R-R interval of the recorded electrocardiogram. This variability is modulated by the sympathetic and parasympathetic components of the autonomic nervous system [7]. Depression is independently associated with cardiovascular dysfunction that is manifested in the form of decreased HRV. Intime-domain HRV assessment: SDNN (estimate of overall HRV); and the root mean square of successive difference (RMSSD) is the most appropriate time-domain measure for short duration ECG recording [8]. The components in frequency-domain variables included Low-Frequency (LF) and High-Frequency (HF) power have been found to be affected by depression [6].

Many studies have documented that massage may elicit an increase in the HF component of HRV (vagal activity) and PNS response which was characterised by a decreased HR [9,10]. Massage is one of alternative treatments which could be used to express certain scientific manipulations of the soft tissues of the body by therapist as a component of a holistic therapeutic intervention. It may have positive psychological effects on depression patients [11-13]. TTM has been associated with significant increases in HRV [14,15] which rebalance the functions of the autonomic nervous system to return to the normal state [16].

The TTM, a type of deep pressure massage, has been used for relieving stress and anxiety in Thai people for long time. It was found to increase HRV in young adults and elderly people who suffered from fatigue and musculoskeletal pain [17,18]. Possible mechanism of TTM on HRV is based on comfortable pressure massage to the soft tissues and stretching to the tightened muscles of the body that relieve muscle pain and stiffness, and facilitate blood flow throughout the body. Therefore, parasympathetic activity of the Autonomic Nervous System (ANS) has been activated. It is proposed that it might affect HRV in patients with depression but there is no evidence to support it. The present study was conducted with the aim to preliminarily examine the immediate effects of TTM on HRV, HR, and BP in patients with major depressive disorder.

MATERIALS AND METHODS

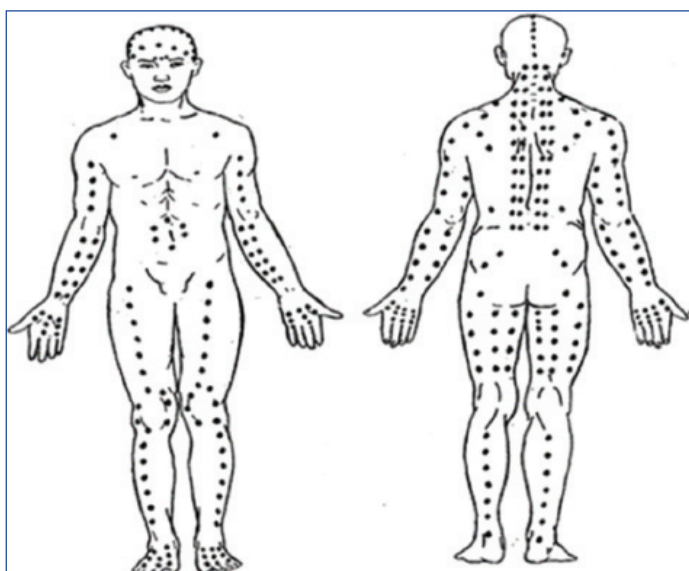
A pre-post experimental design was applied on single group. This was done by having the patients undergo a session of 90 minutes of TTM. All the outcome measures were assessed before and immediately after the TTM treatment. The study was conducted at psychiatric department of Srinagarind Hospital, Khon Kaen University, and Khon Kaen Rajanagarindra psychiatric hospital, Khon Kaen province, Thailand from May 2018 to April 2019. The study proposal was approved by the Khon Kaen University Ethics Committee for Human Research with reference number HE 601073.

All of the eligible patients were screened accordingly to the inclusion criteria to participate in the study using Hamilton Depression Rating Scale (HDRS) by a researcher and the corresponding psychiatrists. HDRS score must be 8 or more. If the participants met the criteria, they gave informed consents and were included in the study.

Patients with any history of the contraindications consisted of psychotic disorder, diabetes mellitus, hypertension, multiple sclerosis or heart disease were excluded. Since this was a preliminary study, sample size estimation has been based on small eligible number of

patients. Twenty-four patients who met all the criteria volunteered to participate.

Intervention of this study was a 90-minute session of standard whole body TTM known as SenSib Nuad Thai. The TTM protocol consisted of the following massage procedure: The patient is asked to lie down on his/her back. The therapist then applies a gentle but firm palm pressure, on the patient's medial aspect of lower limb to temporally occlude the femoral artery for 20-30 seconds. The pressure is then released letting blood flow to the leg and foot. This technique is repeated for the upper arm on the brachial artery of each of the forearms. This technique is called opening the wind gate which aims to stimulate blood flow to all the tissues of the limbs. Then the therapist applies gentle but deep thumb pressure massage along the ten meridian lines of TTM that covers major muscles of limbs, back, neck and head. The massage is repeated five times. The amount of thumb pressure on each of the body parts is adjusted to not exceed the pressure pain threshold of the patient. The TTM is done in side lying positions when back and neck regions are applied. At the end of the massage session, the therapist applies gentle stretches for all major muscles including calf, hamstring, quadriceps, pectorals, back, neck, shoulder, arm, forearm and finger muscles [Table/Fig-1-6].



