

Effects of Emotion Freedom Techniques on Academic Stress in Korean Medical Students: A Single-Group Pre-Post Study

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Objectives: Academic stress poses a significant risk for the mental health of medical students, and a feasible group intervention program for managing academic stress is required. The purpose of this study was to examine the clinical effectiveness of emotional freedom techniques (EFT) on the mental health of Korean medical students.

Methods: The class of first-year medical school students (n=36) participated in an after-school EFT group intervention program comprising six sessions (15 minutes/session, three weeks) to analyze its clinical effectiveness as a single-group test-retest clinical study. The changes in the Perceived Stress Scale (PSS), Test Anxiety Inventory (TAI), Positive and Negative Affect Schedule (PANAS), and State-Trait Anxiety Inventory (STAI) scores were examined using a paired t-test and Cohen's D at post-EFT and two-week follow-up.

Results: There were significant curtailments at post-EFT and follow-up measures in TAI-Total (t=2.704 and t=3.289), TAI-Worry (t=2.297 and t=2.454), TAI-Emotionality (t=2.763 and t=3.654), PSS-Negative Perspective (t=2.659 and t=3.877), and PANAS-Negative Affect (t=2.885 and t=3.259) subscales, however not in PSS-Positive Perspective (t=-1.279 and t=-1.101) and PANAS-Positive Affect (t=0.194 and t=-0.122) subscales. The trait anxiety (t=2.227) was significantly mitigated in the post-EFT measure and the state anxiety (t=2.30) in the follow-up measure.

Conclusions: The EFT group intervention alleviated test stress, negative affect, and anxiety in the Korean medical students. This study contributes to an understanding of academic stress and EFT intervention in the competitive environment of medical education.

Key Words: Emotional freedom techniques, Medical student, Academic stress, Test anxiety, Mental health.



I. INTRODUCTION

Medical students experience higher academic stress and lower quality of life than college students from other disciplines^{1,2}. The majority of medical students attribute them to an overwhelming volume of learning to be completed in a short time, frequent examinations, concerns regarding one's academic grades, and fear of grade retention³⁻⁶. The academic stress of medical students is known to be related to doctor-patient relationship and quality of clinical practice as well as frequent experiences of depression, anxiety, obsessive-compulsive disorder, interpersonal sensitivity, and lowered immune functions^{5,7}.

A negative effect from academic stress was commonly noted in first-year medical students^{6,8}. The first-year of medical school is a pivotal period for students to adapt to the competitive field of medical education. The coping ability with academic stress during this period is crucial for managing mental health and attaining academic achievement¹.

Some relevant studies^{9,10} reported that substantial number of medical students consumed psychotropic drugs such as anxiolytic and antidepressant to mitigate anxiety, depression, and insomnia due to academic stress. However, psychotropic drugs are not helpful in improving coping ability to academic stress, have many adverse effects such as dependency and rebound symptoms after discontinuation, sexual dysfunction, weight gain, and sleep disturbance^{11,12}.

Previous studies¹³⁻¹⁶ have reported non-pharmacological intervention such as cognitive behavior therapy, acceptance-based behavior therapy, and mindfulness and breathing meditation as effective interventions for managing academic stress.

However, There are difficulties in the implementation of cognitive behavior therapy, such as the lack of trained practitioners, and the lack of participants' treatment beliefs, motivation, and time^{17,18}. Similarly,

performing mindfulness meditation also presents challenges such as cognitive and physical problems during meditation sessions, doubts about the efficacy of meditation and self-efficacy, and difficulty finding time and motivation to meditate outside of class hours¹⁹.

Therefore, we need a effective, safe, less time-consuming, easy to learn and practicable by themselves on a day-to-day basis. The Emotional Freedom Techniques (EFT) are easy to learn and practice without specific preparation and apparatus, and useful for managing the psychological distress given its safe, effective, self-help, and non-invasive nature²⁰⁻²².

EFT was proposed as psychological acupuncture or acupoint-based energy psychology protocols by the Basic Recipe of Craig, the founder of EFT²³⁻²⁵. The acupoint tapping has been shown to stimulate meridian circulation or life energy and to clear emotional problems and painful memories^{23,25}. The evidence for its clinical effects was stated with discussions about the mechanism of action and mechanistic reframing^{23,26}. The self-care technique of EFT is reported to increase the secretion of opioids, serotonin, and gamma-aminobutyric acid, and to decrease the stress hormone of cortisol²⁶⁻²⁹, thus leading to epigenetic³⁰ and neurochemical changes³¹.

Moreover, systematic reviews regarding anxiety, and depression, post-traumatic stress disorder (PTSD), qualitative study for chronic diseases, and randomized controlled trials on Hwabyung, phobia, insomnia, pediatric anxiety and depression, and food craving have shown the clinical usefulness of EFT in clinics^{20,31-39}. EFT was registered as 'New Health Technology' by the National Evidence-based Healthcare Collaborating Agency of Korea in 2019 for the recognition of its safety and effectiveness for PTSD⁴⁰. EFT was also mentioned as the promising therapy combining somatic and cognitive perspectives for the adult PTSD in the National Institute for Health and Care Excellence of U.K.⁴¹.

Previous studies supported the idea that EFT intervention successfully reduced the test anxiety in high school and college students^{42,43} and perceived stress and state- and trait-anxiety in nursing students⁴⁴. Thus, EFT might be useful for medical students to manage the academic distress.

