Physical Effects and Cognitive Function after Exercising "Rue-si-dad-ton" (Exercise Using the Posture of the Hermit Doing Body Contortion): A Randomized Controlled Pilot Trial

Lokachet Tanasugarn*, Pasit Natearpha*, Ronnakorn Kongsakon*, Marshima Chaosaowapa*, Woraphon Choatwongwachira*, Dussadee Seanglaw*, Pattarachai Kiratisin MD, PhD**, Chakrapong Namatra MD***, Varalak Srinonprasert MD****, Akarin Nimmannnit MD*****, Manmas Vannabhum MSc******, Tawee Laohapand MD******, Vilai Kuptniratsaikul MD*******

** 6th Year Medical Students, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*
*** Department of Microbiology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*
**** Department of Ophthalmology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*
***** Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*
****** Office for Research and Development, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*
******* Center of Applied Thai Traditional Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*
******** Department of Rehabilitation, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*

Background: *This study aims to preliminarily evaluate effect on physical properties of shoulder joints and cognitive function after practicing Rue-si-dad-ton, a Thai traditional exercise using the postures of the hermit doing body contortion which still lacks systematically conducted evidence-based regarding its benefits.*

Material and Method: *Thirty-seven participants who have routinely worked on computer at least 3 hours per day were recruited and randomized into intervention (n = 19) or control group (n = 18). Physical effect on shoulder joints was evaluated by measuring shoulder range of motion (ROM) and evaluating shoulder function with the American Shoulder & Elbow Surgeons Standardized Shoulder Assessment Form. Cognitive function was determined by Verbal Fluency Test, Trail Maker B Test, and Digit Span Test. Both study groups were assessed by all tests at the beginning and at the end of study by blinded assessors. The intervention group performed 3 postures of Rue-si-dad-ton exercise (an hour per day for 4 days by a well-trained instructor) before the final measurement.*

Results: *Only left and right shoulder flexion of the intervention group (p-value = 0.006 and 0.010 respectively) showed significant increment compared with the control group using ANCOVA test with baseline adjusted as covariate. Other variables, including joint and cognitive function, indicated no significant changes between groups. No complications from exercise were found during the study.*

Conclusion: *Rue-si-dad-ton may safely help improve range of joint motion with potential benefit for joint and cognitive function. Additional extensive studies with adequate number of participants and longer period of exercise are warranted.*

Keywords: *Range of motion, Rue-si-dad-ton, Exercise, Office worker, Cognition*

J Med Assoc Thai 2015; 98 (3): 306-13
Full text. e-Journal: *http://www.jmatonline.com*

Rue-si-dad-ton is a part of Thai wisdom defined as an exercise using the posture of the hermit doing body contortion. There are no evidences of its origin. In 1788, King Rama I compiled and created a Rue-si-dad-ton statue from soil, which was later converted to zinc, and tin based ones during the reign of King Rama III comprising of 80 postures. Nowadays, Rue-si-dad-ton has been used for relieving musculoskeletal symptoms in Thai traditional medicine[1].

The practice of Reu-si-dad-ton consists of slow moving one or several parts of the body into required positions while holding breath for a short period of time. Therefore, practicing it was claimed to relieve joint stiffness, muscular pain, strengthen muscles and related connective tissues. It can improve cardiovascular and respiratory function and also purify the mind[1,2]. Beginning from its proclaimed benefits,

Correspondence to:
Kuptniratsaikul V, Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Prannok Road, Bangkok 10700, Thailand.
Phone: +66-2-4197511, Fax: +66-2-4114813
E-mail: vilai.kup@mahidol.ac.th

studies have been carried out to provide scientific evidences for its use. So far, evidences from previous studies on physiological changes in cardiopulmonary function[3,4] and increase in anaerobic fitness[5] have been suggestive yet with a limitation of small study size and lack of control groups. Other studies showed beneficial outcomes of applying Rue-si-dad-ton as a part of exercise program for health promotion in several groups of population such as diabetes mellitus patients[6], pre-hypertension patients[7], pre-school children[8] and women with sedentary lifestyle[9].

Considering the slow stretching movements of Rue-si-dad-ton, it is likely that the exercise could have certain impacts on physical and mental health of the practitioners[1]. Both effects could possibly be applied as prevention and treatment of muscle fatigue and joints stiffness among office workers after long-duration, computer use[10]. Thus, this pilot study aimed to initially measure the effect on physical and cognitive aspects from practicing Rue-si-dad-ton among office workers since no previous evidences regarding these aspects of the exercise have been investigated.

