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Original Research

A Randomized Controlled Trial Comparing Thai Facial Massage, Chinese Eye Exercise of Acupoints and Standard Treatment in Patients with Dry Eye Disorders

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Abstract

Dry eye disorder (DED) is a chronic medical condition that requires ongoing treatment, with increasing prevalence worldwide. Traditional Thai eye exercises (TFM) and Chinese eye exercises of acupoints (CEA) are believed to improve ocular health. The objective of this study is to examine the efficacy and potential adverse effects of TFM and CEA in treating DED compared to standard treatment of lid hygiene (STD). In this 12-week single-blind randomized controlled trial, 84 participants aged 20-60 years with mild to moderate DED were recruited from Thammasat University Hospital, Thailand. They were equally divided into three groups: TFM, CEA, and STD (28 participants each). The participants were trained to self-administer treatments at home. The primary outcomes were OSDI scores, SIT, TBUT, and CSS, while the secondary outcomes were ocular tests, including VA and Likert scale, to measure DED-related symptoms. One-way ANOVA and repeated measures (ANOVA) were used to compare results between groups and study visits, respectively; $p<0.05$ were considered statically significant. The post-treatment results showed a gradual improvement of OSDI ($p<0.001$), TBUT ($p<0.001$), and SIT ($p<0.01$) in all groups. CSS improved significantly only in CEA groups ($p<0.05$). No significant differences were found between the study groups, except for SIT in week 4 and week 12 when there was a greater reduction of SIT in CEA compared to TFM and STD groups ($p < 0.05$). No adverse event was observed in all study groups throughout the intervention program. TFM and CEA could be effectively used as alternative treatments for STD without any negative side effects.

Keywords: Dry eye syndromes; Thai massage; Acupressure

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Introduction

Dry eye disorder (DED) refers to chronic ocular conditions caused by the imbalance of tear fluid in the anterior eyes. DED-related symptoms range from dryness, irritation, watering, and a burning sensation. Patients with DED may visit eye clinics to receive medical treatments. DED symptoms range from mild, such as discomfort or conjunctivitis, to severe indications, for example, cornea scar and visual damage [1,2]. If left untreated, symptoms of DED can escalate and lead to complications like corneal inflammation and infection [3]. It has been observed that the prevalence of dry eye disease is comparatively higher among the Asian population than in Europe and the United States [4]. DED incidence has been increasing steadily because of excessive screen time and long hours of working online [5].

DED is divided into two types: aqueous tear deficiency caused by insufficient tear production, and evaporative dry eye caused by an unstable lipid tear layer. The co-occurring of both can mixed-type DED. Consequently, the diagnosis on DED must be precise to prescribe effective treatments [2,6]. A wide range of options, such as artificial tears, environmental adaptation to punctual occlusion, or lid surgery, are available to treat DED [7,8]. Standard treatment of lid hygiene or (STD) is another viable option to treat patients with evaporative dry eye or mixed-type DED [9]. The processes of lid hygiene involve warm compresses, eyelid massage, and lid scrub.

Traditional alternative therapies such as herbal remedies, nutritional supplements, and acupuncture are currently provided to treat and prevent DED [10-12]. Each therapy can be used in conjunction with standard treatments. Chinese acupuncture (CA) is one of the alternative therapies extensively investigated for its effects to treat DED [13]. Contemporary research has determined the effects of CA in terms of frequency, acupuncture points, and treatment interval [14].

Previous studies reported that CA on the human face was found to produce positive effects, while exact acupuncture points to achieve effectiveness are still unspecified [15,16]. However, the difficulties of applying CA include needle phobia, frequent visits, and traveling. Thus, the home therapy techniques that DED patients can perform by themselves may be preferable as practical solutions.

Chinese eye exercise of acupoints (CEA) is a type of massage on periocular acupoints employing traditional Chinese acupressure to improve ocular health. CEA can alleviate ocular fatigue and other symptoms associated with vision [17] and decelerate myopia while the findings on CEA's effects remain debatable [18,19]. China has implemented the eye exercises of acupoints in schools which seek to relieve visual symptoms and lower myopia in students [20].

Thai yoga, known as Ruesi Dadton (RSD), is a traditional form of Thai exercise that incorporates controlled breathing, meditation, and postures. This practice has been widely utilized in Thailand for many years and is considered a mind-body exercise [21,22] to restore homeostasis, manage pain, and promote muscle flexibility [23-25]. The guiding principles and techniques of RSD resemble low-intensity yoga exercises that yield considerable physical and psychological health benefits [26]. The first set of RSD exercises is referred to as the Seven Steps of Thai Facial Massage (TFM). The massage locations, including face, head, ear, and neck, aim to relieve ocular discomfort and related symptoms ranging from blurred vision, irritation and burning sensation [27]. TFM seems to share similar massage points with CA and CEA. Current research highlights that collaborative stimulation of various acupoints produces greater clinical effects on DED compared to single acupoint treatments [28]. Both TFM and CEA incorporate various acupoints to achieve optimal effects to relieve DED [20,27]. DED has become an emerging public health concern with a rising number of patients suffering from DED [29]. Currently, there is limited clinical evidence on the impact of TFM and CEA on DED. Moreover, it should be noted that the Seven Steps TFM has not been utilized previously to mitigate DED-associated symptoms. Therefore, this study aimed to compare the efficacy and side effects of TFM, CEA, and STD in relieving DED.

Methods

Study design

The 12-week study was designed to explore the effectiveness and safety of TFM and CEA in DED. The study was conducted between July 2022 and May 2023, with the investigators being blinded. The study flow chart is represented in figure 1.

Ethical consideration

This research was a single-blind randomized controlled trial conducted in the outpatients of Thammasat University Hospital, Pathum Thani, Thailand, between July 2022 and May 2023. This study was approved by the Human Research Ethics Committee of the Faculty of Medicine, Thammasat University, Thailand (approval number: MTU-EC-OO-0-011/65). This research complied with the Declaration of Helsinki. It was registered in the Thai Clinical Trial Registry (trial registration identifier: TCTR20221130005). Volunteers were informed about the research protocol before they were recruited into this research. All the participants signed their written informed consent before participating in this research. They were notified that they had the right to withdraw from this research

at any time without any restrictions. The 12-week intervention program was designed to investigate the effectiveness and safety of TFM, CEA, and STD to relieve DED.

Sample size and sampling method

The average ocular surface disease index (OSDI) from a previous acupressure study [30] indicated an effect size of 0.76. The researchers employed G-power software with 80% power and a 5% significance level to calculate the sample size. Twenty-eight participants from TFM, CEA, and STD groups were required for each group to compensate for the 20% dropout rate. Therefore, a total number of 84 participants were recruited for this study. In order to allocate participants to one of the three groups, a block of six randomization methods was utilized. As the treatment method employed could not be blinded, the participants were informed of the group they were assigned to. The investigators, however, were kept unaware of the group to which each participant belonged.