The present study was designed as a single-group pre-post clinical study to analyze the clinical effectiveness of EFT group intervention program on academic stress in Korean medical students during the first semester of their first-year using psychological measures for establishing regular educational program. Previous studies demonstrated the efficacy of EFT with brief interventions^{38,45}, which is an acceptable group therapy with equivalent efficacy as conventional treatments⁴⁶. Therefore, we hypothesized that EFT program might improve the mental health of medical students by reducing anxiety, negative affect, and perceived stress and increasing positive affect which were not attested in medical students of Korea.

II. METHODS

1. Participants and procedures

This study was carried out to analyze the effectiveness of EFT as a group intervention for ameliorating academic stress in medical students as a single-group pre-post study. A class of first-year students (n=49) attending classes of the School of Korean Medicine was invited to participate, and those who were on leave of absence or were participating in other clinical studies were excluded. This study was approved by Institutional Review Board of Pusan National University (PNU IRB/2017_17_HR) before recruitment, and the study was registered in Clinical Research Information Service of Korea with the registration number of KCT0004948. The participants provided informed written consent after hearing the

purpose and procedures of this study and agreeing to participate.

The current EFT group intervention program was composed of an EFT program education for three weeks (7th~9th week) and follow-up for two weeks (10th and 11th week) during the first semester (total of 18 weeks) of the first-year. The baseline and post-EFT measures were implemented before and after the three-week EFT program, and the follow-up measure was recorded after a two-week follow-up as shown in Fig. 1.

There were five examinations during the current EFT program and two examinations during the follow-up period including anatomy, medical physiology, and medical terminology. The first-year medical students usually take one or two examinations per week during the semester.

2. EFT group intervention program

The EFT group intervention used in this study was developed as a brief therapy considering the busy schedule of medical students using the Basic Recipe of Craig's EFT manual²⁵, and was a self-training program with a supplementary leaflet to aid easy learning and self-care for managing academic stress.

This EFT group intervention program comprised of six sessions (15 minutes, every Tuesday and Thursday) for three weeks (7th~9th week of the first semester), as shown in Fig. 1. The program was conducted during the after-school hours by a clinical specialist and a resident of neuropsychiatry (JHL and SWL) who completed the eight-hour EFT training workshop course.

The procedure of the current EFT group intervention program is shown in Fig. 2.

The program consisted of three phases as follows: the preparation phase (steps 1 and 2), main phase (steps 3~7), and closing phase (step 8). During the preparation phase, the participants identified psy-

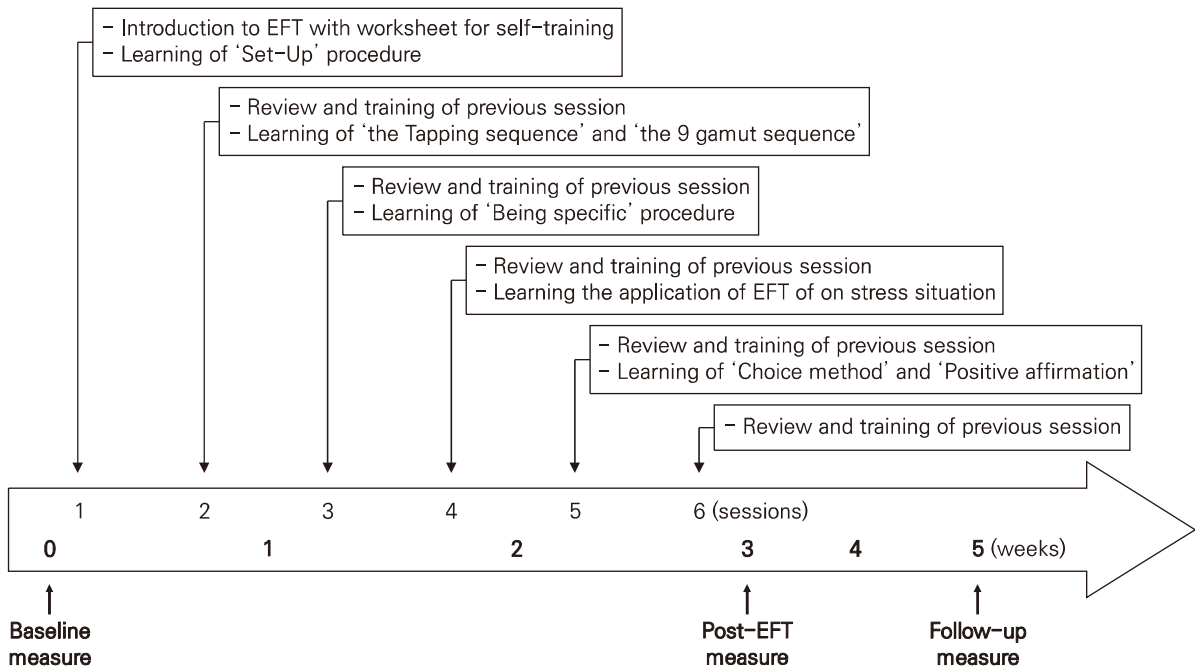


Fig. 1. Schematic illustration of the current EFT group intervention program.

