Psychological Stress Can Be Decreased by Traditional Thai Massage

Thanarat Sripongngam MSc*,**, Wichai Eungpinichpong PhD**,
Dhavee Sirivongs MD***, Jaturat Kanpittaya PhD****,
Kamonwan Tangvoraphonkchai PhD*****, Sutin Chanaboon MD******

** PhD candidate, Graduate School, Khon Kaen University, Khon Kaen, Thailand*
*** Research Center in Back, Neck, Other Joint Pain and Human Performance, Khon Kaen University, Khon Kaen, Thailand*
**** Department of Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*
***** Department of Radiology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*
****** Faculty of Medicine, Mahasarakham University, Mahasarakham, Thailand*
******* Sirindhorn College of Public Health Khon Kaen, Khon Kaen, Thailand*

Objective: *The purpose of this study was to investigate the immediate effects of traditional Thai massage (TTM) on psychological stress and heart rate variability (HRV).*
Material and Method: *Thirty healthy participants were randomly allocated in two groups, a TTM group (n = 15) who received a 1-hour session with moderate pressure of whole body TTM or a control group (n = 15) who rested on the bed for 1 hour. All of them were given a 10-minute mental arithmetic test to induce psychological stress after which they received a 1-hour session of TTM or bed rest. Psychological stress and HRV were measured at baseline and immediately after mental arithmetic test, and immediately after TTM or bed rest.*
Results: *The study found that psychological stress was significantly increased ($p<0.05$) after mental arithmetic test in both groups. Comparison on these measures between immediately after mental arithmetic test and after TTM or bed rest revealed that psychological stress was significantly decreased ($p<0.05$) and HRV was significantly increased ($p<0.05$) in both groups. Root mean square of successive differences (RMSSD) and low frequency were significantly increased ($p<0.05$) only in the TTM group. However, all of these measures were found without significant difference when groups were compared.*
Conclusion: *TTM and bed rest could decrease psychological stress and HRV.*

Keywords: *Psychological stress, Sympathetic activity, Thai massage*

J Med Assoc Thai 2015; 98 (Suppl. 5): S29-S35
Full text. e-Journal: *http://www.jmatonline.com*

Acute and chronic stresses are states of mind in response to pressure from environmental conditions that can cause psychological and physiological changes. Many studies found that stress affects heart rate variability (HRV)[1-4] and activities of the autonomic nervous system (ANS)[5-9]. The mechanism of stress that affected both HRV and ANS could be explained that during stress, the cerebral cortex sends the signals to the ANS. Consequently, the sympathetic nervous system is activated and causes an increase in sympathetic activity leading to an increased HR and alters HRV[1-4].

Previous studies have shown that massage could effectively reduce stress[10-12], increase HRV, decrease sympathetic nervous activity, and increase parasympathetic activity[13,14]. TTM is an alternative treatment that differs from other type of massage because the main massage technique being used includes deep pressure massage applied along the meridian lines on the body, and often combines stretching the muscles (Fig. 1). Although TTM has been used for the purpose of inducing relaxation for a long time, studies on its effect are very limited and mostly based on subjective measures such as perceived pain or relaxation from stress. Only one research has studied the immediate effects of TTM on HRV and psychological stress, which, found that 30-minute

Correspondence to:
Eungpinichpong W, Department of Physical Therapy, Faculty of Associated Medical Science, Khon Kaen University, 123 Moo 16l, Mittraphap Road, Muang, Khon Kaen 40002, Thailand.
Phone: +66-81-7494748, Fax: +66-43-202399, +66-43-347482
E-mail. wiceun@yahoo.com

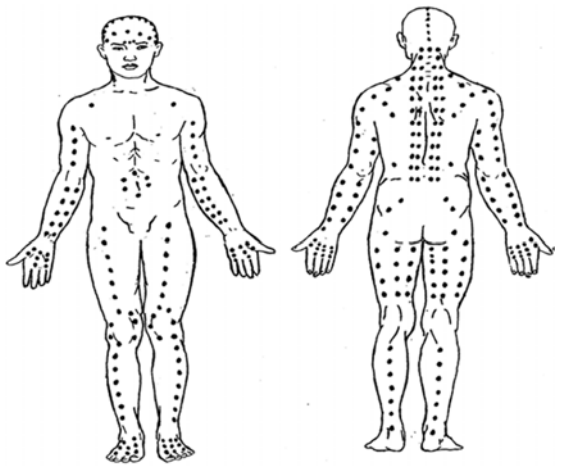

Fig. 1 The points on the meridian lines massage of TTM as depicted by Eungpinichpong W[21].

session of TTM on the back muscles could increase HRV and decreased anxiety in patients with back pain associated with myofascial trigger points[15]. Since psychological stresses may affect both psychological and physical wellbeing, any kind of stress reduction methods, such as massage, and rest, would benefit quality of life. However, no research is available that has studied the immediate effects of TTM on all parameters of HRV and psychological stress. Therefore, the purpose of this study was to investigate the immediate effects of TTM on psychological stress and HRV in healthy persons.