Participants

Between July 2022 and February 2023, a total of 141 volunteers from the ophthalmology unit at Thammasat University Hospital in Pathum Thani, Thailand, were enrolled in a study. Out of the 141 participants, 84 individuals who met the inclusion criteria were random-

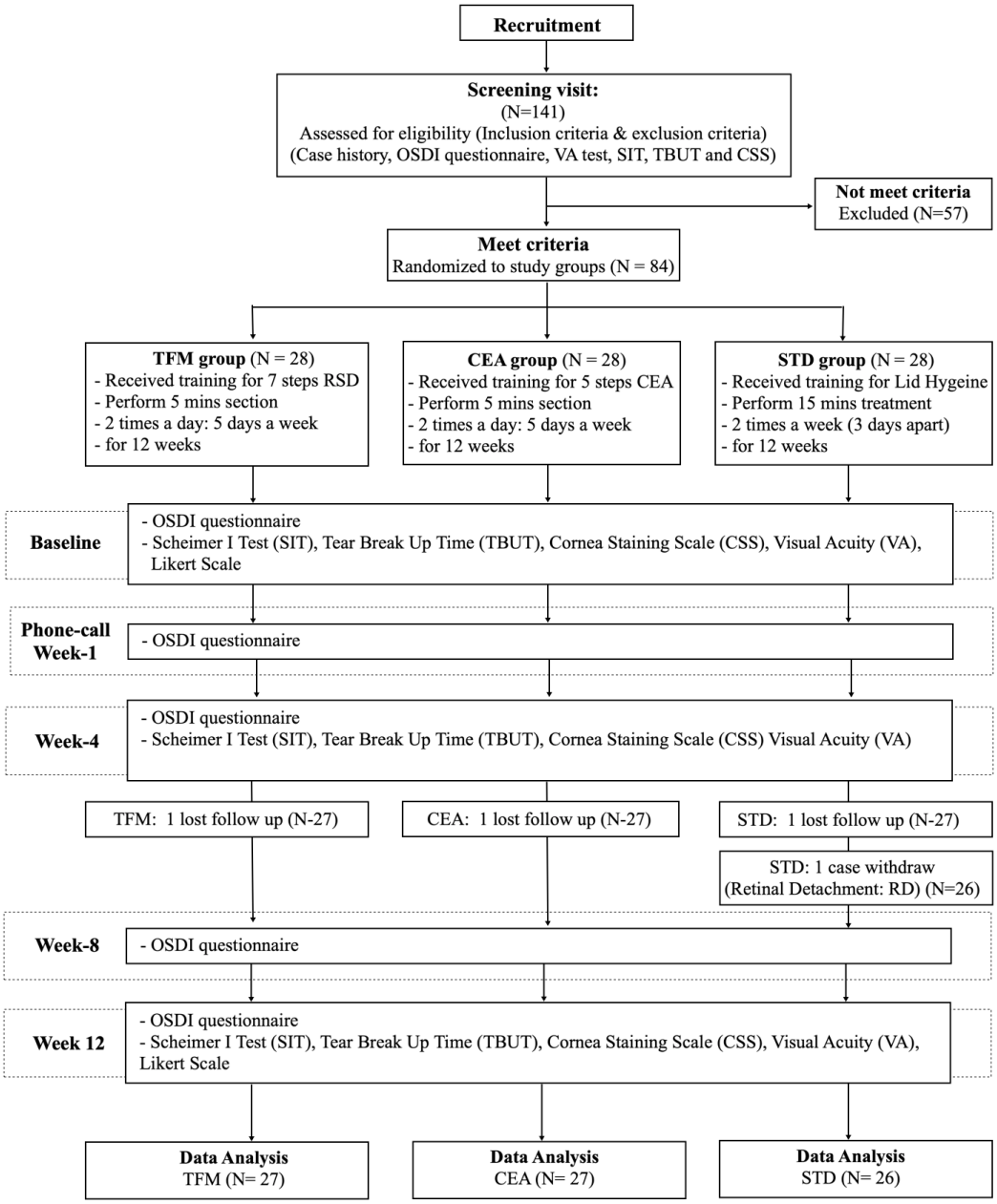

Figure 1. Study flow chart

ly assigned to one of three groups - TFM, CEA, and STD, with each group consisting of 28 participants.
The inclusion criteria were: (1) males or females aged 20-60 years, (2) symptomatic DED for 3 months, (3) OSDI scores above 12, (4) TBUT between 5 to 10 secs or SIT between 5 to 10 secs in one or both eyes which indicated mild to moderate DED.
The exclusion criteria were: (1) ocular and/or systemic conditions that directly contribute to DED, such as thyroid eye disease, Stevens-Johnson syndrome, cranial nerve palsy, (2) a history of refractive surgery or ocular surgery, (3) LogMAR Visual Acuity (VA) worse than 0.3 in each eye, (4) pregnant or breastfeeding women, (5) wearing contact lenses for more than 72 hours per week, (6) using routine medications or supplemental supplies that may contribute to DED, (7) using alternative treatments of and CEA in the last six months, (8) the participants who could not follow the study protocol for longer than a week.

Data collection and procedures

Primary and secondary outcomes

The primary outcome was OSDI scores SIT, TBUT, and CSS, while the secondary outcomes were ocular tests, including VA and Likert scale, to measure DED-related symptoms. The standardized OSDI questionnaire, a 12-item scale to evaluate DED-related symptoms [31,32] in the Thai version Field [33], was chosen as the primary outcome in this study. The score ranges from 0 to 100 (0-12: normal, 12-22: mild, 23-32: moderate, 33-100: severe) while higher scores mean severe dry eye symptoms [33]. The OSDI questionnaire was collected at baseline, week 1, week 4, week 8 and week 12.
The Schirmer test (SIT), designed to examine tear volume, is a noninvasive method to collect human tears. The researchers placed a Schirmer paper strip (Whatman No. 41 filter paper) at the lower fornix 2/3 towards the lateral side for 5 minutes to determine the wetting range (mm) [8]. The Schirmer's paper is a reliable tool for identifying DED and determining biomarkers [34].
TBUTs were verified instantly by employing a slit lamp biomicroscope and video recording system. The researchers instilled three dyes on the superior bulbar conjunctiva. Then, each participant was informed to blink as normal, and a dark spot in the tear film was observed [35]. TBUT has been widely used to examine dry eyes since it is a convenient and efficient [36].
Corneal surface staining (CSS) measures the staining density on a fluorescent dye seen on the cornea. Oxford grading system defines the CSS scores between (no staining) and 5 (severe staining) [8,37].
Visual acuity (VA) is one of the commonly used tests used to assess the ability of human eyes to differentiate shapes and items in detail at a specific distance by applying a Snellen chart or E-chart [38]. The participants in this study experienced some reduced vision. VA test was collected at baseline, week 4, and week 12 to monitor any changes resulting from treatments.
The ocular tests, including SIT, TBUT, and CSS, were collected at baseline, week 4, and week 12, as shown in the flowchart.
This study employed a 5-point Likert scale from 1 (very slight concern), 2 (slight concern), 3 (moderate concern), 4 (very concern), to 5 (extreme concern) to determine the impacts of DED on daily life at baseline and week 12.