Overall procedure of emotional freedom techniques

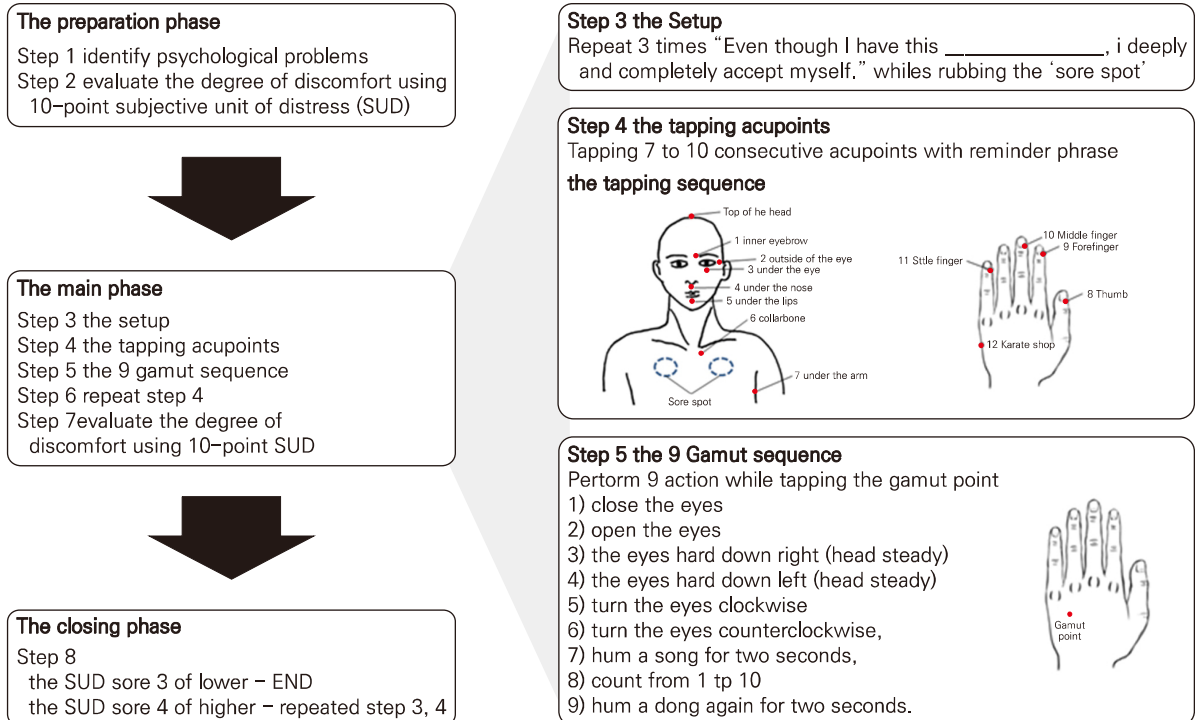


Fig. 2. Procedure of the current EFT group intervention program.

chological problems to be solved (step 1) and evaluated their degree of discomfort using a 10-point subjective unit of distress (SUD) scale (step 2).

The main phase began with constructing a customized Setup Statement (SS), such as “Even though I have this _____, I deeply and completely accept myself.” The participants read their SS three times while rubbing the ‘sore spot’ on the chest below the collar bone (step 3, the Setup). The participants performed 7 to 10 consecutive acupoint tapping on their head (top of the head, inner eyebrow, outside of the eye, under the eye, under the nose, and under the lip), chest (collarbone, and under the arm), and hand (tip of fingers except for the ring finger, and karate chop point) using the reminder statement fitted to the status of the participant (step 4, the tapping sequence).

Moreover, the participants continued the 9 Gamut Sequence while tapping on the gamut point on the back of the hand (step 5). The 9 Gamut Sequence with the following order was performed as follows: 1) close the eyes, 2) open the eyes, 3) move the eyes hard down right while holding the head steady, 4) move the eyes hard down left while holding the head steady, 5) turn the eyes clockwise, 6) turn the eyes counterclockwise, 7) hum a song for two seconds, 8) count rapidly from 1 to 10, 9) hum a song again for two seconds.

After that, the previous tapping sequence of step 4 was repeated once more (step 6). At the end of the main phase, the change of discomfort was measured again using the SUD scale after two deep breaths (step 7).

The closing phase (step 8) ended when the SUD score of step 7 was 3 or lower. However, when the SUD of step 7 was 4 or higher, the participants repeated the Setup (step 3) and the tapping sequence (step 4), and the remaining discomfort was measured with the modified SS of “Even though I still have

some of this _____, I deeply and completely accept myself.” (step 7).

3. Measurements method of mental health

1) Test Anxiety Inventory

The Korean version of Test Anxiety Inventory (TAI), originally developed by Spielberger, measures anxiety proneness in evaluation situations and examinations, and has two subscales of TAI-Worry (TAI-W, 10 items) for the cognitive perspective of test anxiety and TAI-Emotionality (TAI-E, 10 items) for its outward expression⁴⁷⁾.

The TAI-W refers to excessive concern and pre-occupation regarding examination outcomes including its failure, whereas TAI-E refers to affective and behavioral reactions or external responses caused by evaluation situations. In addition, the TAI-Total as the sum of TAI-W and TAI-E scores is an overall cognitive, affective, and behavioral reaction to the test situation⁴⁸⁾.

It uses a 5-point Likert scale from ‘not at all’ (1) to ‘very much’ (5), and a higher score represents higher test anxiety. The internal consistencies using Cronbach’s alpha of TAI-Total, TAI-W, and TAI-E were 0.93, 0.89, and 0.85, respectively.

2) Perceived Stress Scale

The Perceived Stress Scale (PSS) established by Cohen assesses the degree to which a person perceives or appraises their life as stressful, and the frequency of a person recognizing their life as uncontrollable, unpredictable, and overloaded in the previous month⁴⁹⁾.

