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ผลของรำไทย 2 สัปดาห์ ต่อการตอบสนองประสาทพลศาสตร์ในพนักงานสำนักงานที่ไม่มีอาการแสดง

Effects of Two-week Thai Dancing on Neurodynamic Responses in Office Workers without Musculoskeletal Symptoms

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บทคัดย่อ: *ลักษณะงานสำนักงาน เป็นงานที่มีการเคลื่อนไหวซ้ำๆ หรือคงท่าใดท่าหนึ่งนานๆ ส่งผลต่อการบาดเจ็บของเนื้อเยื่อทางระบบกระดูกและกล้ามเนื้อ ความตึงตัวของระบบประสาทส่วนระยางค์บนเป็นตัวบ่งชี้ถึงการบาดเจ็บของกล้ามเนื้อบ่าและแขน การลดความตึงของระบบประสาท สามารถทำได้โดยอาศัยการเคลื่อนไหวเฉพาะ ช้าๆ และเป็นจังหวะ ท่ารำและจังหวะของรำไทยมีส่วนคล้ายลักษณะการเคลื่อนไหวที่ใช้ในการรักษาลดความตึงตัวของ ระบบประสาท ส่วนระยางค์บน และอาการเจ็บจากการทำงาน การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาผลของรำไทยต่อตึงตัวของเส้นประสาทแขนในกลุ่มพนักงานสำนักงาน ผู้เข้าร่วมการศึกษาเป็นพนักงานสำนักงาน จำนวน 11 คน อายุระหว่าง 21-45 ปี ที่ไม่มีอาการเจ็บที่ต้องการการรักษาใดๆ แต่มีความตึงตัวของเส้นประสาทแขนเส้นใดเส้นหนึ่งใน 3 เส้น เป็นบวก ผู้เข้าร่วมการศึกษาจะถูกวัดความตึงตัวของระบบประสาท และระดับกั้นความเจ็บ ทั้งก่อน ระหว่าง และสิ้นสุดโปรแกรมรำไทย โปรแกรมการรำไทยประกอบด้วย การรำไทยตามคลิปวิดิโอ 15 นาที 3 ครั้งต่อสัปดาห์ เป็นเวลาต่อเนื่อง 2 สัปดาห์ ผลการศึกษาพบว่า ความตึงตัวของเส้นประสาทมีเดียน เรเดียล และอัลน่า มีความตึงตัว และระดับกั้นความเจ็บ ลดลงอย่างมีนัยสำคัญทางสถิติ (P<.05) จึงเห็นได้ว่าโปรแกรมรำไทยที่รำอย่างต่อเนื่อง 2 สัปดาห์ สามารถลดความตึงตัวของระบบประสาทและระดับกั้นความเจ็บ ซึ่งเป็นอาการหนึ่งของการบาดเจ็บทางระบบกระดูกและกล้ามเนื้อเนื่องจากการทำงาน การรำไทยควรเป็นตัวเลือกหนึ่งในการจัดการปัญหา การบาดเจ็บทางระบบกระดูกและกล้ามเนื้อ ที่เกี่ยวข้องกับการทำงานได้*

คำสำคัญ: *รำไทย ความตึงตัวของเส้นประสาท โรคระบบกระดูกและกล้ามเนื้อที่เกิดจากงาน งานสำนักงาน*

ABSTRACT: *Office work is characterized as repetitive or sustained posture. This results in injuries of musculoskeletal tissues. Neural tension of the upper limbs is used to indicate injuries of shoulders and upper limbs. Reducing the neural tension can be accomplished by performing specific movement rhythmically and slowly. Thai dance is a slow dance with movement and rhythm similar to treatment maneuver for reducing neural tension. This study aimed to investigate effects of Thai dancing on upper-limb neurodynamic and pain responses in office workers. The participants were 11 females with age range 21-45 years and positive neural tension sign at least 1 from 3 nerves and without any symptoms that require any kinds of treatment. The neural tension, pain and pressure pain threshold were determined at before, in between, and at the end of Thai dancing program. The program included Thai dancing by following 15-min clip video, 3 times/week, for 2 weeks consecutively. The result indicated that the tension of median, radial and ulnar nerves, and pressure pain threshold were decreased significantly. To be concluded, performing Thai dance for 2 weeks can reduce the signs of work-related musculoskeletal disorders, such as neural tension and pressure pain threshold. It should be one of management choices for work-related musculoskeletal injuries.*