Intervention

The 12-week intervention program in this study consisted of three groups: TFM, CEA as interventions, and STD as a control. In each group, the experts demonstrated and trained the participants on how to perform their assigned treatment at home. −
In the TFM group, a traditional Thai medicine practitioner demonstrated how to perform the seven steps of facial massage to TFM participants. After the demonstration was completed, the participants were asked to perform all the steps in front of the practitioner to validate the accuracy of their practice. TFM consisted of seven steps that aimed to massage and exercise the facial, head, and neck areas: (1) brush back, (2) face powdering, (3) mount whipping, (4) chin whipping, (5) chin pressing, (6) ear rubbing, (7) occiput slapping. The complete description of all the steps is represented in Supplementary 1. Each TFM practice took 5 minutes to complete, and the participants were asked to perform it twice a day, 5 days a week for 12 weeks.
In the CEA group, a traditional Chinese medicine practitioner demonstrated how to perform self-massage to the participants. After the demonstration was completed, the participants were asked to perform the self-massage in front of the practitioner to validate the accuracy of their practice. CEA comprised 5 acupressure steps on 8 acupoints around the eye globe [17]. These acupoints included BL1 (Jingming), BL2 (Caunzhu), ST2 (Sibai), EX-HN4 (Yuyao), EX-HN5 (Taiyang), TE-23 (Sizhukong), GB (Tongziliao), ST1 (Chengai). The complete description of all the steps is represented in Supplementary 2. Each CEA practice took 5 minutes to complete and the participants were asked to perform it twice a day, 5 days a week for 12 weeks. The researchers provided the handouts containing QR codes for video demonstrations and researcher contact details and daily record forms. The researchers also made weekly calls to follow up the progress of the participants.
In the STD group, optometrists demonstrated how to perform STD to the participants. STD consisted of three steps: warm compress, lid massage, and lid scrub. The participants performed a warm compress

by using a self-heating carbon eye mask for 10 minutes. Lid massage was performed around the upper and lower eyelids, and lid scrub was performed by using a sterile cotton bud to clean the eyelids [39]. The STD practice took 15 minutes to complete, and the participants were asked to perform it twice a week with 2-to-3-day intervals for 12 weeks.

The researchers provided handouts containing QR codes for video demonstrations, researcher contact details, and daily record forms to all three groups. In the first week, all participants were required to send the video recorder of their practice back to researchers to check for corrections. If any concerns or misconduct arose, researchers were notified, trained, and consulted to ensure that participants were compliant with the study protocol. The researchers also made weekly calls to follow up on the progress of the participants. The researchers granted permission to all participants to continue their routine systemic medication prescriptions, including ACE inhibitors and angiotensin receptor blockers for hypertension. Additionally, the use of supplementary vitamins, such as vitamins C and B, Glutathione, Zinc, and multivitamins, was permitted. Participants were also allowed to utilize artificial tears, both preservative and preservative-free, to avoid exacerbating their DED symptoms. Throughout the study period, participants were advised to keep a record of any changes made to their routine medications, vitamins, and supplements. The researchers interviewed the participants using social applications and completed record forms, including the OSDI and safety questionnaires, in weeks 1 and 8. The participants were informed to return for follow-up exams at week 4 and week 12. Moreover, the participants in all three groups were asked to write down a daily record of how they experienced any adverse effects or illnesses throughout the 12-week intervention program.

Statistical analysis

SPSS software version 24 (IBM, NY, USA) was used to analyze statistical data. The data was presented in mean and standard error. $P < 0.05$ was considered as statistically significant. One-way ANOVA and A chi-squared test were used to compare demographic characteristics among all three groups. One-way ANOVA and independent t-tests were used to compare the differences between groups, while repeated measures ANOVA was used to compare outcome measurements across different intervals. A paired-sample t-test was conducted to analyze the differences between the effects of DED on daily life before the treatments and after the treatments.

Results

Baseline characteristics

Table 1 shows demographic data: age, digital hours, symptoms period, gender, artificial tear use, and smoking history. Eighty participants completed the program (TFM=27, CEA=27, STD=26); while three participants were excluded from this study because they did not follow the research protocol and one participant dropped out in week 6. The mean age of the remaining participants was 30.95 ± 1.27. Most participants spent more than 8 digital hours a day. The majority of all the participants were females with the ratio of males: females at 10:70; while most of the participants experienced DED-related symptoms less than a year. Most participants did not use artificial tears and they were non-smokers.

Clinical assessment

Primary outcome measurement: OSDI questionnaire

Table 2 reports the total OSDI scores and its categories, namely ocular symptoms, vision-related functions, and environment triggers in all three groups at baseline, in week 1, week 4, week 8, and week 12. The total OSDI scores were significantly reduced in all three groups ($p<0.001$), while ocular symptoms, vision-related functions, and environment triggers decreased continuously with statistical significance ($p<0.001$) in all three groups from baseline to week 12. STD showed the greatest reduction followed by

Table 1. Demographic data of the participants in all three groups at baseline

Demographic data	TFM (N=27)	CEA (N=27)	STD (N=26)	p
Age (mean ± SE) [a]	31.74± 2.37	26.67±1.98	34.57±2.32	*0.046**
Digital Hours (mean ± SE) [a]	9.85±0.36	8.96±0.33	8.63±0.46	0.083
Symptoms period (N) (3-6 months, 6-12 months, >12 months) [b]	10:11:6	15:7:5	8:9:9	0.339
Gender (N) (male: female) [b]	5:22	3:24	2:24	0.474
Artificial tear (N) (yes: no) [b]	6:21	4:23	7:19	0.553
Smoke or second hand (N) (yes: no) [b]	6:21	7:20	4:22	0.462

TFM, Thai facial massage; CEA, Chinese eye exercise of acupoint; STD, standard treatment;
[a] One-way ANOVA (mean SE); [b] Pearson chi-square (N%);
* Statistically significant differences with $p < 0.05$.

TFM and CEA. All three groups had no statistically significant differences from week 1 to week 12.

Secondary outcome measurement

Table 3 reports the outcomes, including SIT, TBUT, CSS, and VA, in all three groups at baseline in weeks 4 and 12.

The results indicated that SIT and TBUT in both eyes exhibited statistical improvement ($p<0.01$) in all three groups; while an improvement in CSS was observed in the CEA group only (right $p=0.008$, left $p=0.024$)

There was a statistical improvement ($p=0.028$) in the right eye in TFM group; while there was no statistical improvement in the VA presented in the CEA group and STD group. TFM could help improve vision acuity in TFM group.

TBUT, CSS, and VA were compared between groups and did not differ significantly in all three groups from week 4 to week 12.

Significant differences in SIT were detected between groups in week 4 (right $p=0.034$, left $p=0.012$) and week 12 (right $p<0.001$, left $p<0.001$). The CEA group showed the greatest improvement, followed by TFM and STD. A significant difference was found between TFM group and CEA group and another significant difference was found between CEA group and STD group.

According to table 4, the results showed that SIT was significantly improved among the CEA group compared to the STD group at both week 4 and week 12 ($p<0.05$). Additionally, TFM was significantly improved in the CEA group at week 12 ($p<0.005$). This suggests that SIT is greatly improved with CEA treatment, although there is no significant difference between TFM and STD.