Material and Method

Study design and participants

This was a randomized control trial study, approved by the Ethical committee of Khon Kaen University, Thailand (HE561485). The study was conducted at the Department of Health and Sport Science, Faculty of Education, Mahasarakham University, Mahasarakham, Thailand.

Procedure and protocol

Thirty volunteered participants were randomly allocated in two groups, a TTM group (n = 15) included 3 males, and 12 females, average age 33.07±6.4 years and a control group (n = 15) included 4 males, 11 females, average age 36.33±5.26 years. Each of them gave written informed consent to participate in this study. Initially, the participants had mild psychological stress levels in both groups (TTM = 21.27±1.53 and control = 22.13±1.36) as they were assessed using the Suanprung Stress Test-20[16]. The participants were excluded from the study if they had any kind of medication or other medical treatment, 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 or who had moderate stress (25-42 score) assessed by the Suanprung Stress Test-20, or menopause. The participants were advised to refrain from eating, drinking alcohol, smoking, and foods containing caffeine, at least 2 hours before participating in this study. The participants in both groups were given a 10-minute mental arithmetic test to induce psychological stress before the 1-hour session of TTM or 1-hour of bed rest.

HRV, ANS function and stress

HRV parameters which included heart rate (HR), the standard deviation of the normal-to-normal (NN) intervals (SDNN), root mean square of successive differences (RMSSD) were used to assess ANS activity. Increased HR, decreased SDNN and RMSSD indicated an increased sympathetic activity, In contrast, decreased HR and increased SDNN and RMSSD represented increased parasympathetic activity[17]. High frequency (HF), low frequency (LF), and low frequency per high frequency (LF/HF) ratios were used to assess ANS balance. Decreased HF and increased LF/HF ratio represented increased sympathetic activity, whereas, increased HF and decreased LF/HF ratio represented increased parasympathetic activity[17]. LF reflects the modulation of cardiac autonomic outflows by baroreflexes, which increases LF representing increased baroreflex function, not measure for cardiac sympathetic activity[18,19]. Increased baroreflex cause increase parasympathetic activity and decrease sympathetic activity to maintain homeostasis in the body. Increasing or decreasing HF and LF reflects the ability of the body to maintain ANS balance[17].

ANS function includes stress index and stress resistance where, increased stress index and decreased stress resistance represent increased sympathetic activity. On the other hand, decreased stress index and increased stress resistance represent increased parasympathetic activity.

Psychological or mental stress was used to assess stress, namely, increased and decreased psychological stress represented increased and decreased stress, respectively.

SDNN and RMSSD are parameters of HRV using time domain analysis whereas HF, LF, and LF/HF ratio are parameters using frequency domain analysis.

The time intervals between each successive normal QRS complex (NN intervals) are used to determine for HRV analysis. Abnormal beats that are not generated by sinus node depolarization and artifacts are filtered by the software.

SDNN is a standard deviation of the NN intervals, SDNN reflects total cyclic element of the variability in recorded series of NN intervals. RMSSD is the square root of the mean squared differences of successive NN intervals and this measure estimates high-frequency variations in short term NN intervals of heart rate. It reflects parasympathetic regulation of the heart.

The HF power spectrum ranges between 0.15 and 0.4 Hz. These frequencies reflect parasympathetic activity. The LF power spectrum ranges between 0.04 and 0.15 Hz. It reflects both sympathetic and parasympathetic activity. The LF/HF ratio is the ratio between the power of low and high frequency. This measured value indicates overall balance between the sympathetic and parasympathetic systems. This is calculated from the ratio of LF Norm and HF Norm, where LF Norm = LF/(LF + HF) x 100 and HF Norm = HF/(LF + HF) x 100.