[Table/Fig-1]: Traditional Thai massage on SenSib line.

The massage points on the meridian lines of TTM as depicted by Wichai Eungpinichpong. Reproduced with permission from therapeutic Thai massage [19].

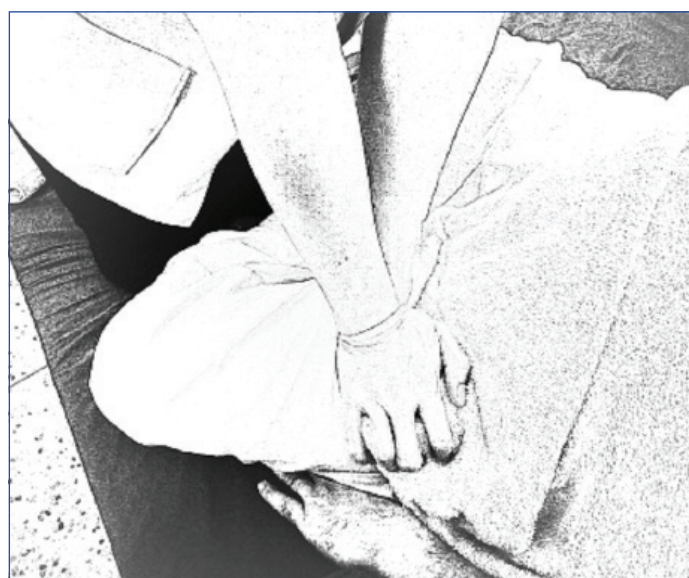


[Table/Fig-2]: Massage on head.

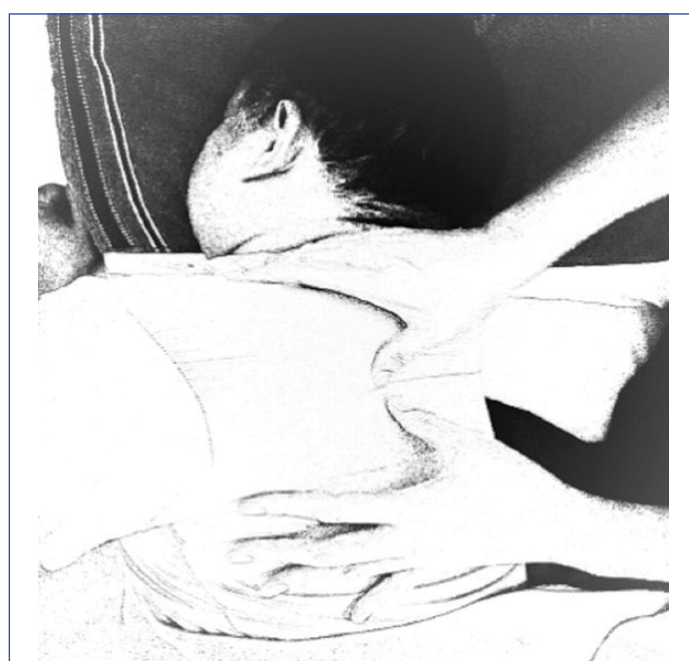
Massage areas used in this study were based on the ten meridian lines of Thai massage. First line (1st line) was on the left side began at the navel, ran down outer leg line, and turned up at the knee. It was called "Ei-tar". The second line (2nd line), named "Ping-ka-la", was on the right side and ran identical to the left one. Both lines



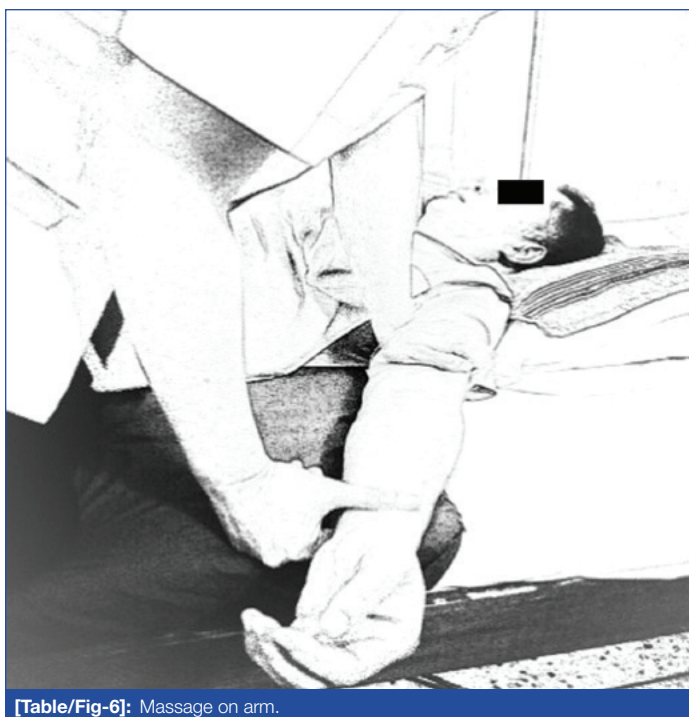
[Table/Fig-3]: Massage on calf.



