Effects of Thai Dancing on Median Neurodynamic Response During 4-Hour Computer Use

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Objective: *To investigate the effects of Thai dancing on median neurodynamic response during 4-hour computer use.*
Material and Method: *Twenty-four healthy participants aged 20-30 years performed 5 minutes of Thai dancing including Prom See Na, Yoong Fon Hang, Sod Soy Mala, Lor Keaw and Cha Nee Rai Mai during a 10-minute break of 4-hour computer use. All participants were assessed for nerve tension by elbow range of motion of upper limb neurodynamic test 1 (ULNT1) and components of quick test. The discomfort was measured by visual analogue discomfort scale (VADS). These measurements were assessed before and after computer work. The statistical analyses employed paired t-test for continuous outcome and Friedman's test.*
Results: *The median nerve tension (indicated by elbow range of motion) was significantly reduced at before and after work, when 5 minutes of Thai dancing was introduced during the break. While components of the quick test emphasized that Thai dance immediately helped reduce the median nerve tension. The VADS in eight body areas increased over the period of 4 hours, but decreased after performing Thai dancing ($p<0.05$).*
Conclusion: *Thai dancing helped relieve median nerve tension and body discomfort. It may be recommended as an exercise during break for computer users who continuously work to prevent WMSDs.*

Keywords: *Thai dancing, Neurodynamic, Median nerve tension, Computer use*

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Work-related musculoskeletal disorders (WMSDs) are major health problems for computer users[1,2]. Consequently, both direct and indirect costs related to WMSDs and impact on work ability, quality of work and activities of daily living are substantially increased[3,4]. In many countries, WMSDs causes more absenteeism, early retirement, and disability than any other diseases[5,6]. Several previous studies have indicated that using computer continuously was associated with increased WMSDs[7-9]. In addition, characteristics of computer use such as awkward posture[10], repetitive movement[11], localized pressure and excessive use of force[9] can lead to change of mechanical and physiological neural tissues, resulting in the increase of neural tension that can develop musculoskeletal disorders[12,13]. Therefore, preventing the increase of neural tension occurring from using computer may help prevent the occurrence of WMSDs.

The neural mobilization is used to reduce neural tension by increasing the blood flow and healing injuries of the nerves[14]. Rozmaryn et al (1991) used nerve-gliding exercises to treat patients with carpal tunnel syndrome. The result showed 70.2% of patients had good or excellent effects from treatment[15]. Thai dancing uses hand movements along with music. Its characteristic is similar to components of standard upper limb neurodynamic tests and treatment identified by Butler[16]. Therefore, Thai dancing may be beneficial for those working with computers since it helps relieve neural tension. The present study aimed to determine the effect of Thai dance on median neurodynamic response and body discomfort as a break after 4-hour computer use.

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Material and Method

Participants

The study was a comparative design approved by the Mahidol University Institutional Review Board (MU-IRB COA. No. 2013/031.0504).

Twenty-four healthy subjects aged between 20-30 years (23.00±2.38 years) were recruited. The inclusion criteria included: experience in working with computer at least one year, accustomed to longer than four hours of computer work a day and typing skills at least at intermediate level. The participants with limitations of the neck and upper extremity motion, that may obstruct the neurodynamic test, were excluded.

Procedure

Before the test, adhesive markers were placed on the anatomical landmarks of the participants including the medial epicondyle of the humerus, styloid process of ulna and midline of coracoid process to the medial epicondyle. Videography was taken during upper limb neurodynamic test 1 (ULNT1) at before 4 hours of computer use. Discomfort was assessed six times using the visual analogue discomfort scale (VADS) and a quick test for neurodynamic testing was performed 4 times. A diagram for assessments is shown in Fig. 1.