Material and Method

In February 2011, 37 subjects were recruited following the eligibility criteria as follows.

Inclusion criteria

The office workers whose work involved using computers for at least 3 hours per days, and 5 days per week and aged more than 32 years old (criteria for advance aging of Thai Traditional Medicine as advised by Center of Applied Thai Traditional Medicine, Faculty of Medicine Siriraj Hospital) were enrolled.

Exclusion criteria

The workers who had abnormalities of vertebral column, lower extremities, and carrying angle, had severely injured shoulder joint, had diagnosis of severe osteoporosis or were unable to sit cross-legged and to kneel on the floor, folding legs underneath thighs while resting the buttocks on the heels were excluded from the study.

Subject allocation

The randomization table was generated and the code was sealed in opaque envelopes by a research assistant who was not involved in the enrollment process. After recruitment and pre-testing, subjects were randomly allocated into control and experimental groups by researchers who were blinded to the randomization list. All assessors were blinded to the group subjects to which they were allocated. Consent was obtained from all participants. The study was approved by Siriraj Institutional Review Board.

Intervention: Rue-si-dad-ton training

Selection of Rue-si-dad-ton movements

Three postures that involved shoulder movement, which were recommended by experts at Center of Applied Thai Traditional Medicine and Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, and expected to pose minimal risk on the subjects, were selected from the original 80 postures.

Instruction for each selected movement[1]

1. The posture to relieve abdominal pain, pain of the scapular (Fig. 1).

Sit on the floor with crossed-legs, arms above knees. Slowly raise arms with elbow semi-flexed until elbows are at shoulder level. Move arms backwards, extend wrists and fingers, face upwards slightly. Hold breath and stay in this position for 10 seconds.

2. The posture to relieve laziness (Fig. 2)

Sit on the floor with crossed-legs, arms above knees. Hold hands together by crossing fingers. Slowly stretch both arms and twist body to the left, to the right,

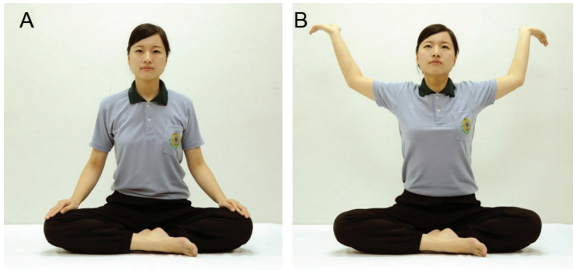

Fig. 1 The posture to relieve abdominal pain, pain of the scapular. A) Preparatory posture, B) Finalized posture.

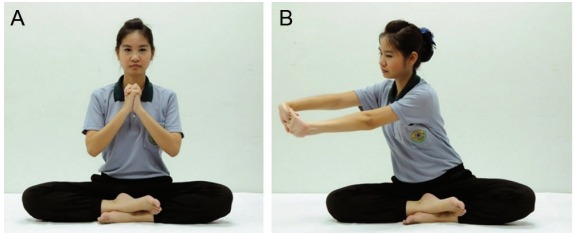

Fig. 2 The posture to relieve laziness. A) Preparatory posture, B) Finalized posture.

and above the head, respectively. Hold breath and stay in this position for 10 seconds.

3. The position to relieve abdominal pain and limitation of ankle (Fig. 3)

Kneel on the floor, folding legs underneath thighs, while resting the buttocks on the heel. Stretch arms to the front, palm faces together. Slowly move arms above head. Stretch arms to the back. Hold breath and stay in this position for 10 seconds.

Rue-si-dad-ton exercise sessions

For the intervention group, an hour per day of Rue-si-dad-ton exercise was arranged for 4 days. The sessions were held at Center of Applied Thai Traditional Medicine. Led by a single professional trainer in Rue-si-dad-ton, each participant was assured to receive the same standard for the intervention. After receiving the intervention for 4 days, the intervention groups underwent the final assessment. While the intervention group received intervention as mentioned, the control group did not participate in such sessions and was not allowed to exercise until the end of the project.