[Table/Fig-4]: Opening the wind gate.



[Table/Fig-5]: Massage on back.



[Table/Fig-6]: Massage on arm.

ran up the inner leg line through iliac crest, Hamstring insertion, and up along paravertebral muscles and ended at the base of skull of both sides. The third line (3rd line) ran out from the navel to the base of the tongue. It was named "Sum-ma na". The fourth line (4th line) ran from the navel in four branches where two branches ran to the upper part the body and two branches ran to the lower. They ran through the back, outer leg line and outer arm line. The fifth line (5th) ran from the navel in the left side, and down the inner leg and turned up in outer leg line through the pelvis, chest and end at left eye, it was called "Sa-ha-sa-rang-si". The sixth line (6th), named "Ta-wa-ree", was identical to the fifth line but ran on the right side. The seventh line (7th) ran from the navel through the left chest and terminated at left ear. It was called "Jan-ta-pu-sank". The eighth line (8th) was identical to the seventh line but ran on the right side. It was called "Rusum". The ninth line (9th) ran from the navel and shifted a little to the left and ran down to anus. It was called "Su-ku-mang". The tenth line (10th) is identical to the ninth line but ran on the right side and ran down to reproductive organ. It was called "Si-ki-nee" [19].

Procedure

Each session of data collection took place at the same time of the days during 9.00 am to 3.00 pm for the heart rate recording, measuring the blood pressure and HRV. All subjects were asked to have an early meal at least 2 hours prior to participating in the measurements. They were also instructed to refrain from alcohol or caffeinated consumption 24 hours before participation. After that the patient rested in a massage room for a few minutes, a qualified female massage therapist, who passed the training by the Department of Alternative Medicine, Ministry of Public Health, gave a session of 90 minutes of whole-body standard TTM procedure while the patient was lying on the supine, prone, left and right side consequently in the massage room. Conversation between the massage therapist and the patient was minimised during the massage procedure, only few questions were allowed in order to maintain concentration for both of them. The massage session was always ended with stretching. Immediately after receiving TTM, all of the outcome measures were reassessed.

Measurement Equipments

Blood pressure was measured at rest after the patient rested on supine position for 10 minutes using a digital sphygmomanometer (Omron, Japan). Systolic Blood Pressure (SBP) And Diastolic Blood

Pressure (DBP) were recorded three times before and after massage and averaged for each of the BP. Heart rate and heart rate variability were recorded for 5 minutes by SA 3000P (Medi-core, Seoul, Korea). SA-3000P is an apparatus that collect the pulse rate from the finger through a pulse plethysmography. Then, it analyses the "HRV" which give significant information on ANS regulating function and balance status. The change (variation) of heart rate during short term (5 minutes) is analysed with the method of both time domain and frequency domain to provide the degree of balance and activity of autonomic nervous system. During HRV measurement each patient was guided to breathe naturally in order to obtain accurate HRV data.

STATISTICAL ANALYSIS

Data were analysed by using SPSS for Windows Version 19.0 (IBM Corp. Released 2010, IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.) Under licensed of Khon Kaen University. Shapiro-Wilk test was used to verify the normal distribution of continuous variables. Demographic data and descriptive statistics were also applied. Paired t-test was used to compare the outcome variables between the pre- and the post-treatment procedure. p-value <0.05 was considered as statistically significant.