Stress index presents the level of stress in the body. It consists of two parts, pressure index and emotional status. The pressure index implies physical stress or physical pressure based on SDNN and mean HR in the time domain. The emotional status is the emotional stress level calculated from the balance of the sympathetic nervous system and parasympathetic nervous system. Stress resistance indicates the adaptability of the body against the stress and is derived from SDNN[20].

The Faces Rating Scale was used to assess psychological stress and consists of 10 scales.

Procedure

The participants sat on a comfortable chair with a backrest with eyes opened and breathed normally throughout the 5 minutes of data collection. The HRV and stress parameters were measured by SA-3000P (Medicore Co., LTD., Korea) and the procedure of measurement followed the SA-3000P operation manual version 2.8. HR, SDNN, RMSSD, HF, LF, and LF/HF ratio were used to evaluate HRV. Stress resistance, and stress index were used to reflect ANS function.

Traditional Thai Massage (TTM) and bed rest

The participants received a 1-hour session of TTM or bed rest in a temperature-controlled room (25-26°C). Moderate thumb and palm pressure of the TTM was applied along the meridian lines on all the parts of the body including lower limbs, back, neck, head, and upper limbs. Massage was performed in the supine, side lying on the left, and on the right positions (Fig. 1). At the end of the massage for each part, the participants had passive stretches for the corresponding muscle groups. In the control group, the participants lay on a bed in the same positions.

Statistical analysis

The data were presented as mean $\pm$ SD. Repeated measures ANOVA was used to compare the mean difference within group in each period. The two-way repeated measures analysis of variance (ANOVA) was used to compare the mean difference between TTM and control groups. Statistical significance was set at the p-value ≤ 0.05.

Results

Within-groups comparison of the means between baseline and immediately after mental arithmetic test revealed that only psychological stress in both groups was significantly increased ($p = 0.001$ and $p = 0.001$ in TTM and control groups, respectively). Although, HF in the TTM group ($p = 0.07$) and LF/HF ratio in both groups ($p = 0.059$ and $p = 0.052$ in TTM and control groups, respectively) showed no difference, it showed a tendency to decline and increase, respectively, when compared to baseline.

Comparing the means between immediately after mental arithmetic test and TTM or control group, we found a significant decrease in HR ($p = 0.02$ and $p = 0.027$ in TTM and control groups, respectively), and significant increase in SDNN ($p = 0.033$ and $p = 0.008$ in TTM and control groups, respectively). However, RMSSD was significantly increased only in the TTM group ($p = 0.002$).

Significant increase in HF was found in both groups ($p = 0.002$ and $p = 0.039$ in TTM and control groups, respectively). However, LF was significantly increased only in the TTM group ($p = 0.011$), whereas the LF/HF ratio was not changed in both groups.

The authors also found significant decrease in stress index ($p = 0.004$ and $p = 0.03$ in TTM and control groups, respectively), significant increase in stress resistance ($p = 0.044$ and $p = 0.004$ in TTM and control groups, respectively), and significant decrease in psychological stress ($p = 0.0001$ and $p = 0.0001$ in TTM and control groups, respectively) (Table 1).

Between-groups comparison showed no

Table 1. Mean ± standard deviation in each period of Thai Traditional Massage (TTM) and control groups