Outcome measurements

Participants in both groups were evaluated at pre-test and post-test in terms of physical effects and cognitive functions by blinded assessors. A training session for all assessments was arranged in order to validate the procedures and reduce the inter-rater variation. Physical outcomes consisted of range of motion (ROM) and functions of shoulder joint. ROM of the shoulder was measured by goniometer in flexion, extension, abduction, external rotation and internal rotation using Norkin and White's 180 degree system[11]. The patients' self-report section of the American Shoulder & Elbow Surgeons Standardized Shoulder Assessment Form (ASES) was used to assess pain score and shoulder function. The pain score ranged from one (the least painful) to ten (the most painful) score. The shoulder function was divided into 10 activities' items with score 0 (unable to do) to 3 (no difficulty) for each item resulting in range of 0 to 30 scores. Both part of the assessment form can be calculated as total scoring for patients' section (pASES) = [(10-pain score) x 5] + [(5 x Sum of functional items)/3] with score ranging from 0 (the worst) to 100 (the best)[12].

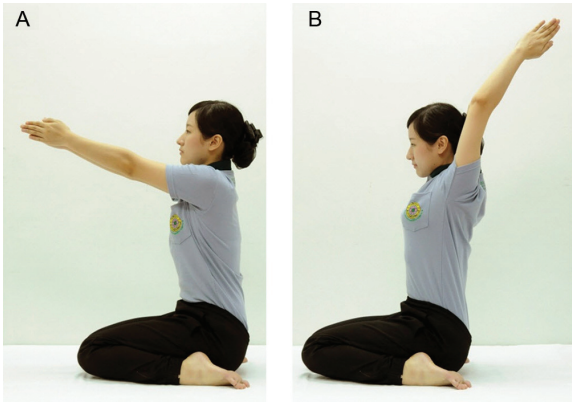

Fig. 3 The posture to relieve abdominal pain and limitation of ankle. A) Preparatory posture, B) Finalized posture.

Cognitive function was measured targeting a working memory using four standard tests which are Verbal Fluency Test, Trail Making B Test, Digit Forwards Span Test and Digit Backwards Span test[13]. Each test has details as followed.

1. Verbal fluency test

Verbal fluency test indirectly involves with working memory by tracking which words have already been said. To give the test, the assessor selected 1 alphabet (in the study, Thai alphabet Kor-Kai and Sor-Seua for pre-test and post-test, respectively). The subject then had 1 minute to speak out as many words as possible beginning with that letter. Proper nouns, numbers and repetitions were not allowed. The results were recorded as the number of valid entries.

2. Trail making B test

Trail making B test evaluates working memory through divided attention. To administer the test, the subjects had to connect the numerical circle alternating with different colors in sequential order. While connecting the circles, the subjects were not allowed to raise the tools that they used to connect the circles from the test paper. However, according to Reitan's method, the assessors were allowed to point out any error that occurred and scored the test on time alone.

3. Digit span tests

Digit span tests assess working memory in form of short-term retention capacity consisting of two tests which are Digit forwards span test and Digit backwards span test. In both tests, sets of digits were told slowly and clearly, to the subjects who were asked to repeat them in the same order for Digit forwards

span test and in the reverse order for Digit backwards span test.

Statistical analysis

All analysis was performed in SPSS version 18. For every variable, means were calculated for both pre-test and post-test. Paired t-test was used to compare differences between mean of pre-test and post-test of each group. ANCOVA using baseline as covariate was used to compare differences between intervention and control group.

Results

After recruiting forty participants, three subjects withdrew resulting in 37 subjects who underwent randomization, from which 19 people were placed in the intervention group and 18 people were in the control group, as shown in Fig. 4. The average ages in the intervention and control group were 41.5±7.1 and 39.7±7.0 respectively. Most subjects were female (89.5% and 88.9% in intervention and control group). No participant was lost to follow-up in either groups.

Physical performance and cognitive tests are shown in Table 1 and 2, respectively. Comparing within each group by paired t-test, the intervention group had significant increment in left flexion, right flexion, right extension, left abduction, right abduction and Trial Making B Test. The control group also significantly increased in right extension, left abduction, right abduction and Trial Making B Test. Comparing between the two groups with ANCOVA adjusted baseline as covariate, right and left flexion of the intervention group showed significant increment (p-value = 0.010 and 0.006 respectively) as shown in Table 1. For cognitive function, no difference between groups was found for cognitive tests. No complications from the exercise, such as muscle ache or joint pain, were reported.