The Korean version of PSS comprises two perspectives: the presence of a negative perspective (PSS-Neg, six items) and the absence of a positive perspective (PSS-Pos, four items as reverse coding)⁵⁰⁾. The PSS-Neg comprises items reflecting maladaptive

symptoms and perceived helplessness, whereas PSS-Pos comprises items reflecting coping ability and self-efficacy⁵¹. A high score on the PSS-total, a sum of PSS-Neg and PSS-Pos, represents a high level of stress in psychological and physical perspectives.

The PSS requires respondents to evaluate their feelings and recognition during the previous month using a 5-point Likert scale from 'not at all' (0) to 'very often' (4). The internal consistencies using Cronbach's alpha of PSS, PSS-Pos, and PSS-Neg were 0.87, 0.82, and 0.81, respectively.

3) Positive Affect and Negative Affect Schedule

The Positive Affect and Negative Affect Schedule (PANAS) of Watson was used in this study to measure the influence of stress from positive and negative perspectives⁵². The Korean version of PANAS has two independent subscales: Positive Affect (PANAS-PA, nine items) with attentive, active, excited, enthusiastic, determined, inspired, proud, interested, and strong characteristics and Negative Affect (PANAS-NA, 11 items) with hostile, irritable, ashamed, guilty, distressed, upset, scared, afraid, jittery, nervous, and alert characteristics.

Each item of PANAS was rated using a 5-point Likert scale from 'not at all' (0) to 'very much so' (4) as for the affects during the last week. The internal consistencies using Cronbach's alpha of PANAS-PA and PANAS-NA were 0.82 and 0.89, respectively.

4) State-Trait Anxiety Inventory

General anxiety of the students was measured using the State-Trait Anxiety Inventory (STAI) developed by Spielberger, which has two subscales of State Anxiety (STAI-S) and Trait Anxiety (STAI-T). The STAI-S (20 items) refers to the current arousal of the autonomic nervous system from a specific situation with feelings of nervousness, discomfort, and fear, whereas the STAI-T (20 items) denotes general anxiety

across typical situations with feelings of stress, discomfort, and stress experienced daily⁵³.

A high STAI score represents high anxiety with a specific event and/or anxious characteristics of a person. The Korean version STAI uses a 4-point Likert scale from 'not at all' (0) to 'very much' (4), and the internal consistencies using Cronbach's alpha of STAI-S and STAI-T were 0.95 and 0.93, respectively.

4. Statistical analysis

The internal consistencies of TAI, PSS, PANAS, and STAI measures at baseline were analyzed using Cronbach's alpha. The significant differences in TAI, PSS, PANAS, and STAI between male and female participants at baseline were examined using the independent t-test. The correlations among TAI, PSS, PANAS, and STAI at baseline were analyzed using Pearson's correlation.

The paired t-test was used to examine significant changes in the post-EFT intervention and the two-week follow-up measures compared to the baseline measures of TAI, PSS, PANAS, and STAI (Fig. 1). The effect size of the EFT intervention on TAI, PSS, PANAS, and STAI at post-EFT and follow-up, compared to that at baseline, was shown with Cohen's D. Since there were significant differences between male and female participants in age, the clinical effectiveness of EFT intervention were also examined in male and female students, respectively.

Data were shown as mean and standard deviation or frequency (%), and the statistical significance was examined at the level of 0.05, 0.01, and 0.001. The statistical analysis was done by IBM SPSS Statistics 23.0 (IBM, Armonk, New York).

III. RESULTS

1. Demographic features of the participants

A class of first-year students (n=49) at the School

of Korean Medicine was invited to participate in the EFT group intervention program, and there were three measures of baseline, post-EFT intervention, and two-week follow-up (Fig. 1). Data from 36 participants were included in the analysis (Fig. 3) since there were 13 drop-outs from lack of practice (n=2), incomplete post-EFT measure (n=4), incomplete fol-

low-up measure (n=1), measures with lost item responses (n=5), and insincere responses marking the same number of questionnaire items (n=1).

Table 1 shows the demographic features of 18 (50%) male and 18 (50%) female students included in the analysis. The mean age of the male students (29.44 ± 3.63) was significantly higher ($t=2.286, p=0.029$)

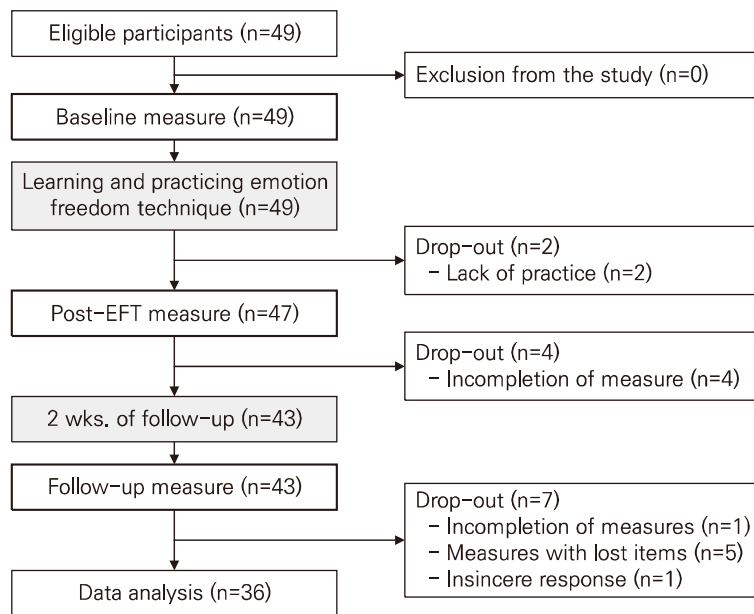


Fig. 3. Flow of procedure for the recruitment, EFT intervention and follow-up.