Outcome	TTM group (n = 15)			C group (n = 15)		
	Baseline	After mental	After TTM arithmetic test	Baseline	After mental	After rest arithmetic test
Psychological stress	2.60±2.06	5.53±1.81[a]*	1.60±1.72[b]*	2.80±2.46	5.40±1.76[a]*	1.67±1.50[b]*
95% CI	1.46, 3.74	4.53, 6.53	0.65, 2.55	1.44, 4.16	4.42, 6.38	0.84, 2.50
Stress index	94.27±11.79	93.80±14.18	84.00±12.24[b]*	97.40±17.15	98.67±17.89	90.87±12.52[b]*
95% CI	87.74, 100.79	85.95, 101.65	77.22, 90.76	87.90, 106.90	88.76, 108.57	83.93, 97.80
Stress resistance	96.67±13.03	98.60±16.17	105.80±11.40[b]*	94.13±11.93	93.60±13.75	103.53±13.80[b]*
95% CI	89.45, 103.88	89.64, 107.56	99.48, 112.11	87.53, 100.74	85.99, 101.21	95.89, 111.17
HR (bpm)	76.07±9.57	75.27±8.46	68.80±12.28[b]*	78.07±13.22	77.47±12.81	73.93±10.72[b]*
95% CI	70.77, 81.37	70.60, 79.95	62.00, 75.60	70.75, 85.39	70.38, 84.56	68.00, 79.87
SDNN (ms)	45.85±18.12	45.85±18.12	55.34±15.13[b]*	39.15±13.64	39.15±13.64	50.19±17.36[b]*
95% CI	33.98, 51.18	35.82, 55.89	46.97, 63.72	32.56, 45.26	31.59, 46.70	40.57, 59.80
RMSSD (ms)	35.99±25.95	31.49±12.92	40.69±15.40[b]*	29.81±16.97	30.12±20.09	32.53±18.16
95% CI	21.61, 50.36	24.33, 38.64	32.16, 49.22	20.42, 39.21	19.00, 41.25	22.47, 42.59
HF (ms^2)	5.43±1.00	5.16±0.82	5.74±0.63[b]*	4.96±1.33	4.84±1.50	5.18±1.18 [b]*
95% CI	4.87, 5.98	4.71, 5.62	5.38, 6.09	4.23, 5.70	4.01, 5.67	4.52, 5.83
LF (ms^2)	5.72±0.88	5.70±0.93	6.21±0.98[b]*	5.29±0.92	5.59±0.62	5.95±1.01
95% CI	5.23, 6.20	5.18, 6.21	5.67, 6.75	4.78, 5.80	5.25, 5.94	5.39, 6.51
LF/HF ratio	1.56±0.91	2.08±1.27	2.29±2.01	1.98±1.75	3.70±4.14	3.64±4.23
95% CI	1.06, 2.06	1.38, 2.78	1.17, 3.40	1.01, 2.95	1.40, 5.99	1.30, 5.99

HR = heart rate; SDNN = the standard deviation of the normal-to normal intervals; RMSSD = root mean square of successive differences; HF = high frequency; LF = low frequency; LF/HF ratio = low frequency per high frequency ratio

* Significant difference at *p*-value <0.05

[a]* Comparison between baseline and after mental arithmetic test

[b]* Comparison between after mental arithmetic test and after TTM

difference between the groups in both conditions including after mental arithmetic test and after intervention (Table 1).

Discussion

The present study demonstrated that mental arithmetic test could increase sympathetic activity as indicated by increased psychological stress. In addition, TTM and bed rest could decrease sympathetic activity indicated by decreased HR, increased SDNN, RMSSD, HF, LF, stress resistance, decreased stress index and psychological stress. A previous study[1], Li et al, (2009) reported a 10-minute video game challenge could decrease RMSSD and HF in 399 youths and young adults that was consistent with Wang et al[2]. They showed RMSSD and HF significantly decreased after three 10-minute laboratory stressors including virtual reality car driving, video game challenge, and the social competence interview) in 427 European and 308 African American twins. It could be concluded that stress could increase sympathetic activity and decrease parasympathetic activity. Although, the present study showed no difference in HF, it may have resulted from the small sample size when compared with both studies. Sympathetic activity increased after stress condition, however, TTM could decrease sympathetic activity indicated by decreased HR, mental stress, stress index and increased stress resistance and increased parasympathetic activity as indicated by increased SDNN, RMSSD, and HF, consistent with previous studies[13-15]. The present study found that, bed rest affected both sympathetic and parasympathetic activities. Psychological stress, stress index and HR were significantly decreased, and stress resistance, SDNN, and HF were significantly increased after bed rest. TTM provided slightly more positive effects than the rest because RMSSD and LF were not changed after bed rest but they showed differences after TTM. LF/HF ratio was not significantly changed after both interventions for maintaining balance of the ANS system. However, the immediate effects of TTM showed no difference from bed rest.

Limitations and future study

Since this study determined the effect of TTM on the induced stress from performing mental arithmetic stress test, the results cannot extrapolated to persons who have already had psychological disorders. Further study of patients with substantial anxiety or stress arising from their daily living activities is suggested. The authors also encourage researchers to investigate long-term and cumulative effects of TTM on these measures in the future.

Conclusion

The present study has demonstrated that either TTM or bed rest could successively recover (decrease) psychological stress and HRV. This was indicated by 1) a decrease in psychological stress, stress index, and HR, increased stress resistance, SDNN, RMSSD, HF, and LF after a 1-hour session of TTM and 2) decreased psychological stress, stress index and HR, increased stress resistance, SDNN, and HF after bed rest.

What is already known on this topic?