Assessments

The ULNT1 was measured via elbow extension range of motion (degree) at first pain or numbness threshold (P1), at pain or numbness tolerance (P2), at first resistance felt by tester (R1) and at end of resistance felt by tester (R2). The ranges of motion (ROM) of elbow extension at four conditions were measured by scion image program (Free software from Scion Corporation). The tester, who was a trained physical therapist, had excellent intra-rater reliability ($ICC_{(2,1)}$ >0.95 for P1, P2, R1 and R2). The protocol for measuring the ULNT1 was developed by having shoulders and head of a participant fixed, while lying supine on a station. The shoulder of the measured side was depressed by a band to keep the pressure not more than 4 kg, indicated by a spring scale with light signal. Then the shoulder was positioned in horizontal abduction, external rotation, and the elbow at 90° of flexion with symptom provocation. The pressure on the shoulder was kept the same for each participant at each test. During testing, the participant was asked to press a hand switch twice. The first time was for the light on to indicate P1, and the last was for the light off to indicate P2. The tester also pressed a foot switch twice. The first time was for the light on to indicate R1, and the last was for the light off to indicate R2.

For the quick test, the participants were asked to perform the quick test actively in the order 1st to 8th. The quick test comprised eight components, the 1st one was the highest tension and the 8th one was the least tension of the median nerve (Fig. 2). The eight components of the quick test were measured at P1 and P2.

All participants performed four hours of computer tasks with a 10-minute break half way, on a computer workstation adjusted based on their comfort, while the computer used in this study included typing and Zuma games (Free online games). The typing game required fingers to perform typing function, while the Zuma game required mouse use. They were asked to start from the typing game followed by the Zuma game for 15 minutes for each task alternately. After performing continuous computer tasks for 2 hours, participants received a 10-minute break and performed a 5-minute Thai dance by following the dance shown on the monitor. Thai dances in the present study comprised Prom See Na, Yoong Fon Hang, Sod Soy Mala, Lor Keaw and Cha Nee Rai Mai (Fig. 3). Prom See Na, Yoong Fon Hang and Sod Soy Mala were performed with 10 repetitions and Lor Keaw and Cha Nee Rai Mai were performed with 20 repetitions in one time.

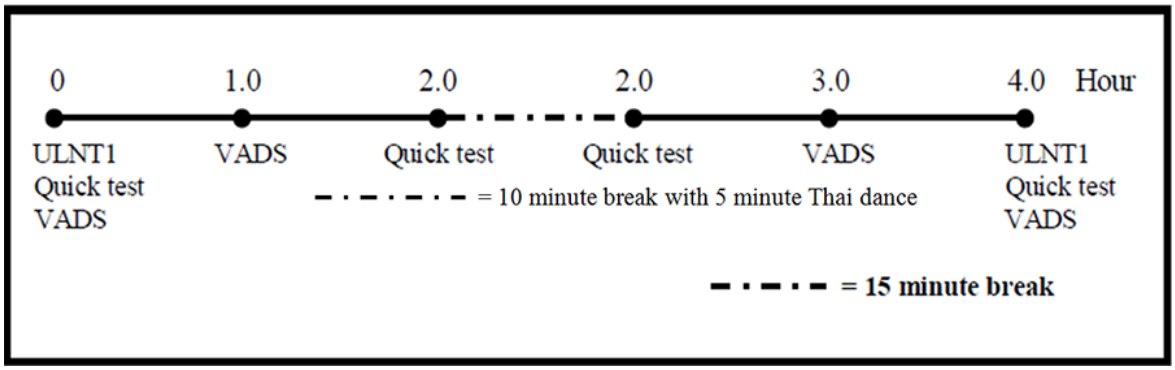

Fig. 1 Diagram for measurement: ULNT1 twice, quick test 4 times, and VADS 6 times.

Fig. 2 The eight components of quick test (using symptom to indicate the component). Test 1 = shoulder horizontal abducted comfortably with elbow flexed 90 degree, Test 2 = test 1 with shoulder full horizontal abducted and external rotation, Test 3 = test 2 with full supination, Test 4 = test 3 with wrist extended, Test 5 = test 4 with elbow extended around 135 degree, Test 6 = test 4 with elbow fully extended, Test 7 = test 6 with head laterally flexed to either side, Test 8 = test 7 with no symptom.

Fig. 3 Thai dance maneuvers: Prom See Na, Yoong Fon Hang, Sod Soy Mala, Lor Keaw, Cha Nee Rai Mai, respectively.

Statistical analysis

Paired t-test was used to determine effects of Thai dancing on elbow extension range of motion at before and after computer work. Friedman test was used to determine effects of Thai dance on components of the quick test and VADS.