Table 5 demonstrates the impacts of DED on daily life in all three groups at baseline and in week 12. There was no statistically significant difference in the impacts of DED on daily life between the groups ($p=0.197$ at baseline, $p=0.978$ in week 12).

At baseline, the scores on the impacts of DED were interpreted as moderate concern ranging from 3.07, 2.74, to 3.27 in TFM, CEA and STA respectively. After the intervention program, the scores decreased statistically significantly ($p<0.001$) to 1.48, 1.44, and 1.46 in TFM, CEA, and STD, respectively. The significant decrease indicated the impacts of DED from moderate to very slight concern in week 12.

Discussion

In this study, 80 participants completed the 12-week intervention program, which consisted of two interventions (TFM, CEA) and a control (STD). Our study revealed that participants in the CEA group who had the lowest average age demonstrated a greater degree of improvement following treatment in comparison to the STD and TFM groups. This discovery highlights the potential impact of age on treatment outcomes, as it was mentioned previously that DED severity is

Table 2. Total OSDI scores and its categories in all three groups at baseline, in week 1, week 4, week 8, week 12

Ocular Surface Disease Index (OSDI) (total score) Total score (100%)	**Baseline Mean±SE**	**Week 1 Mean±SE**	**Week 4 Mean±SE**	**Week 8 Mean±SE**	**Week 12 Mean±SE**	**p [b]**
TFM (N=27)	42.61±2.70	29.76±2.39	21.94±2.16	20.72±1.92	19.47±2.18	<0.001*
CEA (N=27)	37.96±3.09	28.86±2.78	21.62±2.75	17.71±2.30	19.09±0.51	<0.001*
STD (N=26)	39.31±3.75	30.66±3.12	21.95±2.95	19.88±2.23	14.42±1.88	<0.001*
p [a]	0.571	0.602	0.995	0.595	0.211	
Ocular symptoms (41.67%)						
TFM (N=27)	15.19±1.09	11.24±0.98	8.79±0.94	8.52±0.91	8.06±0.96	<0.001*
CEA (N=27)	12.92±1.08	8.81±1.19	8.03±1.08	6.54±1.02	7.59±1.27	<0.001*
STD (N=26)	14.70±1.64	11.96±1.27	9.39±1.14	8.09±0.88	6.43±0.87	<0.001*
p [a]	0.426	0.136	0.665	0.300	0.540	
Visual Related functions (33.33%)						
TFM (N=27)	14.30±1.00	8.98±0.85	5.52±0.73	6.43±0.71	4.65±0.73	<0.001*
CEA (N=27)	14.09±1.45	9.02±1.04	6.84±1.29	5.60±0.86	5.35±0.99	<0.001*
STD (N=26)	13.38±1.53	9.44±1.22	5.41±0.96	5.52±0.88	3.41±0.71	<0.001*
p [a]	0.881	0.968	0.552	0.692	0.256	
Environmental triggers (25%)						
TFM (N=27)	12.93±1.22	9.37±0.97	7.61±0.93	5.75±0.59	6.99±1.00	<0.001*
CEA (N=27)	10.94±0.88	9.02±0.84	6.37±0.71	5.56±0.61	6.14±0.69	<0.001*
STD (N=26)	11.21±1.27	9.25±1.13	7.14±1.22	6.26±0.84	4.56±0.62	<0.001*
p [a]	0.408	0.943	0.661	0.760	0.099	

TFM, Thai facial massage; CEA, Chinese eye exercise of acupoint; STD, standard treatment;
[a] One-way ANOVA, between groups; [b] repeated measure ANOVA, between time;
* Statistically significant differences with $p < 0.05$.

Table 3. Mean Standard Error of TBUT, SIT, CSS, VA of all three groups at baseline, week 4, week 12

Secondary outcome parameter:	Baseline (Mean ± SE)		Week 4 (Mean ± SE)		Week 12 (Mean ± SE)		p[b]	
	Right	Left	Right	Left	Right	Left	Right	Left
SIT (mm.)								
TFM (N=27)	9.22±0.96	9.07±1.10	11.92±1.07	12.18±1.02	14.18±1.23	14.66±1.15	<0.001*	<0.001*
CEA (N=27)	12.22±1.07	12.40±1.36	15.62±1.09	16.44±1.19	19.92±1.27	20.59±1.38	<0.001*	<0.001*
STD (N=26)	9.03±1.13	9.92±1.14	11.80±1.31	12.11±1.22	12.53±1.26	13.15±1.22	0.004*	0.009*
p [a]	0.063	0.061	0.034*	0.012*	<0.001*	<0.001*		
TBUT (second)								
TFM (N=27)	3.67±0.28	3.63±0.32	4.04±0.26	4.48±0.28	5.18±0.25	5.22±0.33	<0.001*	<0.001*
CEA (N=27)	4.37±0.31	3.63±0.28	5.03±0.21	4.66±0.23	5.66±0.25	5.62±0.27	<0.001*	<0.001*
STD (N=26)	3.92±0.38	3.73±0.33	4.26±0.29	4.46±0.32	5.50±0.44	5.57±0.40	<0.001*	<0.001*
p [a]	0.308	0.967	0.084	0.854	0.563	0.651		
CSS (grade)								
TFM (N=27)	0.52±0.11	0.63±0.10	0.62±0.16	0.37±0.12	0.33±0.11	0.48±0.14	0.208	0.170
CEA (N=27)	0.67±0.13	0.63±0.12	0.51±0.09	0.48±0.11	0.25±0.08	0.22±0.81	0.008*	0.024*
STD (N=26)	0.62±0.12	0.58±0.13	0.53±0.13	0.50±0.13	0.54±0.13	0.46±0.13	0.875	0.798
p [a]	0.685	0.941	0.824	0.994	0.222	0.342		
VA (logmar)								
TFM (N=27)	0.40±0.01	0.030±0.01	0.010±0.01	0.011±0.01	0.021±0.01	0.003±0.01	0.028*	0.109
CEA (N=27)	0.40±0.20	0.020±0.01	0.020±0.01	0.005±0.01	0.016±0.01	0.004±0.01	0.120	0.288
STD (N=26)	0.30±0.01	0.020±0.01	0.031±0.01	0.022±0.01	0.023±0.01	0.019±0.01	0.896	0.973
p [a]	0.848	0.838	0.691	0.371	0.939	0.518		

TFM, Thai facial massage; CEA, Chinese eye exercise of acupoint; STD, standard treatment; SIT, Schirmer I test; TBUT, Tear break up time; CSS, Cornea staining scale; VA, visual acuity

[a] One-way ANOVA, between groups; [b] repeated measure ANOVA, between time;

* Statistically significant differences with $p < 0.05$.