Keywords: *Thai dance, Neural tension, WMSDs, Office work*

1. INTRODUCTION

Working repetitively or being in sustained position as found in office workers can be causes of work-related musculoskeletal disorders. The symptoms of the disorders can be characterized as discomfort, pain, numbness, tenderness, and weakness of the upper limbs. The structures involved are muscle, tendon, nerve, ligament, and joints. Peripheral nerves of the upper limbs can be in tension when they are in discharge either from the sensory or motor input. Higher tension of median nerve was found with more activation of trapezius muscle [1]. This may indicate that nerve tension is sensitive for detecting hyperalgesia of somatic structures. Several studies confirmed this incidence. Elvey [2] investigated that the arm pain was related to WMSDs. While, Byng [3] found office workers whose work involved with computer had muscle problem in conjunction with abnormal neural tension.

To treat patients with musculoskeletal disorders, both nerves and muscles must be in attention. Treating a muscle pain is common, while the neural tension can be treated by a special technique performed by physical therapists so called nerve mobilization. The technique has been widely introduced by Butler [4]. He also suggested Flamingo dance as a home program for patients with neural tension. The home program may be easily performed by one who knows the dance well. For those, who don't know such as Thai workers, they may need other program that they are familiar with Mekhora et al. [5] noted that Thai dance movement is similar to neural tension testing maneuver and help reduce the median nerve tension. They conducted a quasi-experimental study for computer users to use Thai dance as an exercise during break after continuously working with computer. They found that neural tension and pain were decreased. However, they only investigated an immediate effect. This study therefore aimed to investigate effects of continuing Thai dancing for a period of 2 weeks on neural tension and pain in computer workers.

2. METHODS

This study used a quasi-experimental design using subjects as their own control. Pre and post-test of neural tension test and pressure-elicited tension were used to investigate effects of Thai dancing program.

2.1 Subjects of This study

Subjects of this study were 11 computer workers aged 21-45 year. They had 4-6 hours a day of computer work for at least a year. They had no symptoms of musculoskeletal disorders during daily activity. They must have positive sign of neural tension at least one nerve from the three main nerves (median, ulnar and radial nerves), tested by the researcher before participating the

study. Before the study began, they were tested and screened for some disorders which might inhibit the movement during performing neural tension test. For example, workers with range of motion limitation of neck, shoulders, elbows, wrists and hands were excluded. Furthermore, workers who regularly have Thai dancing as their exercise or leisure were excluded.

2.2 Variables

The dependent variables were the tension of median, radial and ulnar nerves measured via component of movement and a dynamometer. The detail of the tests was as the following steps.

Steps of component test: It is a subjective measurement. The components were varied for each nerve and the process of testing is as follow.

1. passive stretching for pectoralis major, teres major, teres minor, and latissimus dorsi muscles for both sides, one time for 30 seconds. This stretching is for minimizing the effect of muscle tightness.

2. asking the subject lying supine and passive upper limb into the tensioned position:

    - For median nerve: shoulder depression, shoulder abduction 110 degrees, shoulder external rotation (with elbow in 90 degrees of flexion), full forearm supination, and full wrist and finger extension.

    - For radian nerve: shoulder depression, shoulder abduction 45 degrees, shoulder full internal rotation, elbow full pronation, wrist and fingers flexion with radial deviation.

    - For ulnar nerve: shoulder depression, shoulder abduction 30 degrees, full wrist and finger extension, full elbow flexion, full external rotation.

3. recording the final component of each nerve test. The end range of motion is detected by the first feeling of pain or discomfort (P1) elicited by the movement, and the end feel of pain or discomfort (P2) perceived by the subjects. When each nerve is in fully stretched component, the contra-lateral lateral flexion or ipsi-lateral lateral flexion of the neck is added to confirm the tension is from the nerve rather than other structures being stretched.

4. Negative tension indicated no tension at all, even fully component and contra-lateral lateral flexion of the neck are performed.

Steps of using dynamometer to elicit tension: It is transformed the subjective to more objective measurement. The starting position before applying the pressure was varied for each nerve and subject depending on individual tension, but it was kept the same for whole study for each subject and nerve. The steps of testing are as follow.