Table 1. Demographic Features of the Participants in the Current Study

	Male (n=18)	Female (n=18)	Total (n=36)	Statistical analysis
Age*	29.44±3.63	26.72±3.51	28.08±3.78	
Education				
Bachelor	18 (100)	15 (83.3)	33 (91.7)	
Master	0 (0)	3 (16.7)	3 (8.3)	
TAI-Total	39.67±13.51	47.50±13.54	43.58±13.91	t=-1.738, p=0.091
TAI-W	20.50±7.62	24.39±7.22	22.44±7.58	t=-1.572, p=0.125
TAI-E	19.17±6.07	23.11±6.91	21.14±6.72	t=-1.819, p=0.078
PSS-Total	19.72±6.23	20.44±5.81	20.08±5.95	t=-0.36, p=0.721
PSS-Pos	8.61±2.83	8.00±2.43	8.31±2.62	t=0.695, p=0.492
PSS-Neg	12.33±4.31	12.44±3.63	12.39±3.93	t=-0.084, p=0.934
PANAS-PA	17.33±6.63	15.11±6.06	16.22±6.36	t=1.05, p=0.301
PANAS-NA	18.00±8.92	17.11±9.53	17.56±9.11	t=0.289, p=0.774
STAI-S	44.44±10.65	46.89±12.09	45.67±11.3	t=-0.644, p=0.524
STAI-T	40.67±10.84	44.94±10.78	42.81±10.87	t=-1.187, p=0.243

TAI: Test Anxiety Inventory, TAI-W: TAI-Worry, TAI-E: TAI-Emotionality, PSS: Perceived Stress Scale, PSS-Pos: PSS-Positive Perspective, PSS-Neg: PSS-Negative Perspective, PANAS: Positive Affect and Negative Affect Schedule, PANAS-PA: PANAS-Positive Affect, PANAS-NA: PANAS-Negative Affect, STAI: State and Trait Anxiety Inventory, STAI-S: STAI-State, STAI-T: STAI-Trait.

*p<0.05.

than that of female students (26.72±3.51), however there were no significant (p=0.229) differences in the education level.

2. Correlation between measures of TAI, PSS, PANAS, and STAI

The results of the correlation analysis confirmed a significant correlation between the TAI, PSS, PANAS, and STAI subscales as shown in Table 2.

The TAI-Total score had a significant correlation with STAI-T (r=0.550, p<0.01), but not with STAI-S (r=0.289, ns.), which may show that the test anxiety in medical school is more general anxiety in a typical situation, instead of nervousness related to a specific situation. The TAI-W score revealed a significant correlation with STAI-T (r=0.595, p<0.01) and STAI-S (r=0.337, p<0.05), which may indicate that the cognitive perspective of test anxiety for medical students includes the feeling of discomfort, nervousness, and fear. However, the TAI-E score indicated a significant correlation with STAI-T (r=0.469, p<0.01), but not with STAI-S (r=0.217, ns.), which may indicate that the external affective and behavioral responses of medical students are related to the general feeling of stress and discomfort.

The PSS-Total score had a significant correlation

with TAI-Total (r=0.393, p<0.05), PANAS-PA (r=-0.423, p<0.05), PANAS-NA (r=0.617, p<0.01), STAI-S (r=0.696, p<0.01), and STAI-T (r=0.601, p<0.01).

Interestingly, the PANAS showed complex and multi-faceted correlations with other measures of mental health. The PANAS-NA score has significant positive correlations with TAI-Total (r=0.365, p<0.05), PSS-Total (r=0.617, p<0.01), STAI-S (r=0.540, p<0.01), and STAI-T (r=0.483, p<0.01), which may represent the usefulness of PANAS-NA for measuring autonomic nervous system arousal and increased general anxiety from the elevated level of perceived academic and test stress. However, the PANAS-PA score showed negative correlations with PSS-Total (r=-0.423, p<0.05) and STAI-T (r=-0.362, p<0.05) and no significant correlation with TAI-Total (r=0.014, ns.) and STAI-S (r=-0.278, ns). These results might indicate that the PANAS-PA represents a good adaptational status and a low general feeling of anxiety and has no relation to test anxiety and related nervousness. There were no significant correlations (r=0.106, ns) between PANAS-NA and PANAS-PA, as expected.

Table 2. Correlation Coefficients among TAI, PSS, PANAS and STAI Scores at Baseline Measure

	1	2	3	4	5	6	7	8	9
1 TAI-Total									
2 TAI-W	.976**								
3 TAI-E	.970**	.893**							
4 PSS-Total	.393*	.399*	.364*						
5 PSS-Pos	.373*	.390*	.331*	.861**					
6 PSS-Neg	.347*	.343*	.331*	.941**	.637**				
7 PANAS-PA	0.014	-0.026	0.059	-.423*	-.439**	-.348*			
8 PANAS-NA	.365*	.358*	.352*	.617**	.460**	.627**	0.106		
9 STAI-S	0.289	.337*	0.217	.696**	.617**	.643**	-0.278	.540**	
10 STAI-T	.550**	.595**	.469**	.601**	.633**	.489**	-.362*	.483**	.703**

TAI: Test Anxiety Inventory, TAI-W: TAI-Worry, TAI-E: TAI-Emotionality, PSS: Perceived Stress Scale, PSS-Pos: PSS-Positive Perspective, PSS-Neg: PSS-Negative Perspective, PANAS: Positive Affect and Negative Affect Schedule, PANAS-PA: PANAS-Positive Affect, PANAS-NA: PANAS-Negative Affect, STAI: State and Trait Anxiety Inventory, STAI-S: STAI-State, STAI-T: STAI-Trait.