Table 4. SIT compared between groups in week 4 and week 12

SIT:	Week 4 (Mean ± SE)		Week 12 (Mean ± SE)	
	Right	Left	Right	Left
TFM (N=27), CEA (N=27)	11.92±1.07, 15.62±1.09	12.18±1.02, 16.44±1.19	14.18±1.23, 19.92±1.27	14.66±1.15, 20.59±1.38
p value [a]	0.066	0.015*	0.003*	0.004*
TFM (N=27), STD (N=26)	11.92±1.07, 11.80±1.31	12.18±1.02, 12.11±1.22	14.18±1.23, 12.53±1.26	14.66±1.15, 13.15±1.22
p value [a]	0.736	0.852	0.295	0.264
CEA (N=27), STD (N=26)	15.62±1.09, 11.80±1.31	16.44±1.19, 12.11±1.22	19.92±1.27, 12.53±1.26	20.59±1.38, 13.15±1.22
p value [a]	0.041*	0.039*	0.002*	0.005*

TFM, Thai facial massage; CEA, Chinese eye exercise of acupoint; STD, standard treatment.

[a] independent sample t-test, between group;

* Statistically significant differences with $p < 0.05$.

Table 5. Impacts of DED on daily life (Likert scale) at baseline and week 12

Impact of DED on daily life (Likert scale)	Baseline Mean±SE	Week 12 Mean±SE	p [b]
TFM (N=27)	3.07±0.20	1.48±0.12	<0.001*
CEA (N=27)	2.74±0.20	1.44±0.12	<0.001*
STD (N=26)	3.27±0.21	1.46±0.12	<0.001*
p [a]	0.197	0.978	

TFM, Thai facial massage; CEA, Chinese eye exercise of acupoint; STD, standard treatment.
[a] One-way ANOVA, between groups; [b] paired-samples t-test, between time.
* Statistically significant differences with p value < 0.05.

correlated with aging [8,29]. As the majority of participants were female, it is impossible to differentiate by gender. Due to the limited sample size, we cannot establish a relationship between the time of attack and the reduction in DED symptoms.

It was recommended that all participants continue their regular routine to avoid changes in symptoms that may affect the intervention treatment results. However, some factors were out of control. Few participants reported using fewer artificial tears after the intervention, which suggested an improvement after the intervention. Due to the fact that less than 30% of participants used artificial tears prior to the intervention, there were not enough numbers for statistical analysis.

Thai yoga (RSD), or the hermit's art of healing, is one of the three major branches that constitute traditional Thai medicine. Traditional Thai medicine is a holistic system that aims to cure by improving the free flow of energy in the human body [40]. Thai yoga is derived from the statues of Jivaka performing the exercises. Thai yoga is a practical discipline suitable for everyone; it can potentially prevent diseases and promote health [27,41,42]. The health benefits of Thai yoga include relief of pain and muscle tension, better range of motion, greater flexibility, and better venous and lymphatic circulation [22]. In this study, TFM was self-administered by trained participants in the TFM group for 12 weeks; TFM was effective in improving DED-related symptoms measured by OSDI scores, TBUT, SIT, and VA.

TFM, CEA, and STD could improve the total OSDI scores and all three categories statistically significantly ($p<0.001$) from baseline to week 12. The results on OSDI scores indicated that TFM, CEA, and STD could improve visual-related functions while relieving ocular symptoms and environmental triggers. The significant decrease in the total OSDI scores was consistent with a decrease in the impacts of DED on daily life measured by the Likert scale. The moderate concern at baseline was reduced by TFM, CEA, and STD to very slight concern in week 12. Therefore, it can be suggested that improving ocular symptoms helps alleviate the participants' concern about the impact of DED on their daily lives, contributing to a better quality of life [43].

Moreover, TFM, CEA, and STD could improve SIT and TBUT significantly; while CSS was improved in the CEA group only, and VA in the right eye was only improved in the TFM group only. In theory, massage can help promote blood flow and activate nerve endings in related areas [44]. It can be hypothesized that the activation of trigeminal receptors may induce a signal to the lacrimal gland, thereby augmenting the production of tears leading to the amelioration of SIT [45].

Acupressure is a therapy similar to acupuncture; nevertheless, acupressure is a type of touch therapy that integrates the theories of acupuncture and Chinese medicine [46]. Acupuncture is an alternative therapy in traditional Chinese medicine that aims to restore the homeostasis of Qi, the life energy. Traditional Chinese medicine theorizes that an imbalance or poor flow of Qi can cause diseases [46]. Acupressure can be performed by applying finger pressure instead of inserting needles on the same acupoints used in acupuncture. Acupressure is a simple and noninvasive therapy while self-acupressure is a therapy using finger pressure performed by trained participants. Self-acupressure is safe, convenient, and cost-effective [47]. TFM and CEA were performed around the face, head, and neck, supported by the trigeminal nerve. The trigeminal nerve branch leads to the ophthalmic branch, which supplies the lacrimal gland, resulting in tear secretion [48]. A massage relaxes human body, which stimulates the parasympathetic nervous system, resulted in acetylcholine secretion activating the lacrimal tear secretion [49].

The improvement of TBUT in the TFM group and CEA group could be explained through orbit and facial skin and muscle movements triggered by massage or acupressure. This causes the secretion of lipid tears from meibomian glands on the eyelid by gentle rubbing on the eyelid or blinking [50]. Acupoints in TFM and CEA encompass related areas around the eye globe, as well as the eyebrows and cheekbones

near the eye. Massaging around this area can promote eyelid movements, which act similarly to lid massage in lid hygiene techniques [51], should resulting in increased lipid tear secretion.

All interventions were effectively improving SIT. The mechanism of improvement is to dissolve the blocked lipids in the meibomian gland and improve lipid tear quality or TBUT. Which resulted in a lowered tear evaporation rate and maintained tear quantity (improved SIT) effectively [39,52]. A study has suggested that CEA showed greater improvement than other interventions. It was previously mentioned that not all warm compresses may give the same results [39], all massage methods may also give different results. Therefore, further investigation of its mechanism is needed to understand these differences.

A significant improvement in CSS was found in the CEA group only. A decrease in 1β (IL-1β) seems to be associated with a less severe level of DED [53]. DED causes staining on the cornea. Therefore, increased tear secretion and tear quality can improve corneal integrity, as measured by CSS [54]. The CEA group had the greatest improvement in CSS due to SIT reduction. Further analysis of change in tear composition and osmolarity is required to explain the mechanism of CEA to relieve DED-related symptoms.

The massage points and acupoints in this study may play an important role in relieving DED-related symptoms. Current research has revealed that stimulating the trigeminal nerve endings through intra-nasal or extra-nasal tear simulators can increase tear secretion. BL-1 in CEA was observed as a crucial acupoint for the successful acupuncture [55] and CEA. TFM also shared the same massage points as step 2 (face powdering). The auricular region may be related to DED. The findings from a recent study in 2022 on auricular acupressure showed improved outcomes in DED parameters [56]. TFM integrated the massage points in the auricular area through step 6 (ear whipping), while CEA did not include the acupoints in this area. However, both TFM and CEA still demonstrated positive effects on relieving DED-related symptoms.

To our knowledge, this study is the first clinical research to compare the two interventions of TFM and CEA with the standard treatment of lid hygiene and to investigate the effects of both interventions on relevant measurement tools compared with the control of a standard treatment. As alternative treatments, TFM and CEA were comparable to STD in alleviating DED-related symptoms; while no adverse effects were reported throughout the intervention program.