RESULTS

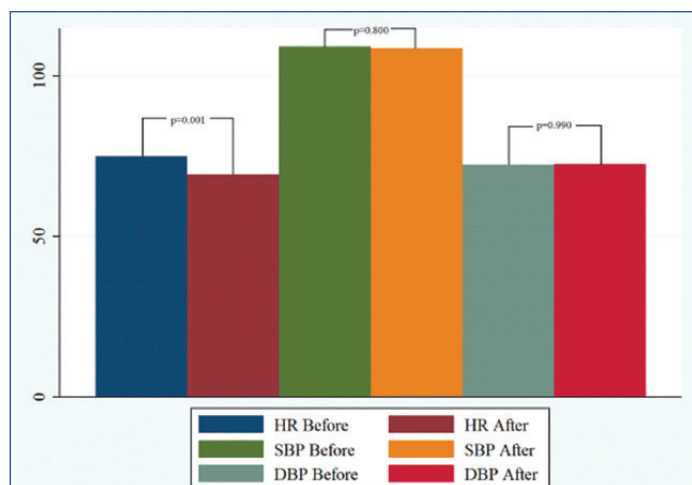
Demographic data showed that 45.84% of the patients were 20-30 years of age and the majority of them (87.50%) were females. Most of them were single (58.33%). Their incomes ranged from less than 10,000 baht/month (58.33%) to more than 10,000 baht/month (41.67%) [Table/Fig-7].

Characteristics	n (%)
Age	
20-30	11 (45.84)
31-40	5 (20.83)
≥41	8 (33.33)
(Mean±SD)	(34.54±11.08)
(Max: Min)	(51: 20)
Sex	
Male	3 (12.50)
Female	21 (87.50)
Status	
Single	14 (58.33)
Married	8 (33.33)
Widow	2 (8.33)
Income (Baht/month)	
<10,000	14 (58.33)
≥10,000	10 (41.67)
The Hamilton rating scale for depression	
Mild depression (8-12)	14 (58.33)
Less than major depression (13-17)	2 (8.33)
Major depression (18-29)	7 (29.17)
Severe major depression (30+)	1 (4.17)

[Table/Fig-7]: Characteristics data.

A comparison on HRV within the group before and after TTM treatment showed significantly increase in SDNN (p=0.008) and RMSSD (p=0.002) components [Table/Fig-8]. However, there were no significant change in any of frequency domain which included LF, HF, and LF/HF [Table/Fig-9].

A comparison on HR, SBP, and DBP within the group between before and after TTM treatment revealed that there was significant decrease in HR (p=0.001) but there were no significantly change in blood pressure.



[Table/Fig-8]: Comparison of HR, SBP, and DBP between before and after TTM treatment.

TTM group (n=24)					
Variables	Before $\bar{X} \pm SD$	After $\bar{X} \pm SD$	Mean difference	95% CI	p-value
SDNN (ms)	31.27 \pm 10.45	37.76 \pm 11.55*	6.49	(2.25-11.02)	0.004
RMSSD (ms)	24.23 \pm 11.69	34.49 \pm 16.51*	10.26	(3.00-14.68)	0.001
LF (ms ²)	165.84 \pm 215.68	158.65 \pm 257.20	-7.19	(-107.86-93.48)	0.558
HF (ms ²)	110.27 \pm 103.10	141.66 \pm 163.81	31.39	(-15.22-78.00)	0.088
LF/HF	1.72 \pm 1.35	1.54 \pm 1.54	-0.18	(-0.76-0.38)	0.746

[Table/Fig-9]: Comparison of HRV within the group before and after TTM treatment. SDNN: Standard deviation normal to normal, RMSSD=Root mean square of successive differences; LF: Low frequency; HF: High frequency; LF/HF: Low frequency to High frequency ratio; *Significant difference at p-value <0.05

DISCUSSION

The results of this study were in line with a previous study which found that Thai massage therapy affected a significant decreased in heart rate, and increase time domain in SDNN, RMSSD [15] even on different study population. The increases in SDNN and RMSSD components of HRV after having TTM suggested that the TTM could modulate the autonomic nervous system and induce recovery from fatigue. The decreased HR after having TTM also indicated that the patients had less anxiety due to modulation on parasympathetic tone [8,9]. Subjectively, all the patients reported with comfortable feeling after having TTM which indicated a positive effect and induced parasympathetic activity, reflected by increased SDNN, and RMSSD value.

A meta-analysis on effects of massage therapy also found that it could provide the greatest effect on reduction in anxiety and depression [20].

Limitation(s)

First, it was a pilot study with small sample size. Secondly, a single group pre-post experimental design applied in this study may provide only a trend on the treatment effect. Further study with a randomised controlled trial was suggested to verify its effect on patients with major depressive disorder. Moreover, long-term effects of TTM on this patient population and a follow-up study would be needed since the nature of this disease is chronic.

CONCLUSION(S)

With the aim to preliminary study the immediate effects of TTM on HRV, HR, and BP in patients with major depressive disorder, the results found that the TTM could significantly increase SDNN, and RMSSD, but no effect on HR and BP. Since the SDNN is well known to be representative of the entire autonomic nervous system function and always reflect subjective symptoms, the increased SDNN resulting from TTM might be a good sign to verify if the TTM could be an alternative treatment for patients with major depressive disorder in the future.

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