Bold represents correlation coefficient more than 0.4.

*p<0.05, **p<0.01.

3. Changes in TAI, PSS, PANAS, and STAI scores after the EFT group intervention program

Changes in TAI, PSS, PANAS, and STAI scores at the post-EFT and follow-up measures were examined in comparison with the baseline measures using a paired t-test and demonstrated with Cohen's D. The subscale scores of TAI, PSS, PANAS, and STAI at baseline, post-EFT, and follow-up measures were shown in Table 3.

The TAI-Total, TAI-W, and TAI-E measures showed significant reductions at post-EFT ($t=2.704$, $t=2.297$, and $t=2.763$, respectively) and follow-up ($t=3.289$, $t=2.454$, and $t=3.654$, respectively) measures compared to the baseline measure, and these results maintained after 2 weeks, indicating a substantial reduction in cognitive worry from the test situation and its behavioral and affective expressions caused by the EFT group intervention. The effect size of the EFT intervention program on TAI-Total, TAI-W, and TAI-E was found to be apparent ($D>0.35$) in the current study.

As for the PSS and PANAS, the measures after the EFT group intervention showed a significant decrease

in the negative perspectives of PSS-Neg ($t=2.659$ and $t=3.877$) and PANAS-NA ($t=2.885$ and $t=3.259$) at post-EFT and follow-up measures, but not in PSS-Pos ($t=-1.279$ and $t=-1.101$) and PANAS-PA ($t=0.194$ and $t=-0.122$). The effect size of the EFT intervention program on PSS-Neg and PANAS-NA was found to be apparent ($D>0.35$), but not on PSS-Pos and PANAS-PA in the current study. These results may indicate that EFT intervention led to a reduction in autonomic nervous system arousal and general anxiety from the elevated level of perceived academic and test stress, whereas it had no effect on adaptation status, and self-efficacy in the evaluation situation.

The STAI-S and STAI-T measures showed a marginal reduction at post-EFT ($t=1.956$ and $t=2.227$) and follow-up ($t=2.30$ and $t=1.699$) measures compared to the baseline measures by the EFT group intervention. The effect size of the EFT intervention program on STAI-S and STAI-T was from 0.283 to 0.379 in the current study. These results may show that the EFT intervention has marginal effects on the nervousness, discomfort, and general anxiety from the test situation in medical students.

Although the baseline measures of TAI, PSS, PANAS, and STAI did not show any gender differences, the

Table 3. Test Anxiety Inventory (TAI), Perceived Stress Scale (PSS), and Positive Affect and Negative Affect Schedule (PANAS), STAI Scores of Baseline, Post-intervention and 2 weeks Follow-up Measures

All	Baseline	post-EFT	Follow-up	Baseline vs. post-EFT		Baseline vs. follow-up	
				t	Cohen's D	t	Cohen's D
TAI-Total	43.58±13.91	38.72±12.84*	37.22±13.68**	2.704	0.451	3.289	0.548
TAI-W	22.44±7.58	20.31±6.73*	19.83±7.71*	2.297	0.383	2.454	0.409
TAI-E	21.14±6.72	18.42±6.66**	17.39±6.45**	2.763	0.460	3.654	0.609
PSS-Total	20.08±5.95	16.83±7.04*	16.06±7.47**	2.307	0.384	2.939	0.490
PSS-Pos	8.31±2.62	9.14±3.00	8.94±3.27	-1.279	-0.213	-1.010	-0.168
PSS-Neg	12.39±3.93	9.97±4.81*	9.00±4.99***	2.659	0.443	3.877	0.646
PANAS-PA	16.22±6.36	15.97±6.80	16.33±7.28	0.194	0.032	-0.122	-0.020
PANAS-NA	17.56±9.11	12.78±8.52**	12.36±10.03**	2.885	0.481	3.259	0.543
STAI-S	45.67±11.30	41.64±11.3	41.25±11.74*	1.957	0.326	2.230	0.372
STAI-T	42.81±10.87	39.58±9.74*	40.94±10.50	2.272	0.379	1.699	0.283

Bold represents effect size (Cohen's D) more than 0.35.
Significance were found compared to the baseline measure.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table 4. TAI, PSS, PANAS and STAI Scores of Baseline, Post-intervention and 2 weeks Follow-up Measures in Males

Male	Baseline	post-EFT	Follow-up	Baseline vs. post-EFT		Baseline vs. follow-up	
				t	Cohen's D	T	Cohen's D
TAI-Total	39.67±13.51	32.61±10.42*	32.33±11.19**	2.763	0.651	3.597	0.848
TAI-W	20.50±7.62	17.56±5.91*	17.11±5.81**	2.235	0.527	3.252	0.767
TAI-E	19.17±6.07	15.06±4.93**	15.22±5.82**	3.056	0.720	3.316	0.782
PSS-Total	19.72±6.23	15.28±7.18	14.06±7.21*	1.771	0.418	2.333	0.550
PSS-Pos	8.61±2.83	9.72±3.06	9.78±3.28	-0.963	-0.227	-1.069	-0.252
PSS-Neg	12.33±4.31	9.00±4.98*	7.83±4.96**	2.132	0.503	2.937	0.692
PANAS-PA	17.33±6.63	17.50±7.64	17.72±7.61	-0.075	-0.018	-0.249	-0.059
PANAS-NA	18.00±8.92	10.72±7.16**	11.22±9.14**	2.904	0.685	3.112	0.734
STAI-S	44.44±10.65	39.33±10.41	38.33±10.62	1.549	0.365	1.947	0.459
STAI-T	40.67±10.84	37.17±9.52	40.11±10.82	1.407	0.332	0.379	0.089

Bold represents effect size (Cohen's D) more than 0.35.