Study Limitation

There are some limitations in this study which should be addressed. First, no blinding of the intervention was conducted since the participants in each group needed to self-administer their assigned treatments at home. Second, gender-based analysis was not performed since most participants were females. Third, related factors that could not be controlled. For example, living environmental, routine systemic medication used, electronical device use, and air-pollution.

Future studies should minimize confounding factors by recruiting more specific sample groups of volunteers with similar lifestyles during the same time period. Moreover, future studies should consider developing a recording process to record medicine intake and related condition, including the tear film and ocular surface society list, dry eye workshop II (TFOS DEWII), and iatrogenic report.

Conclusion

The Seven Steps of Thai Facial Massage (Thai yoga) and Chinese eye exercises (Chinese acupressure) demonstrated the ability to improve tear quality and secretion without any adverse side effects and effective self-administered. Therefore, it may use as alternative treatments to standard lid hygiene to alleviate DED symptom.

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Conflict of Interests

The authors have no conflicts of interest to declare.

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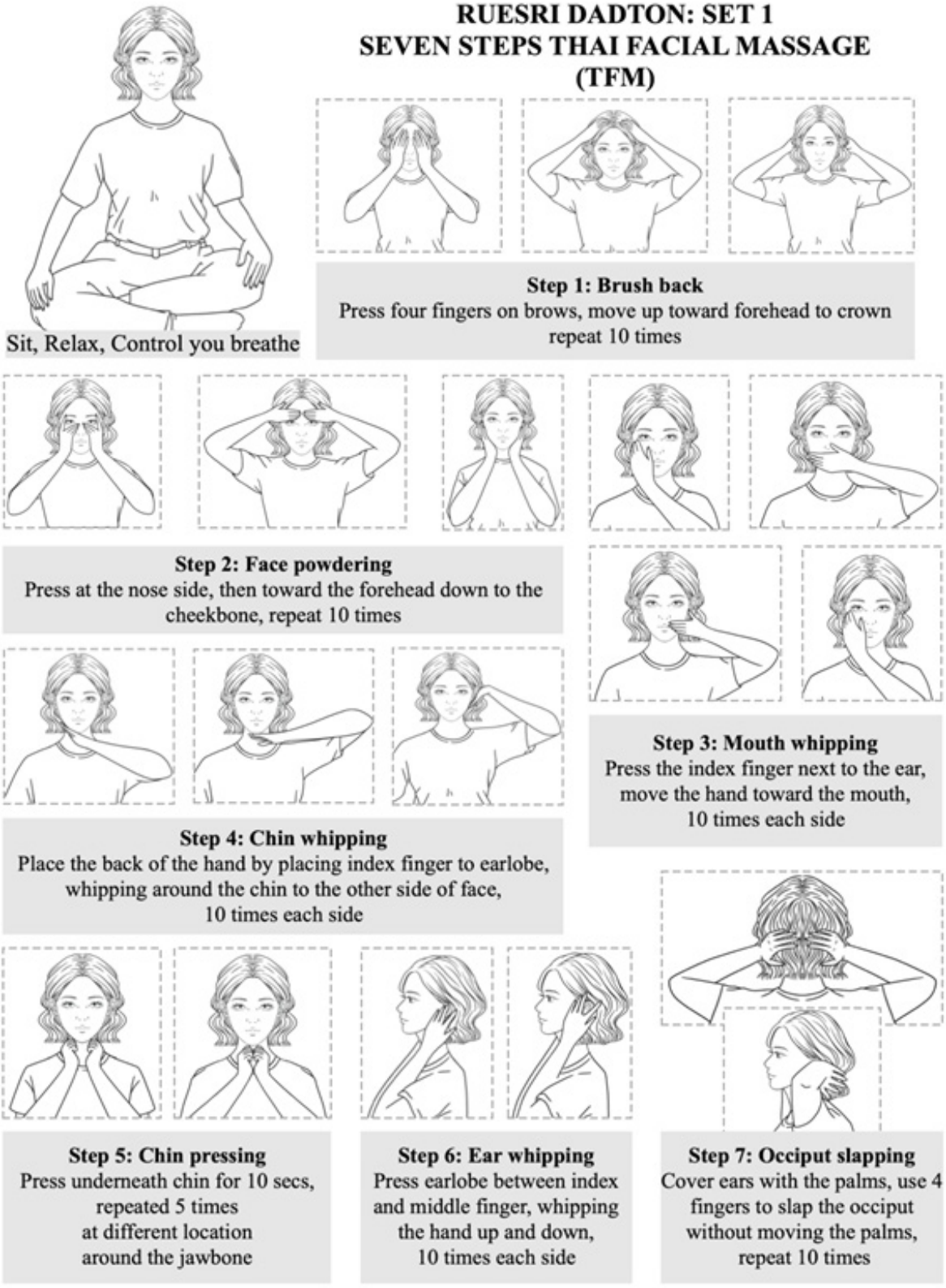
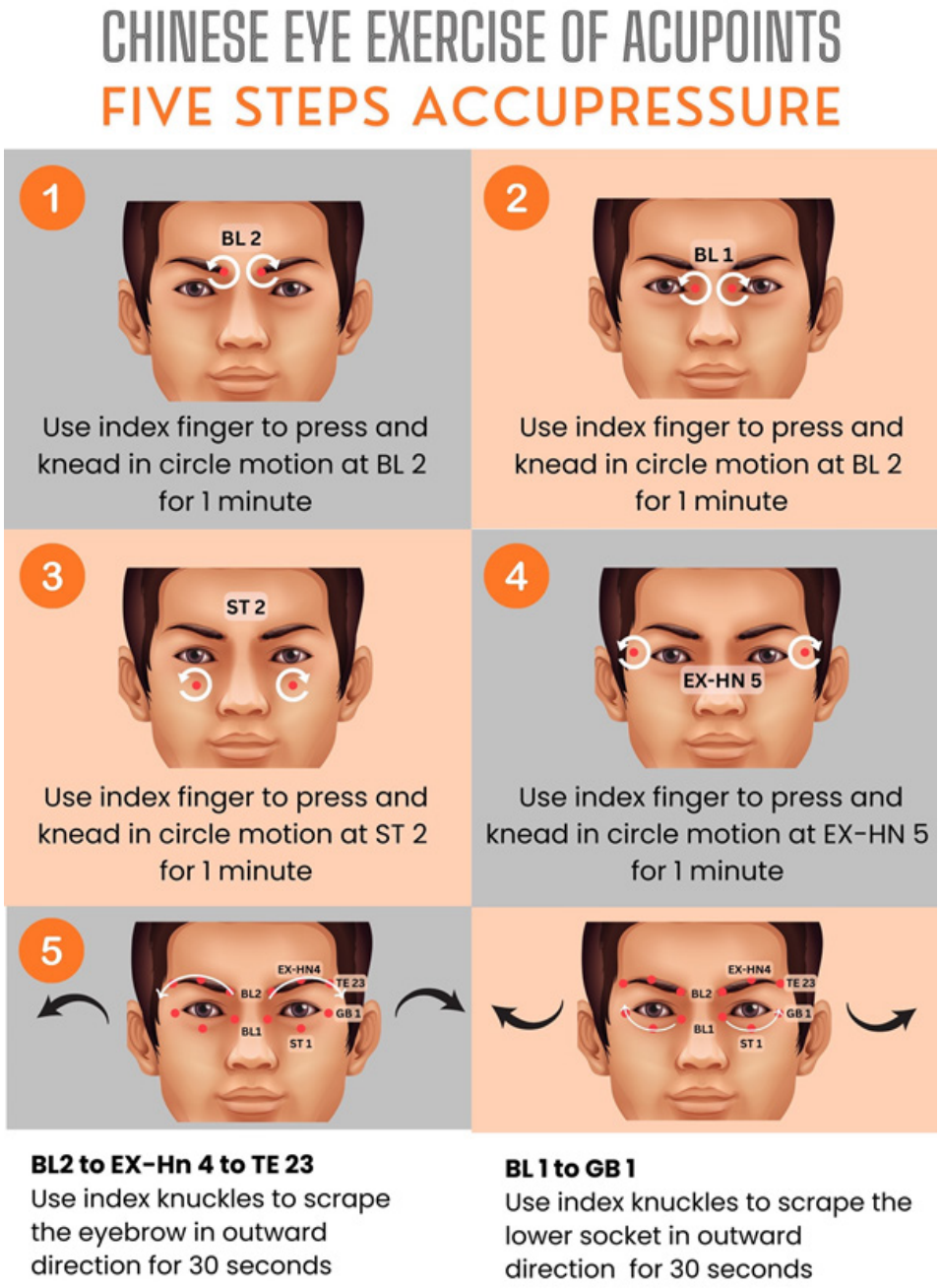