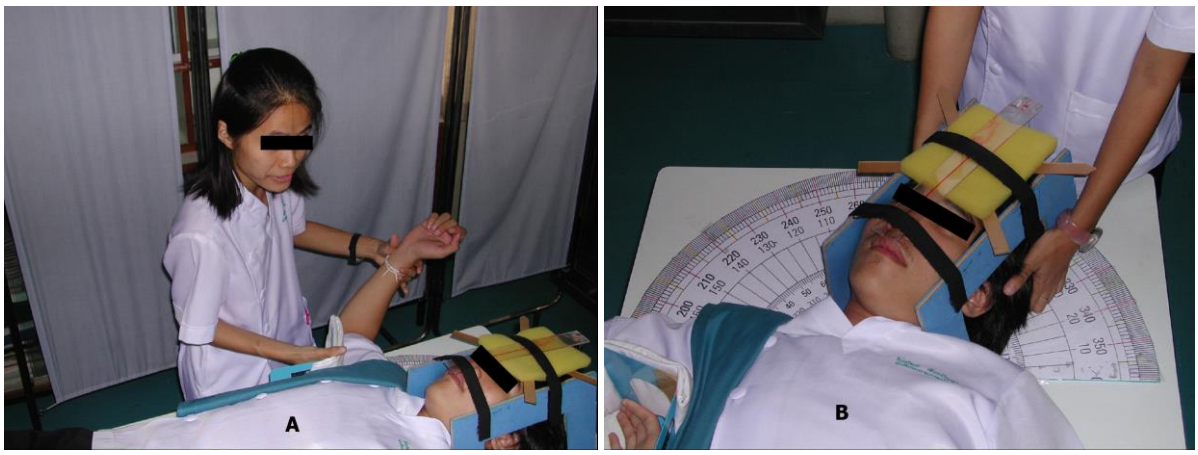

Figure 1: A during performing median nerve tension test, all other components were fixed and only arm was moved. B: Head was moved laterally at the end range to ensure the tension being from the nerve, while the angle was kept in position using a large goniometer.

1. asking the subject lying supine with his or her head fixed in midline
2. setting subject into median, radial, or ulnar nerve tension test (as suggested by Butler (1991) which is similar to the component test) until subject has the first feeling of tension, pain or numbness.
3. reducing the final movement of the test around 5 degrees. This position of each nerve for each subject is recorded and used for the entire study.
4. pressing the shoulder downward using a dynamometer until subject feel the same feeling of tension, pain or numbness. Then record the force from the dynamometer.

2.3 Thai dancing program

The Thai dance as an intervention of this study is derived from an analysis of Thai dancing movement to match with the neurodynamic tests suggested by Butler [4]. Phrom See Nar, Yoong Fon Hang and Chanee Rai Mai are similar to the test for median nerve tension. Yure is similar to the test for radial nerve tension. Sod Soy Mala, Lor kaew, and Chanee Rai Mai are similar to the test for ulnar nerve tension. From the analysis, this study set a 15-minute Thai dancing program comprising all the movements above. In total, there were 60 repetitions for each nerve. Example images of Thai dance are showed in Figure 2.

2.4 Procedure

Volunteer subjects were informed all steps of protocol, risk and benefit, and signed a consent form after they were tested and screened to ensure if they met the criteria. A physical therapist, one of the researchers, performed the physical examination and screening tests. The other researcher performed neural tension test and pain pressure threshold test at before attending the same time of the day and week throughout the study. All subjects were asked to

practice Thai dancing instructed by the researchers until they felt familiarized. During dancing they were informed to have movement with feeling of a little tension. No aggressive movement was allowed. A clip video of Thai dancing program was provided, so that they could perform dancing by following the video. They were asked to perform dancing for 15 minutes a day, 3 times a week, on Monday, Wednesday and Friday. A logbook was provided and they had to report every time they completed the dancing.

Figure 2: **Example images of Thai dance maneuver; Prom See Nar, Yoong Fon Hang and Sod Soy Mala**

4. RESULTS

The result of this study is divided into 2 parts according to the tests. For the component test as showed in Table 1 to 3, the tension of median, radial and ulnar nerves at pre, 1 week and 2 weeks showed a trend of change. At pre, more number of arms were in the components that indicating higher tension, while at 1 and 2 weeks, the number was shift toward lower tension. The statistical analysis was not performed for the component test since each component is not equal.

For the pressure-elicited tension, there was the same trend of change as indicated by the component test and showed in Table 4-6. Most number of arms were in higher tension (less pressure applied) at Pre. While at 1 or 2 weeks most of the arms with tension became having less tension (higher pressure applied). Due to the pressure applied being stopped if it was greater than 15 kg in some cases, the data then statistically analyzed using Wilcoxon signed raked test. It was

found that, the pain pressure threshold was significantly greater both P1 and P2 when comparing between Pre and 1 or 2 weeks. This mean subjects were able to receive more pressure on their shoulders to perceive the same pain after having Thai dancing, as showed in Table 7.