Significance were found compared to the baseline measure.

*p<0.05, **p<0.01.

Table 5. TAI, PSS, PANAS and STAI Scores of Baseline, Post-Intervention and 2 Weeks Follow-Up Measures in Females

Female	Baseline	post-EFT	Follow-up	Baseline vs. post-EFT		Baseline vs. follow-up	
				t	Cohen's D	t	Cohen's D
TAI-Total	47.50±13.54	44.83±12.32	42.11±14.46	1.069	0.252	1.615	0.381
TAI-W	24.39±7.22	23.06±6.49	22.56±8.54	1.006	0.237	0.979	0.231
TAI-E	23.11±6.91	21.78±6.57	19.56±6.46	0.952	0.224	2.082	0.491
PSS-Total	20.44±5.81	18.39±6.74	18.06±7.38	1.572	0.371	1.939	0.457
PSS-Pos	8.00±2.43	8.56±2.89	8.11±3.12	-0.871	-0.205	-0.171	-0.040
PSS-Neg	12.44±3.63	10.94±4.56	10.17±4.88*	1.620	0.382	2.820	0.665
PANAS-PA	15.11±6.06	14.44±5.64	14.94±6.86	0.483	0.114	0.167	0.039
PANAS-NA	17.11±9.53	14.83±9.45	13.50±11.00	1.101	0.260	1.550	0.365
STAI-S	46.89±12.09	43.94±11.96	44.17±12.38	1.161	0.274	1.115	0.263
STAI-T	44.94±10.78	42.00±9.62	41.78±10.42	2.038	0.480	1.968	0.464

Bold represents effect size (Cohen's D) more than 0.35.

Significance were found compared to the baseline measure.

*p<0.05.

current study analyzed changes in psychological measures in male (Table 4) and female (Table 5) participants due to the significant gender differences based on age (Table 1). In male participants, there were distinctive changes similar to the total participants except for the STAI score (Table 4). Moreover, in female participants, only the PSS-Neg score at the follow-up measure was significantly reduced (Table 5). These results demonstrated that the demographic features of age and gender might be a substantial mediating factor for EFT group intervention in medical education.

IV. DISCUSSION

The current study examined the clinical effectiveness of the EFT group intervention program (six times of 15 minutes session in three weeks) on the academic stress and the mental health of first-year students at the School of Korean Medicine using TAI, PSS, PANAS, and STAI. The results showed significant mental health promotion of the EFT group intervention, particularly in male students regarding test anxiety, negative affect, and perceived negative stress. In addition, these benefits were maintained until the two-week follow-up.

The current study showed distinctly contrasting clinical effectiveness of the EFT group intervention in the light of negative aspects (e.g., PSS-Neg and PANAS-NA) and positive aspects (e.g., PSS-Pos and PANAS-PA). That is, the EFT intervention reduced the negative influences of academic and test stress, however had no significant increase in positive affect in medical students.

From the pathophysiological perspective, the significant decrease in PSS-Neg and PANAS-NA measuring perceived stress and its effect on affect is expected from those of previous reports with university⁵⁴⁾ and medical students⁶⁾. The clinical effectiveness of EFT intervention on STAI were found apparent, although they were relatively moderate. Regarding the state and trait anxiety, there was a decreasing tendency in the state anxiety at the post EFT but statistically significant at the follow-up measurement. In addition, there was a significant decrease in the trait anxiety at post EFT but statistically insignificant at the follow-up measurement. Both results seem to explain well about the concept of state and trait anxiety: the trait anxiety is relatively hard to change and more general than the state anxiety is.

Regarding positive affect, the EFT group intervention did not show significant improvements of PSS-Pos and PANAS-PA in the current study. These results indicate that the PANAS is mutually independent negative and positive affect subscales, which is consistent with preceding studies^{55,56)}. Also, the PANAS-PA in medical students might be not related to anxiety derived from specific objects and situations (STAI-S) or evaluation situations (TAI).

A previous study⁵⁷⁾ with a 40-min single EFT intervention for undergraduate students showed a significant increase in positive emotion (e.g., enjoyment and hope) and a decrease in negative emotion (e.g., anger and shame) at the same time using the Achievement Emotions Questionnaire. Further studies are re-

quired to validate the current findings.

Interestingly, at the baseline measure, there were no significant gender differences among total scores of TAI, PSS, PANAS, and STAI and their subscales. However, the male students showed overall improvement in mental health through the EFT intervention, whereas the female students showed no improvement except the PSS-Neg. That is, the EFT intervention may influence differently depending on the gender.

Previous studies have suggested gender differences in the cognition of and coping with academic stress. Female medical students were reported to have low coping efficacy, academic adjustment, and internal attribution tendencies⁵⁸⁾. Another study showed that female university students were assumed to use social support seeking as well as emotional and avoidant coping styles⁵⁹⁾, which can serve to increase the stress level⁶⁰⁾ and intensify physical and psychological symptoms⁶¹⁾. However, male students⁶²⁾ used problem-solving and self-comfort coping styles, which are active coping methods for ameliorating psychological pain caused by stress.

As an alternative, gender difference in the current study may come from the age difference, which Korean men should serve the obligatory military service in their early 20's and therefore male students are usually older than female students⁹⁾. The confounding effect of socioeconomic variables should be verified in future studies.