RUESRI DADTON: SET 1
SEVEN STEPS THAI FACIAL MASSAGE
(TFM)
Sit, Relax, Control you breathe
Step 1: Brush back
Press four fingers on brows, move up toward forehead to crown
repeat 10 times
Step 2: Face powdering
Press at the nose side, then toward the forehead down to the
cheekbone, repeat 10 times
Step 3: Mouth whipping
Press the index finger next to the ear,
move the hand toward the mouth,
10 times each side
Step 4: Chin whipping
Place the back of the hand by placing index finger to earlobe,
whipping around the chin to the other side of face,
10 times each side
Step 5: Chin pressing
Press underneath chin for 10 secs,
repeated 5 times
at different location
around the jawbone
Step 6: Ear whipping
Press earlobe between index
and middle finger, whipping
the hand up and down,
10 times each side
Step 7: Occiput slapping
Cover ears with the palms, use 4
fingers to slap the occiput
without moving the palms,
repeat 10 times



References

[1] The definition and classification of dry eye disease: report of the Definition and Classification Subcommittee of the International Dry Eye WorkShop (2007). Ocul Surf 2007;5:75-92.

[2] Asbell PA, Lemp MA. Dry Eye Disease The Clinician's Guide to Diagnosis and Treatment. China: Thieme Medical Publishers 2006; p 215.

[3] Fiscella RG. Understanding dry eye disease: a managed care perspective. Am J Manag Care 2011;17 Suppl 16:S432-439.

[4] Tsubota K, Yokoi N, Watanabe H, Dogru M, Kojima T, et al. A new perspective on dry eye classification: proposal by the asia dry eye society. Eye Contact Lens 2020;46 Suppl 1(1):S2-S13.

[5] Prescott CR. Increased screen time and dry eye: another complication of COVID-19. Eye Contact Lens 2021;47:433.

[6] Bowling B. Dry eye. Kanski Clinical Ophthalmology. 8th ed. Elsevier. China 2016; pp 118-129.

[7] Jones L, Downie LE, Korb D, Benitez-Del-Castillo JM, Dana R, et al. TFOS DEWS II management and therapy report. Ocul Surf 2017;15:575-628.

[8] Rouen PA, White ML. Dry eye disease: prevalence, assessment, and management. Home Healthc Now 2018;36:74-83.

[9] Findlay Q, Reid K. Dry eye disease: when to treat and when to refer. Aust Prescr 2018;41:160-163.

[10] McCusker MM, Durrani K, Payette MJ, Suchecki J. An eye on nutrition: The role of vitamins, essential fatty acids, and antioxidants in age-related macular degeneration, dry eye syndrome, and cataract. Clin Dermatol 2016;34:276-285.