Table 1: Number of arms with median nerve tension indicated by present of first feel pain (P1) and end feel pain (P2) when putting subjects into testing component, at before dancing (Pre), 1 and 2 weeks after dancing.

Measurement (Median nerve)	Number of arms with tension									
	Period	Shoulder depressed	Shoulder abducted	Shoulder external rotated	Elbow supinated	Wrist & fingers extended	Elbow extended	Neck contra lateral flexed	Negative	Total
First pain (P1)	Pre	0	2	2	1	0	14	0	0	19
	1 wk	0	1	0	1	0	17	0	0	19
	2 wk	0	0	0	0	0	16	3	0	19
End pain (P2)	Pre	0	0	0	0	0	9	4	6	19
	1 wk	0	1	0	0	0	9	0	9	19
	2 wk	0	0	0	0	0	9	1	9	19

Table 2: Number of arms with radial nerve tension indicated by present of first feel pain (P1) and end feel pain (P2) when putting subjects into testing component, at before dancing (Pre), 1 and 2 weeks after dancing.

Measurement (radial nerve)	Number of arms with tension									
	Period	Shoulder depressed & abducted	Elbow extended	Shoulder internal rotated	Elbow pronated	Thumb & Fingers Flexed	Wrist flexed & unlar deviated	Neck contra lateral flexed	Negative	Total
First pain (P1)	Pre	0	2	0	2	0	3	0	0	7
	1 wk	0	0	0	2	0	1	4	0	7
	2 wk	0	0	0	1	0	4	1	1	7
End pain (P2)	Pre	0	0	0	0	0	0	1	6	7
	1 wk	0	0	0	0	0	0	1	6	7
	2 wk	0	0	0	0	0	0	0	7	7

Table 3: Number of arms with ulnar nerve tension indicated by present of first feel pain (P1) and end feel pain (P2) when putting subjects into testing component, at before dancing (Pre), 1 and 2 weeks after dancing.

Measurement (Ulnar nerve)	Number of arms with tension								
	Period	Shoulder depressed	Wrist & Forearm pronated	Elbow flexed	Shoulder Extended	Shoulder abducted	Neck contra lateral flexed	Negative	Total
First pain (P1)	Pre	0	1	3	4	10	0	0	18
	1 wk	0	0	2	3	11	2	0	18
	2 wk	0	0	1	2	10	2	3	18
End pain (P2)	Pre	0	0	0	0	5	1	12	18
	1 wk	0	0	0	0	5	2	11	18
	2 wk	0	0	0	0	1	4	13	18

Table 4: Number of arms with median nerve tension indicated by present of first feel pain (P1) and end feel pain (P2) when pressing on subjects' shoulders to produce pain threshold along the nerve, at before dancing (Pre), 1 and 2 weeks after dancing.

Measurement (median nerve)	Number of arms with tension							
	Period	0-3 kg.	3.1-6 kg.	6.1-9 kg.	9.1-12 kg	12.1-15 kg	>15 kg.	Total
First pain (P1)	Pre	19	0	0	0	0	0	19
	1 wk	10	0	2	3	2	2	19
	2 wk	3	0	4	2	3	7	19
End pain (P2)	Pre	0	0	0	6	11	2	19
	1 wk	0	0	0	1	9	9	19
	2 wk	0	0	0	2	4	13	19

Table 5: Number of arms with radial nerve tension indicated by present of first feel pain (P1) and end feel pain (P2) when pressing on subjects' shoulders to produce pain threshold along the nerve, at before dancing (Pre), 1 and 2 weeks after dancing.

Measurement (median nerve)	Period	0-3 kg.	3.1-6 kg.	6.1-9 kg.	9.1-12 kg	12.1-15 kg	>15 kg.	Total
First pain (P1)	Pre	6	0	1	0	0	0	7
	1 wk	0	0	0	0	7	0	7
	2 wk	0	0	0	1	2	4	7
End pain (P2)	Pre	0	0	0	2	4	1	7
	1 wk	0	0	0	0	0	7	7
	2 wk	0	0	0	0	1	6	7

Table 6: Number of arms with ulnar nerve tension indicated by present of first feel pain (P1) and end feel pain (P2) when pressing on subjects' shoulders to produce pain threshold along the nerve, at before dancing (Pre), 1 week after dancing and 2 weeks after dancing.