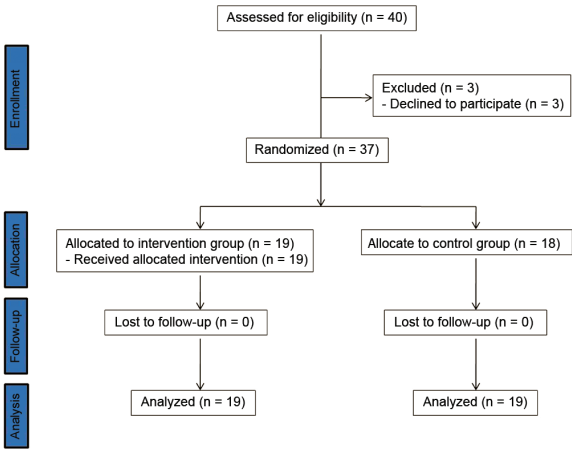

Fig. 4 Participant flow.

Discussion

This pilot study illustrates the feasibility of using Rue-si-dad-ton as an intervention to prevent computer, use-related upper limb musculoskeletal disorders in office workers. Findings from this preliminary study suggest that the exercise could improve range of motion of certain direction.

Within each group, it could be seen that right extension, right and left abduction and Trial Making B test significantly increased. Since the control group was not allowed to exercise during the project and none of them reported violating this agreement, this means that these parameters also changed in the control group from other factors apart from the exercise. Changes in right and left flexions were statistically significant only in the intervention group. When comparing the between intervention and control groups by ANCOVA using baseline as covariates, both flexions in the intervention group still showed statistical significance compared to the control, thus suggesting the positive effects of the exercise on range of motion in this direction.

Considering movement of the chosen postures used in the intervention, flexion of shoulders is the main action in the three postures. The results could imply that Rue-si-dad-ton may have positive effects on joint function in the exercised movement. Improvement in physical function from the exercise is similar to that of other studies on the effects of Rue-si-dad-ton with different physical outcomes[3-5,8].

Effects of passive stretching exercise can be explained by two rationales, which are biomechanical changes and cellular biological approach[14,15]. Applying passive force to a substance, it will be deformed depending on its material properties, a phenomenon of biomechanical change. This kind of change occurs readily but it is also reversible and only lasts for minutes to hours. Considering at molecular structure of tissues surrounding joints, stretching can also affect its cellular structure such as increment in number of sarcomeres. This latter adaptation occurs quite late, but is also considered less readily reversible thus contributing to lasting effects of the exercise. Since the intervention was only 4-days long, most of the observed effects possibly came from the biomechanical one.

Table 1. Physical performance at baseline (Day 0) and on the 4th day (Day 4)

Variables	Intervention (n = 19)	Control (n = 18)	*p*-value[2] (between groups)
Range of motion (ROM) (degree)			
Left flexion			
Day 0	170.1±7.7	171.0±10.6	
Day 4	177.4±5.4	170.6±10.4	0.006*
p-value[1]	0.001*	0.858	
Right flexion			
Day 0	172.0±7.3	170.6±9.4	
Day 4	177.2±2.9	171.9±8.4	0.010*
p-value[1]	0.003*	0.458	
Left extension			
Day 0	46.6±10.3	49.8±9.8	
Day 4	51.1±7.2	52.2±8.3	0.837
p-value[1]	0.130	0.287	
Right extension			
Day 0	47.5±8.3	46.9±6.4	
Day 4	51.4±6.3	53.7±8.9	0.283
p-value[1]	0.022*	0.006*	
Left abduction			
Day 0	177.8±3.7	173.8±12.1	
Day 4	179.9±1.7	176.0±11.2	0.569
p-value[1]	0.031*	0.039*	
Right abduction			
Day 0	178.8±2.6	175.9±8.1	
Day 4	180.4±0.8	179.2±6.1	0.935
p-value[1]	0.015*	0.040*	
Left internal roation			
Day 0	50.6±13.0	50.0±10.7	
Day 4	50.7±7.0	53.4±9.3	0.203
p-value[1]	0.967	0.119	
Left external rotation			
Day 0	85.3±11.1	82.8±14.2	
Day 4	86.0±10.3	81.0±16.3	0.223
p-value[1]	0.501	0.391	
Right external rotation			
Day 0	88.1±3.4	84.3±12.5	
Day 4	89.2±2.8	81.3±18.4	0.201
p-value[1]	0.106	0.426	
Pain scale (0-10 points)			
Day 0	0 (0, 0)	0 (0, 0)	
Day 4	0 (0, 2)	0 (0, 2)	0.985
p-value[3]	0.063	0.088	
Shoulder function (0-30 points)			
Day 0	24.8±4.4	25.2±2.0	
Day 4	19.4±1.6	19.0±2.1	0.389
p-value[1]	0.708	0.830	
pASES (0-100 points)			
Day 0	80.8±4.2	81.5±3.4	
Day 4	85.7±2.3	85.7±3.0	0.867
p-value[1]	0.090	0.136	