Regarding the correlations, the current study showed significant correlations among test anxiety, perceived stress, and negative affect which was shown in some previous studies with Asian samples^{8,62)}. However, there was no relations between test anxiety and positive affect and state anxiety. That is, the perceived stress was correlated with all the variables negatively (e.g., positive affect) or positively (e.g., trait and state anxiety, negative affect), but the test anxiety seems to relate only to negative affect, trait anxiety, or per-

ceived stress.

These results might implicate that test anxiety of medical students was more relevant to negative affect and generalized anxious tendency than transient anxious tendency from the specific situations or occasions. In other words, medical students might suffer from the long-term academic stress or burnout with the repetitive concerns of low academic scores or failure (cognitive perspective) in the competitive circumstances at the length of time⁶⁾. These negative and anxious conditions are somewhat different from affective expression of nervousness (outward expression) with high school students and college students^{42,43,63)} for a relatively short time. These correlations are quite distinctive revelations and should be substantiated for the generalization of characteristics of medical students.

In the survey conducted at the end of the EFT group intervention, the medical students regarded the EFT as positive, fresh, encouraging, and enjoyable and described its effects as calming, relaxed, and pacified which were reported in other studies^{43,44)} despite all the suspicion at the beginning.

To sum up, it is easy to learn and provide self-care⁶⁴⁾ without extra resources and preparation, the EFT group intervention program may be a plausible option for promoting the mental health of medical students. Due to group intervention was conducted, the effectiveness of the EFT intervention in this study may have been enhanced by borrowing benefits which means that the benefits of EFT extend to individuals other than the clients receiving treatment^{65,66)}. EFT has an advantage as an group therapy, it is considered that it has the potential to be used as a part of an educational program for academic stress management. Implementation of EFT group intervention using borrowing benefits in class and encouragement of individual EFT intervention in daily life after school is expected to bring about a greater syner-

gistic effect for improving the mental health of medical students.

The current study may provide foundation for the comprehensive and multi-faceted understanding on the sustainable health management and promotion of EFT for medical students. Moreover, the experience of the EFT intervention program would provide the chance to familiarize themselves with the mind-body techniques of the East-Asian traditional medicine, since the EFT intervention shares a theoretical foundation with acupuncture of the East-Asian traditional medicine²⁵⁾.

This study has some limitations. First, the effectiveness of the EFT intervention on resolving stress and anxiety is not conclusive since there is no control group to compare the results. However, considering the fact that the steady increase of PANAS-NA and academic stress was reported with the same medical school of the current study⁶⁾, the decrease of PANAS-NA, TAI, PSS, and STAI measures in the current study may be reliable clinical effectiveness of the EFT group intervention. Moreover, a randomized controlled trial with an increased number of participants would be needed in future studies. Second, the eye movement included in the 9 Gamut sequence may have contributed to the decrease of PANAS, TAI, PSS, and STAI scores. The bilateral eye movement of the 9 Gamut sequence may have similar effects of the eye movement desensitization and reprocessing which enhance parasympathetic nervous system activity and alleviate anxiety by inducing brain waves during Rapid Eye Movement^{67,68)}. Further studies excluding the 9 Gamut might be needed to show the clinical effectiveness of acupoint tapping. Third, there may be an influence of the test schedule on TAI, PSS, PANAS, and STAI measures; however, it would have introduced minor or no variations in test anxiety and stress throughout the current EFT intervention period⁶⁾ because one or two tests were conducted every

week, providing constant academic and test stress. Fourth, the compliance with self-care during the two-week follow-up period was not examined which may have influenced the mental health of the participants. Further studies considering the degree of accordance with the EFT practice should be conducted.

In addition to the studies to explore the optimal EFT group intervention duration for alleviating psychological distress and promoting mental health of medical students, future studies on the influential factors of demographic features, socio-economic status, and personality traits along with biological marker such as heart rate variability and electroencephalogram should be performed to generalize the usefulness of the current EFT intervention on academic adjustment, examination anxiety, burnout, and well-being of medical students for its application in medical education. Depth analysis of EFT group intervention on medical students using qualitative methods would provide a better understanding of its clinical usefulness.

V. CONCLUSION

The current study investigated the effectiveness of the EFT group intervention on the mental health of medical students using psychological measurements of TAI, PSS, PANAS, and STAI.

1. TAI, PSS-Total, PSS-Neg, and PANAS-NA scores at the post-EFT and at follow-up were significantly reduced compared to baseline, while STAI-S and STAI-T scores were significantly reduced in at follow-up and at the post-EFT measurements, respectively. These may implicate that the EFT group intervention was effective in alleviating stress and negative affects in medical students.

2. TAI, PSS-Total, PSS-Neg, PANAS-NA scores in male students decreased significantly at the post-EFT and follow-up compared to baseline, while there is

no significant change in psychological measurements scores in female students except PSS-Neg scores. These suggests that EFT group intervention may influence differently depending on gender.

3. TAI had significant correlation with PSS, PANAS-NA, STAI-T, while no significant correlation with PANAS-PA, STAI-S. These might implicate that test anxiety of medical students was more related to negative affect and generalized anxious tendency than to transient anxiety regarding the situations.

The EFT group intervention may be a useful self-care remedy for alleviating test anxiety and negative emotion and managing mental health in medical students. In the future, large-scaled, rigorously designed clinical studies on the effectiveness of EFT group intervention on mental health of medical students is required.

CONFLICT OF INTEREST

There is no issue related to conflict of interest for this study.

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