Results

Comparison of neurodynamic response (by elbow extension ROM)

The result between before and after 4 hours of computer work, when Thai dancing was provided 5 minutes during the break, showed an ROM of elbow extension at only R1 was significantly greater ($p = 0.010$). However, the ROMs of elbow extension at P1, P2 and R2 afterwards were also greater, but without significant difference (Table 1).

Comparison of neurodynamic response of the median nerve (quick test)

The data of components of the median neurodynamic response both left and right sides at P1 and P2 were presented by median and 25th and 75th percentiles. The result showed significant differences for both P1 and P2. The trend of components of the quick test for both P1 and P2 decreased after two hours of continuous computer use. On the contrary, the components of the quick test increased after performing Thai dancing (Table 2).

Comparison of body discomfort during 4-hour computer work

The results showed the visual analog discomfort scale at neck and upper extremities was significantly different at $p<0.05$ in eight body areas (Table 3). The trend of body discomfort increased after performing continuous computer work at 1st, 2nd, 3rd and 4th hours. However, level of body discomfort decreased after performing Thai dancing in all body areas (Table 3).

Discussion

This study investigated the effects of Thai dancing on median neurodynamic response and

Table 1. Median neurodynamic response (indicated by degree of elbow extension range of motion at before and after computer work (n = 48))

Parameters	Before (mean ± SD)	After (mean ± SD)	*p*-value[a]
Pain or numbness threshold (P1)	115.03±38.43	119.07±36.65	0.829
Pain or numbness tolerance (P2)	154.84±24.93	159.37±20.18	0.076
First resistance (R1)	128.41±16.56	134.85±15.93	0.010*
End of resistance (R2)	158.19±18.01	160.06±17.05	0.514

* = significant difference at *p*-value <0.05 by paired t-test

Table 2. Median value and 25th and 75th percentile of the outcome from quick test along the period of work; greater number indicates less tension (n = 48)

Parameters	Before computer tasks	After computer tasks at 2nd hour	After 10 minute break with Thai dance	After 4 hours of computer task	*p*-value[a]
Pain or numbness threshold (P1)	6 (5,7)	5 (4,6)	6 (4,7)	6 (4,7)	<0.001*
Pain or numbness tolerance (P2)	8 (7,8)	7 (7,8)	8 (7,8)	7 (7,8)	<0.001*

* = significant difference at *p*-value <0.05 by the Friedman's test

body discomfort during continuous computer work for four hours among healthy subjects. The median neurodynamic response was determined by median neurodynamic test via degree of elbow extension ROM and quick test via component of the median neurodynamic test, and examined the body discomfort by VAD scale.

The result showed the degree of elbow extension ROM of ULNT of R1 after performing Thai dance was higher than before. This was confirmed by the quick test, which used the subjective outcome from the participants for which a greater component was found after the Thai dancing. Thus, from the results of the median neurodynamic and quick tests it was indicated that Thai dancing effectively reduced tension of the median nerve. The decreased median nerve tension may have resulted from the immediate effects of Thai dance because Thai dance combines repetitive movement, gentle oscillation of sequence, and is slow and rhythmic. This movement can cause nerve sliding and gliding and pumping blood into the nerves, increasing oxygen flow and nutrients in the nervous system[16]. Some mechanisms that occur from Thai dancing may help improve neural function, since circulation is improved.

In addition, the scores of the VAD scale slowly increased while performing continuous computer work and decreased significantly after performing Thai dancing. This decreased discomfort may be the same consequence as decreased nerve tension.

Conclusion

This study suggests that Thai dancing may have beneficial effects for relieving median nerve tension and body discomfort, which are factors of WMSD development. Therefore, Thai dance may be recommended for continuous computer users to prevent WMSD from computer use.

What is already known on this topic?

Neural tension for the upper extremities has been studied worldwide for both assessment and treatment. Working repetitively can increase the risk of peripheral nerve injuries such as carpal tunnel syndrome, which can gain benefit from Thai dancing.

What this study adds?

This study tried to gain preventive rather than curative benefit from Thai dancing. It proved that Thai dance helped reduce the increase of median nerve tension. To some extent, it added the value of Thai dance as one type of exercise for computer workers.