[1] Mean ± SD, *p*-value from Paired t-test for comparison within each group
[2] *p*-value obtained from comparison between groups by ANCOVA using baseline as covariate
[3] Median (Q_1, Q_3), *p*-value from Wilcoxon signed-ranks test
* Statistically significant

Table 2. Cognitive function at baseline (Day 0) and on the 4th day (Day 4)

Variables	Intervention (n = 19)	Control (n = 18)	*p*-value[2] (between groups)
Verbal fluency test (words)			
Day 0	14.2±6.1	12.7±4.2	
Day 4	14.6±3.1	12.7±3.9	0.166
p-value[1]	0.741	1.000	
Trail maker B test (second)			
Day 0	56.7±15.1	76.0±35.3	
Day 4	46.0±12.6	56.0±18.5	0.303
p-value[1]	0.000*	0.025*	
Digit forwards span test (digits)			
Day 0	7.7±1.0	7.6±1.3	
Day 4	7.6±1.0	7.4±1.2	0.418
p-value[1]	0.790	0.215	
Digit backwards span test (digits)			
Day 0	4.5±1.2	4.3±1.1	
Day 4	4.6±1.1	5.0±1.2	0.798
p-value[1]	0.546	0.231	

[1] Mean ± SD, *p*-value from Paired t-test for comparison within each group
[2] *p*-value obtained from comparison between groups by ANCOVA using baseline as covariate
* Statistically significant

Other Complementary and Alternative (CAM) exercises with similar features like Rue-si-dad-ton are Yoga[16,17], Tai Chi[18,19], and Qigong[20,21], being self-practicable exercises with slow movement correlated with breathing pattern. Studies on these exercises show physical and improvements in the intervention group encouraging the need to justify psychological enhancement from Rue-si-dad-ton.

The present study does have some limitations. The most important limitation is the time limit resulting in very short duration of the trial. Most of the pilot studies regarding CAM exercises last at least a month with intervention sessions ranging from one to three sessions per week. Findings from other studies suggest that other mental aspects such as stress level and overall quality of life changed significantly in about four to six weeks; thus, it is very possible that unchanged cognitive function in the current study is due to the mentioned time constraint. Despite this fact, the trial still yielded positive results in improvement of certain directions of range of motion. Another potential limitation is the sample size. Being a pilot study, no sample size estimation was formally calculated. However, comparing with other studies in the same field, the number of participants in the present study is fairly acceptable. Another limitation is that the study does not incorporate long-term follow-up concerning the retention of effects from the exercise.

Results from the study may be applied to support the practice of Rue-si-dad-ton as an office-based intervention to prevent computer-related musculoskeletal disorders by increasing range of motion in exercised directions. Further research trials with longer duration and larger sample size are warranted.

Author's contributions

All authors conceived of the study. Tanasugarn L, Natearpha P, Kongsakon R, Chaosaowapa M, Choatwongwachira W, Seanglaw D conducted recruitment and outcome measurement process. Vannabhum M and Laohapand T organized the intervention session. Tanasugarn L, Natearpha P, Nimmannnit A, Srinonprasert V analyzed the data. Tanasugarn L, Natearpha P, Kongsakon R, Kiratisin P, Srinonprasert V, Nimmannnit A, Vannabhum M, Tanasugarn L, Kuptniratsaikul V drafted the manuscript. All authors read and approve the manuscript.

What is already known on this topic?

Rue-si-dad-ton has been studies in various aspects such as physiologic effects on cardiopulmonary function and change in anaerobic fitness. Also, a number of studies illustrate its application and benefit in many populations such as diabetes mellitus patients, pre-hypertension patients, pre-school children and women with sedentary lifestyle.