Previous studies have shown stress could decrease HRV[1-5] and many studies have demonstrated that massage could reduce stress[10-12], increase HRV, decrease sympathetic nervous activity, and increase parasympathetic activity[13,14]. However, only one research[15] found that TTM could increase HRV. They measured LF, HF, and LF/HF ratios, the frequency domain of HRV and they used a 30-minute session of TTM on the back muscles in patients with back pain associated with myofascial trigger points.

What this study adds?

The present study induced stress using a 10-minute mental arithmetic test. After that, the participants received a 1-hour TTM on to all parts of the body or bed rest. This study measured frequency domain (LF, HF, and HF/LF ratio), time domain (SDNN and RMSSD) of HRV, ANS function (stress index and stress resistance) and psychological stress at baseline, after mental arithmetic test, and immediately after TTM or bed rest.

Acknowledgement

The authors wish to thank the volunteers who participated in the study. Our special thanks to Thai Traditional Medical Knowledge Fund, Research Center in Back, Neck, Other Joint Pain and Human Performance, Khon Kaen University, and Graduate School of Khon Kaen University, for financially supporting this study.

Potential conflicts of interest

None.

References

1. Li Z, Snieder H, Su S, Ding X, Thayer JF, Treiber FA, et al. A longitudinal study in youth of heart

rate variability at rest and in response to stress. Int J Psychophysiol 2009; 73: 212-7.
2. Wang X, Ding X, Su S, Li Z, Riese H, Thayer JF, et al. Genetic influences on heart rate variability at rest and during stress. Psychophysiology 2009; 46: 458-65.
3. Orsila R, Virtanen M, Luukkaala T, Tarvainen M, Karjalainen P, Viik J, et al. Perceived mental stress and reactions in heart rate variability—a pilot study among employees of an electronics company. Int J Occup Saf Ergon 2008; 14: 275-83.
4. Chandola T, Heraclides A, Kumari M. Psychophysiological biomarkers of workplace stressors. Neurosci Biobehav Rev 2010; 35: 51-7.
5. Kuipers NT, Sauder CL, Carter JR, Ray CA. Neurovascular responses to mental stress in the supine and upright postures. J Appl Physiol (1985) 2008; 104: 1129-36.
6. Hayashi N, Someya N, Endo MY, Miura A, Fukuba Y. Vasoconstriction and blood flow responses in visceral arteries to mental task in humans. Exp Physiol 2006; 91: 215-20.
7. Castellani S, Ungar A, La Cava G, Cantini C, Stefanile C, Camaiti A, et al. Renal adaptation to stress: a possible role of endothelin release and prostaglandin modulation in the human subject. J Lab Clin Med 1997; 129: 462-9.
8. Middlekauff HR, Nguyen AH, Negrao CE, Nitzsche EU, Hoh CK, Natterson BA, et al. Impact of acute mental stress on sympathetic nerve activity and regional blood flow in advanced heart failure: implications for 'triggering' adverse cardiac events. Circulation 1997; 96: 1835-42.
9. Tidgren B, Hjemdahl P. Renal responses to mental stress and epinephrine in humans. Am J Physiol 1989; 257 (4 Pt 2): F682-9.
10. Thanakiatpinyo T, Suwannatrai S, Suwannatrai U, Khumkaew P, Wiwattamongkol D, Vannabhum M, et al. The efficacy of traditional Thai massage in decreasing spasticity in elderly stroke patients. Clin Interv Aging 2014; 9: 1311-9.
11. Hodgson NA, Lafferty D. Reflexology versus Swedish Massage to Reduce Physiologic Stress and Pain and Improve Mood in Nursing Home Residents with Cancer: A Pilot Trial. Evid Based Complement Alternat Med 2012; 2012: 456897.
12. Garner B, Phillips LJ, Schmidt HM, Markulev C, O'Connor J, Wood SJ, et al. Pilot study evaluating the effect of massage therapy on stress, anxiety and aggression in a young adult psychiatric inpatient unit. Aust N Z J Psychiatry 2008; 42: 414-22.
13. Lindgren L, Rundgren S, Winso O, Lehtipalo S, Wiklund U, Karlsson M, et al. Physiological responses to touch massage in healthy volunteers. Auton Neurosci 2010; 158: 105-10.
14. Pishbin T, Firoozabadi SM, JafarniaDabanlo N, Mohammadi F, Koozehgari S. Effect of physical contact (hand-holding) on heart rate variability. Int J Adv Comput Sci Appl 2012; 2: 452-6.
15. Buttagat V, Eungpinichpong W, Chatchawan U, 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 2011; 15: 15-23.
16. Department of Mental Health, Ministry of Public Health. Suanprung stress test-20 [Internet] 2011 [cited 2013 Oct 20]. Available from: http://www.dmh.go.th/test/stress/
17. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Heart rate variability: standards of measurement, physiological interpretation and clinical use. Circulation 1996; 93: 1043-65.
18. Goldstein DS, Bentho O, Park MY, Sharabi Y. Low-frequency power of heart rate variability is not a measure of cardiac sympathetic tone but may be a measure of modulation of cardiac autonomic outflows by baroreflexes. Exp Physiol 2011; 96: 1255-61.
19. Rahman F, Pechnik S, Gross D, Sewell L, Goldstein DS. Low frequency power of heart rate variability reflects baroreflex function, not cardiac sympathetic innervation. Clin Auton Res 2011; 21: 133-41.
20. Heart rate variability analysis system clinical information VERSION 3.O. [Internet]. n.d. [cited 2013 Nov 12]. Available from: http://medi-core.com/download/HRV_clinical_manual_ver3.0.pdf
21. Eungpinichpong W. Therapeutic Thai massage. Bankok: Suweeriyasarn Printing Press; 2008.