Measurement (median nerve)	Period	0-3 kg.	3.1-6 kg.	6.1-9 kg.	9.1-12 kg	12.1-15 kg	>15 kg.	Total
First pain (P1)	Pre	14	1	1	0	1	1	18
	1 wk	1	0	8	6	3	0	18
	2 wk	3	0	1	1	7	6	18
End pain (P2)	Pre	0	0	0	3	12	3	18
	1 wk	0	0	0	0	12	6	18
	2 wk	0	0	0	1	6	11	18

Table 7: Comparison of pressure pain threshold (first feel pain (P1) and end feel pain (P2)) when pressing on subjects' shoulders on median, radial and ulnar nerves, at before dancing (Pre), 1 and 2 weeks after dancing.

Nerve	Comparison	P1		P2	
		Z	p-value	Z	p-value
Median nerve	Pre - 1 week	-3.564	0.000*	-2.887	0.004*
	1 week - 2 week	-3.169	0.002*	-1.508	0.132
	Pre – 1 week	-3.814	0.000*	-3.441	0.001*
Radial nerve	Pre - 1 week	-2.692	0.007*	-1.890	0.059
	1 week - 2 week	-2.226	0.026*	-1.732	0.083
	Pre – 1 week	-2.949	0.003*	-2.828	0.005*
Ulnar nerve	Pre - 1 week	-3.253	0.001*	-2.236	0.025*
	1 week - 2 week	-3.501	0.000*	-3.153	0.002*
	Pre – 1 week	-3.832	0.000*	-3.662	0.000*

* Significant level at $p < 0.05$ by Wilcoxon signed ranked test

5. DISCUSSION

The subjects of this study had some degrees of neural tension with no symptom at the beginning. Since they were asked to perform usual activities plus Thai dancing, the change of the neural tension and symptom is therefore from the Thai dancing which was intervened. The component measurement was relied on subjective feeling from subjects (as indicated by P1 and P2) and was transferred to component of the test. To be more objective, the tension was again measured via pressing on the shoulder with a dynamometer. Both measurements detected the same thing, but using different methods. This was to ensure the result indicating the benefit of the intervention.

This study demonstrated that with Thai dancing for 2 weeks the neural tension gradually improved. From the result from the component measurement, the subjects were able to be pushed toward the end of the component. This means the tension was less. While, more pressure could be applied on the subjects' shoulder indicating tension was reduced.

The reduction of the tension was possibly from the maneuver of the Thai dance, which is rhythmic and smooth. Butler [6] and Shacklock [7] have pointed that those types of movement could help improve the intraneural circulation, axoplasmic flow, neural connective tissue viscoelasticity and reduce the sensitivity of abnormal neural tissue. Therefore, performing Thai dancing for some period helped improve the tension of the nerve. When the tension in the nerve is reduced, its function such as impulse for muscle control and sensation could be improved as well. The relationship between onset of pain and muscle activity when the nerve was put in tension, was reported by van der Heide et al [1]. Therefore, when the nerve is in less tension, it could be more flexible and having higher threshold to the stimuli.

When comparing between nerves, it could be seen that median tension responded to the Thai dancing more than others. This could be explained that the subjects had less tension of radial and ulnar nerves at the beginning. Therefore, there was less room for change. However, this study showed the benefit of Thai dancing only in subjects without symptoms. With the support from Mekhora et al [5] that they found the benefit of Thai dancing in subjects with no treatment-required symptoms on median nerve tension in computer users. It could be said that, there might be some beneficial effects on the other nerves as well for those with symptoms.

To reduce the neural tension, Thai dance can be a choice of treatment for those who have only tension without any other symptoms. It is easy for Thai people to perform without any harmful. However, for those with symptoms, the symptoms such as persistent numbness or weakness must be monitored as a stop sign of the exercise and they must consult medical doctors or physical therapists, if the symptoms remained.

Further studies should put more intention on the physiological improvement of the nerve as well as observing a longer effect of Thai dance as an exercise for office workers. Likewise, subjects who have performed Thai dance regularly may be of interest to expose to computer use. It was unfortunated that this study did not observe the neural tension after withdrawing the Thai dance. It might be a draw back effect which may be interesting to study.

In conclusion, this study therefore suggested that Thai dancing should be introduced as a preventing exercise program to reduce the neural tension of the upper limb nerves for people

with positive neural tension. By this way, the work-related musculoskeletal disorders could be minimized.

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