What this study adds?

This study preliminarily indicates that the exercise can increase range of motion and is feasible as a prevention of musculoskeletal disorder in upper limbs in office workers.

Acknowledgement

The authors wish to thank staffs from Center of Applied Thai Traditional Medicine and all research participants for their cooperation.

Potential conflicts of interest

None.

References

1. Laohapand T, Jaturatamrong U. Rue-si-dad-ton exercise. Volume 1. Bangkok: Suppawanich Press; 2011.
2. Chidnok W. Ruesi Dadton stretching exercise. J Med Tech Phys Ther 2009; 21: 189-97.
3. Chidnok W, Weerapun O, Wasuntarawat C, Khamchon N, Duangneth D, Khamrid N. Ventilatory and heart rate responses during the Ruesi-Dudton-Stretching-Exercise. Thai J Phys Ther 2009; 31: 104-11.
4. Chidnok W, Weerapun O, Wasuntarawat C, Lertsinthai P, Sripariwuth E. Effect of the Ruesi-Dadton-Stretching-Excercise training on respiratory muscle strength in females. Thai J Phys Ther 2007; 29: 126-36.
5. Chidnok W, Weerapun O, Wasuntarawat C, Lertsinthai P, Sripariwuth E. Effect of the Ruesi-Dadton-Stretching-Exercise training to anaerobic fitness in healthy sedentary females. Naresuan Univ J 2007; 15: 205-14.
6. Pithaksa P, Salitool P. The association between Thai traditional medicine dhammanamai health promotion program and quality of life in diabetes patients in Kantharalak district, Si Sa Ket province. Journal of Thai Traditional & Alternative Medicine 2012; 10: 43-51.
7. Samnak N, Eukuyi M, Boonrod T, Somrak K. Modification of health behavior in a group of patients with pre-hypertension at the Pakphanang District, Nakhon Si Thammarat Province. KKU Journal of Public Health Research 2011; 4: 21-8.
8. Pantoon N. The results of movement activities and applied hermit excercise (Ruesi Dadton) rhythms for the physical development of preschool children. Journal of Educational Research Faculty of Education, SWU 2012; 7: 21-32.
9. Buranruk O, Eungpinitpong W. Effects of ruesidadton, chikung, and combination exercises on stress and quality of life in sedentary women. J Med Tech Phys Ther 2013; 25: 280-8.
10. Ming Z, Zaproudina N. Computer use related upper limb musculoskeletal (ComRULM) disorders. Pathophysiology 2003; 9: 155-60.
11. Braddom RL. Physical medicine and rehabilitation. Philadelphia: Elsevier; 2011.
12. Angst F, Schwyzer HK, Aeschlimann A, Simmen BR, Goldhahn J. Measures of adult shoulder function: Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH) and its short version (QuickDASH), Shoulder Pain and Disability Index (SPADI). Arthritis Care Res (Hoboken) 2011; 63 (Suppl 11): S174-88.
13. Lezak MD, Howieson DB, Bigler ED, Tranel D. Neuropsychological assessment. 4th ed. New York: Oxford University Press; 2004.
14. De Deyne PG. Application of passive stretch and its implications for muscle fibers. Phys Ther 2001; 81: 819-27.
15. Harvey L, Herbert R, Crosbie J. Does stretching induce lasting increases in joint ROM? A systematic review. Physiother Res Int 2002; 7: 1-13.
16. Cowen VS, Adams TB. Physical and perceptual benefits of yoga asana practice: results of a pilot study. Journal of Bodyworkand Movement Therapies 2005; 9: 211-9.
17. Thomley BS, Ray SH, Cha SS, Bauer BA. Effects of a brief, comprehensive, yoga-based program on quality of life and biometric measures in an employee population: a pilot study. Explore (NY) 2011; 7: 27-9.
18. Lan C, Lai JS, Chen SY, Wong MK. Tai Chi Chuan to improve muscular strength and endurance in elderly individuals: a pilot study. Arch Phys Med Rehabil 2000; 81: 604-7.
19. Palumbo MV, Wu G, Shaner-McRae H, Rambur B, McIntosh B. Tai Chi for older nurses: a workplace wellness pilot study. Appl Nurs Res 2012; 25: 54-9.
20. Kemp CA. Qigong as a therapeutic intervention with older adults. J Holist Nurs 2004; 22: 351-73.
21. Witt C, Becker M, Bandelin K, Soellner R, Willich SN. Qigong for schoolchildren: a pilot study. J Altern Complement Med 2005; 11: 41-7.