ความเครียดทางด้านจิตใจสามารถลดได้โดยการนวดแผนไทย

ธนารัตน์ ศรีผ่องงาม, วิชัย อึงพินิจพงศ์, ทวี ศิริวงศ์, จตุรัตน์ กันต์พิทยา, กมลวรรณ ตั้งวรพงศ์ชัย, สุทิน ชนะบุญ

วัตถุประสงค์: *เพื่อศึกษาผลทันทีของการนวดแผนไทยที่มีต่อความเครียดทางด้านจิตใจและความแปรปรวนของอัตราการเต้นของหัวใจ*

วัสดุและวิธีการ: *อาสาสมัครที่มีสุขภาพดีจำนวน 30 คนถูกสุ่มแบ่งออกเป็น 2 กลุ่ม คือกลุ่มที่ได้รับการนวดแผนไทย (จำนวน 15 คน) หรือกลุ่มควบคุม (จำนวน 15 คน) อาสาสมัครทุกคนได้ทำแบบทดสอบคณิตศาสตร์เป็นเวลา 10 นาที เพื่อกระตุ้นให้เกิดความเครียดทางด้านจิตใจ หลังจากนั้นอาสาสมัครได้รับการนวดแผนไทยหรือการนอนพักเป็นเวลา 1 ชั่วโมง ทำการวัดค่าความเครียดและค่าความแปรปรวนของอัตราการเต้นของหัวใจก่อนและหลังจากการทำแบบทดสอบคณิตศาสตร์ทันทีและหลังการนวดแผนไทยหรือการนอนพักทันที*

ผลการศึกษา: *ผลการศึกษาพบว่าความเครียดทางด้านจิตใจเพิ่มขึ้นอย่างมีนัยสำคัญหลังจากการทำแบบทดสอบคณิตศาสตร์ในทั้ง 2 กลุ่ม เมื่อเปรียบเทียบผลหลังจากการทำแบบทดสอบคณิตศาสตร์ทันทีและหลังการนวดแผนไทย หรือการนอนพักทันทีพบว่าความเครียดทางด้านจิตใจลดลงอย่างมีนัยสำคัญ ($p<0.05$) และความแปรปรวนของอัตราการเต้นของหัวใจเพิ่มขึ้นอย่างมีนัยสำคัญ ($p<0.05$) ในทั้ง 2 กลุ่ม ในขณะที่ค่ารากที่สองของค่าความแตกต่างเฉลี่ยกำลังสองของจังหวะการเต้นของหัวใจในช่วงปกติต่อเนื่อง และค่าย่านความถี่ต่ำเพิ่มขึ้นอย่างมีนัยสำคัญ ($p<0.05$) เฉพาะกลุ่มที่ได้รับการนวดแผนไทย อย่างไรก็ตามตัวแปรทั้งหมดพบว่าไม่มีความแตกต่างกันเมื่อเปรียบเทียบระหว่างกลุ่ม*

สรุป: *การนวดแผนไทยและการนอนพักสามารถช่วยลดความเครียดทางด้านจิตใจและความแปรปรวนของ อัตราการเต้นของหัวใจได้*