[11] Reyhani M, Aghamollaei H, Jadidi K, Barzegar A. Herb-

al-based drugs for dry eye; treatment and adverse reaction. Indian J Tradit Know 2021;20:33-40.
[12] Rapata MEJ, Meyer JJ. Evaluation of online information on complementary and alternative treatments for dry eye disease. Optom Vis Sci 2021;98:355-361.
[13] Na JH, Jung JH, Park JG, Song PH, Song CH. Therapeutic effects of acupuncture in typical dry eye: a systematic review and meta-analysis. Acta Ophthalmol 2021;99:489-498.
[14] Kim TH, Kang JW, Kim KH, Kang KW, Shin MS, et al. Acupuncture for the treatment of dry eye: a multicenter randomised controlled trial with active comparison intervention (artificial teardrops). PLoS One 2012;7:e36638.
[15] Dhaliwal DK, Zhou S, Samudre SS, Lo NJ, Rhee MK. Acupuncture and dry eye: current perspectives. A double-blinded randomized controlled trial and review of the literature. Clin Ophthalmol 2019;13:731.
[16] Yang L, Yang Z, Yu H, Song H. Acupuncture therapy is more effective than artificial tears for dry eye syndrome: evidence based on a meta-analysis. Evid Based Complement Alternat Med 2015;2015:143858.
[17] Li SM, Kang MT, Peng XX, Li SY, Wang Y, et al. Efficacy of Chinese eye exercises on reducing accommodative lag in school-aged children: a randomized controlled trial. PLoS One 2015;10:e0117552.
[18] Liang YB, Vasudevan B, Lin Z, Zhou HJ, Ciuffreda KJ. The effect of eye exercises of acupoints on myopia progression: a 3-year cohort report from the Beijing Myopia progression study. Risk Manag Healthc Policy 2020;13:2793-2799.
[19] Lin Z, Vasudevan B, Jhanji V, Gao TY, Wang NL, et al. Eye exercises of acupoints: their impact on refractive error and visual symptoms in Chinese urban children. BMC complement Alternat Med 2013;13:1-9.
[20] Lin Z, Vasudevan B, Fang SJ, Jhanji V, Mao GY, et al. Eye exercises of acupoints: their impact on myopia and visual symptoms in Chinese rural children. BMC Complement Altern Med 2016;16:349.
[21] Department of Thai Traditional and Alternative Medicine. Ruesi Dadton, Exercise for a healthy life: 15 basic Thai hermit exercises. Bangkok: Post publishing 2013; p 74.
[22] Corsi E. Traditional Thai Yoga: The Postures and Healing Practices of Ruesri Dat Ton. Simon and Schuster 2008; p 192.
[23] Thanasilungkoon B, Niempoog S, Sriyakul K, Tungsukruethai P, Kamalashiran C, et al. The efficacy of ruesi dadton and yoga on reducing neck and shoulder pain in office workers. Int J Exerc Sci 2023;16:1113-1130.
[24] Sawangwong P, Tungsukruthai S, Nootim P, Sriyakul K, Phetkate P, et al. The effects of 12-week traditional thai exercise (Ruesi Dadton) on glycemic control and inflammatory markers in prediabetes: a randomized controlled trial. Life 2023;13:2166.
[25] Khanthong P, Natason A, Dechakhamphu A. Benefit of ruesi dadton on oxidative stress and physical performance: quasi-experimental study. Phys Occup Ther Geriatrics 2022;40:79-93.
[26] Buranruk O, Grow S, Ladawan S, Makarawate P, Suwanich T, et al. Thai Yoga as an appropriate alternative physical activity for older adults. Journal of Complementary and Integrative Medicine. 2010;7.
[27] Ngowsiri K, Tanmahasamut P, Sukonthasab S. Rusie Dutton traditional Thai exercise promotes health related physical fitness and quality of life in menopausal women. Complement Ther Clin Pract 2014;20:164-171.
[28] Lin YH, Wu HC, Hsieh PC, Tzeng IS, Wu SY, et al. An Association rule analysis of combined acupoints for the treatment of patients with dry eye disease. Complement Med Res 2021;28:317-324.
[29] Stapleton F, Alves M, Bunya VY, Jalbert I, Lekhanont K, et al. TFOS DEWS II epidemiology report. Ocul Surf 2017;15:334-365.
[30] Kim M-K, Yoon H-M, Jung H-M. The effects of self-acupressure on the visual health of college students. J Acupunct Res 2012;29:39-50.
[31] Miller KL, Walt JG, Mink DR, Satram-Hoang S, Wilson SE, et al. Minimal clinically important difference for the ocular surface disease index. Arch Ophthalmol 2010;128:94-101.
[32] Midorikawa-Inomata A, Inomata T, Nojiri S, Nakamura M, Iwagami M, et al. Reliability and validity of the japanese version of the ocular surface disease index for dry eye disease. BMJ Open 2019;9:e033940.
[33] Ozcura F, Aydin S, Helvaci MR. Ocular surface disease index for the diagnosis of dry eye syndrome. Ocul Immunol Inflamm 2007;15:389-393.
[34] Di D, Cai S-H, Chen W, Yuan Z-C, Wang Z, et al. Schirmer paper tear sampling of human eye diseases for paper spray mass spectrometry analysis. Int J Mass Spectrom 2021;469:116689.
[35] Paugh JR, Tse J, Nguyen T, Sasai A, Chen E, et al. Efficacy of the fluorescein tear breakup time test in dry eye. Cornea 2020;39:92-98.
[36] Xue AL, Downie LE, Ormonde SE, Craig JP. A comparison of the self-reported dry eye practices of New Zealand optometrists and ophthalmologists. Ophthalmic Physiol Opt 2017;37:191-201.
[37] Bron AJ, Evans VE, Smith JA. Grading of corneal and conjunctival staining in the context of other dry eye tests. Cornea 2003;22:640-650.
[38] Kim JH, Jo E, Ryu S, Nam S, Song S, et al. A deep learning ensemble method to visual acuity measurement using fundus images. Appl Sci 2022;12:3190.
[39] Murakami DK, Blackie CA, Korb DR. All warm compresses are not equally efficacious. Optom Vis Sci 2015;92:e327-333.
[40] He K. Traditional Chinese and Thai medicine in a comparative perspective. Complement Ther Med 2015;23:821-826.
[41] Corsi E, Fanfani E. Traditional Thai yoga : the postures and healing practices of Ruesri dat ton. Vermont. Healing Arts Press. USA 2008.
[42] Khanthong P, Sriyakul K, Dechakhamphu A, Krajarng A, Kamalashiran C, et al. Traditional Thai exercise (Ruesi Dadton) for improving motor and cognitive functions in mild cognitive impairment: a randomized controlled trial. J Exerc Rehabil 2021;17:331-338.
[43] Gomes JAP, Santo RM. The impact of dry eye disease treatment on patient satisfaction and quality of life: A review. The Ocular Surface 2019;17:9-19.
[44] Field T. Massage therapy research review. Complement Ther Clin Pract 2016;24:19-31.
[45] Pazhaniappan N. The Trigeminal Nerve (CN V): Teachmeanatomy; 2020 [updated 15 August 2020. Available from: https://teachmeanatomy.info/head/cranial-nerves/trigeminal-nerve/.
[46] Mehta P, Dhapte V, Kadam S, Dhapte V. Contemporary acupressure therapy: Adroit cure for painless recovery of therapeutic ailments. J Tradit Complement Med 2017;7:251-263.
[47] Chen JM, Lu ZN, Wu RW, Bi KW, Liu CT. Effect of self-acupressure on middle ear barotrauma associated with hyperbar-

ic oxygen therapy: A nonrandomized clinical trial. Medicine (Baltimore). 2021;100:e25674.
[48] Walker HK. Cranial Nerve V: The Trigeminal Nerve. Clinical Methods: The History, Physical, and Laboratory Examinations. Boston: Butterworths; 1990.
[49] Yu MD, Park JK, Kossler AL. Stimulating tear production: spotlight on neurostimulation. Clin Ophthalmol 2021;15:4219-4226.
[50] Wang MTM, Liu LJ, McPherson RD, Fuller JR, Craig JP. Therapeutic profile of a latent heat eyelid warming device with temperature setting variation. Cont Lens Anterior Eye 2020;43:173-177.
[51] Daruwalla Z, Vukicevic M, Koklanis K, Jaross N. Treating dry eye disease in an orthoptic-led ophthalmology clinic. Austr Orthopt J 2021;53:40-47.
[52] Jeon J, Park S. Comparison of the efficacy of eyelid warming masks and artificial tears for dry eye symptoms in contact lens wearers. Cont Lens Anterior Eye 2021;44:30-34.
[53] Treewipanon N, Kasetsuwan N, Reinprayoon U, Satitpitakul V, Uthaithammarat L, et al. Efficacy of interleukin-1β inhibitor on dry eye disease in patients with degenerative arthritis. Clin Ophthalmol 2023;17:2967-2974.
[54] Pflugfelder SC, de Paiva CS. The pathophysiology of dry eye disease: what we know and future directions for research. Ophthalmology 2017;124:S4-S13.
[55] Zhang X, Zhang B, Peng S, Zhang G, Ma J, et al. Effectiveness of acupuncture at acupoint BL1 (Jingming) in comparison with artificial tears for moderate to severe dry eye disease: a randomized controlled trial. Trials 2022;23:605.
[56] Huang Q, Zhan M, Hu Z. Auricular acupressure for dry eye disease: a systematic review and meta-analysis of randomized controlled trials. Medicina 2023;59:177.