Table 3. Summary of rating scores on body part discomfort during 4-hour computer use (n = 24)

Area	Before computer work	After computer work at 1st hour	After computer work at 2nd hour	After 10 minute break with Thai dance	After computer work at 3rd hour	After 4 hours of computer work	*p*-value[a]
Neck	1.11±1.77	1.85±2.27	2.39±2.80	1.73±2.72	2.09±3.06	2.42±2.95	<0.001*
Upper back	1.33±2.16	1.89±2.63	2.27±2.79	1.33±2.52	1.89±2.87	2.70±3.23	<0.001*
Lt. Shoulder	0.73±1.53	0.98±1.98	2.01±2.50	1.53±2.39	1.68±2.86	1.86±3.12	<0.001*
Rt. Shoulder	0.93±1.76	1.24±2.03	1.92±2.41	1.47±2.24	1.93±2.68	2.23±2.84	<0.001*
Lt. Arm	0.61±1.57	0.98±2.14	1.75±2.79	1.36±2.49	1.67±2.88	1.89±3.18	<0.001*
Rt. Arm	0.78±1.87	1.07±2.04	1.58±2.46	1.15±2.17	1.85±2.92	2.11±3.04	<0.001*
Lt. Wrist/Hand	0.61±1.52	0.97±2.13	1.35±2.65	0.96±2.00	1.36±2.67	1.53±2.78	<0.001*
Rt.Wrist/Hand	0.84±1.97	1.11±2.13	1.88±2.47	0.98±1.68	1.20±1.57	1.38±1.78	<0.001*

* = significant difference at *p*-value <0.05 by the Friedman test

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Potential conflicts of interest

None.

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ผลของรำไทยต่อการตอบสนองประสาทพลศาสตร์มีเดียนช่วงที่ใช้คอมพิวเตอร์ 4 ชั่วโมง

คีรินท์ เมฆโหรา, ฉัตรดาว เสพย์ธรรม, วรรธนะ ชลายนเดชะ

วัตถุประสงค์: *เพื่อสืบหาผลของรำไทยต่อการตอบสนองของประสาทพลศาสตร์ของเส้นประสาทมีเดียนเมื่อใช้งานคอมพิวเตอร์ 4 ชั่วโมง*

วัสดุและวิธีการ: *อาสาสมัครเข้าร่วมวิจัย 24 คน อายุ 20-30 ปี ทำการรำไทย 5 นาที ประกอบไปด้วยท่าพรหมสี่หน้า ยูงฟ้อนหาง สอดสร้อยมาลา ล่อแก้ว และชะนีร่ายไม้ ในระหว่างช่วงพัก 10 นาที ของการใช้คอมพิวเตอร์ 4 ชั่วโมง ผู้เข้าร่วมวิจัยทั้งหมดจะถูกทำการทดสอบ ความตึงตัวของเส้นประสาทและความรู้สึกไม่สบาย โดยใช้การทดสอบ ประสาทพลศาสตร์ ของเส้นประสาทมีเดียน ท่าตรวจความแบบเร็วและแบบประเมินความรู้สึกไม่สบายในช่วงก่อนและหลังทำงานและรำไทย สถิติที่ใช้คือ Paired t-test และ Friedman's test*

ผลการศึกษา: *ความตึงตัวของเส้นประสาทมีเดียน (ระบุโดยองศาการเคลื่อนไหวของข้อศอก) ลดลงอย่างมีนัยสำคัญ ในช่วงเวลาก่อนและหลังทำงานโดยมีการรำไทย 5 นาที ในขณะพัก ขณะที่การทดสอบด้วยท่าแบบเร็วเน้นว่ารำไทย ช่วยลดความตึงตัวของเส้นประสาทมีเดียนทันทีหลังจากรำ ความรู้สึกไม่สบายตามส่วนต่าง ๆ ของร่างกายทั้ง 8 ที่ เพิ่มขึ้นเมื่อทำงานต่อเนื่อง 4 ชั่วโมง แต่ลดลงทันทีหลังรำไทย*

สรุป: *รำไทยสามารถลดความตึงตัวของเส้นประสาทมีเดียนและอาการไม่สบาย อาจนำรำไทยไปใช้เพื่อเป็นการออกกำลังกายขณะพักในผู้ที่ใช้งานคอมพิวเตอร์อย่างต่อเนื่องเพื่อการป้องกันปัญหาการเกิดโรคทางกระดูก และกล้ามเนื้อที่เกี่ยวข้องกับการทำงาน*