ผลทางกายภาพและสมรรถภาพสมองหลังกายบริหารด้วยท่าฤาษีดัดตน: การศึกษานำร่องเชิงทดลองแบบสุ่มและมีกลุ่มควบคุม

โลกเชษฐ์ ธนสุกาญจน์, พสิษฐ์ เนตรอาภา, รณกร คงสกนธ์, มัชฌิมา เชาว์เสาวภา, วรพล โชติวงศ์วชิร, ดุษฎี เชี่ยงหลอ, ภัทรชัย กีรติสิน, จักรพงศ์ นะมาตร์, วราลักษณ์ ศรีนนท์ประเสริฐ, อัครินทร์ นิมมานนิตย์, ทวี เลาหพันธ์, แม้นมาศ วรรณภูมิ, วิไล คุปต์นิรัติศัยกุล

ภูมิหลัง: *การศึกษานี้มีจุดประสงค์เพื่อประเมินผลทางกายภาพต่อข้อต่อหัวไหล่ และผลต่อสมรรถภาพการทำงานของสมองหลังกายบริหารด้วยท่าฤาษีดัดตน ซึ่งยังขาดหลักฐานเชิงประจักษ์ในส่วนของประโยชน์จากกายบริหารดังกล่าว*

วัสดุและวิธีการ: *ผู้ที่ยินยอมเข้าร่วมการศึกษา 37 คน ซึ่งทำงานประจำหน้าคอมพิวเตอร์เป็นเวลาอย่างน้อย 3 ชั่วโมงต่อวัน ถูกแบ่งเข้าในกลุ่มทดลอง (19 คน) และกลุ่มควบคุม (17 คน) แบบสุ่มผลทางกายภาพต่อข้อต่อหัวไหล่ประเมินโดยการวัดพิสัยของข้อต่อหัวไหล่และแบบทดสอบการทำงานของข้อต่อหัวไหล่ สมรรถภาพสมองทดสอบโดยใช้การทดสอบ verbal fluency, Trail Making B, และ Digit span ผู้เข้าร่วมการศึกษาทั้งสองกลุ่มถูกประเมินด้วยการทดสอบทั้งหมดเมื่อเข้าร่วมและสิ้นสุดการศึกษาด้วยผู้ประเมินกลุ่มเดียวกันซึ่งไม่ทราบว่าผู้เข้าร่วมการศึกษาอยู่ในกลุ่มใด กลุ่มทดลองได้เข้าร่วมในการปฏิบัติกายบริหารฤาษีดัดตนโดยท่ากายบริหาร 3 ท่า (ใช้ระยะเวลาครั้งละ 1 ชั่วโมง เป็นเวลา 4 วัน โดยผู้นำกายบริหารที่ได้รับการฝึกมา) ก่อนการประเมินครั้งสุดท้าย*

ผลการศึกษา: *มีเพียงการงอข้อศอกของข้อต่อหัวไหล่ซ้ายและขวาที่แตกต่างอย่างมีนัยสำคัญทางสถิติ เมื่อเปรียบเทียบระหว่างกลุ่มทดลองและกลุ่มควบคุม ($p = 0.006$ และ 0.010 ตามลำดับ) เมื่อทดสอบด้วยการวิเคราะห์ ANCOVA โดยใช้ค่าพื้นฐานของทั้งสองกลุ่มเป็นตัวแปรร่วม ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของตัวแปรอื่น ๆ เมื่อเปรียบเทียบระหว่างทั้งสองกลุ่ม และไม่พบภาวะแทรกซ้อนจากกายบริหารระหว่างการศึกษาในครั้งนี้*

สรุป: *กายบริหารฤาษีดัดตนอาจช่วยเพิ่มพิสัยการเคลื่อนไหวของข้อต่อได้อย่างปลอดภัย โดยพบประโยชน์ต่อการทำงานของข้อต่อ และมีความเป็นไปได้ที่จะมีสมรรถภาพของสมอง ควรมีการศึกษาเพิ่มเติมที่มีผู้เข้าร่วมศึกษาที่เพียงพอ และระยะเวลาที่นานขึ้น*