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Effects and Influencing Factors of a Stress Relief Program on Stress Response of Female High School Students in Korea

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Abstract

The purpose of this study was to investigate the effect of a stress relief program on school stress level and stress response and coping experience of female high school students and to compare the effects and influencing factors by stress level. The study subject includes 32 female high school students in South Korea. After a stress relief program, in the low-stress group, stress coping was the only significant factor influencing stress response and its explanatory power in the constructed regression model was 66.0% (F=16.27, p=.005). In the high-stress group, coping with friendship stress and problematic stress was a significant factor influencing stress response and its explanatory power in the constructed regression model was 47.0% (F=9.98, p=.001). It is found that a stress relief program could improve the stress coping strategies among female high school students and thus should be implemented in high schools to decrease school stress and response levels among adolescents in South Korea.

Key words: high school female student, stress relief program, school stress, stress response, stress coping

Ⅰ. Introduction

1. Background

Adolescence is the developmental transition period from childhood to adulthood. Adolescents experience stress in various aspects of their lives. The ability to properly manage stress affects the consequences of health and risky behavior (Hutchinson, *et. al.*, 2006). Adolescence is a period of continued brain maturation, which plays a significant role in physiological and emotional changes. Adolescent development can also be a period of pivotal psychological and physiological vulnerabilities (Eiland & Romeo, 2013). Facilitating the growth and development of adolescents and preparing them for adulthood is a very important issue worldwide. In recent years, a youth policy that promotes healthy growth and development of adolescents has been presented in many ways within the paradigm of 'Positive Youth Development'. The target areas for youth development include physical and emotional health, and intellectual, social, civic, cultural, and occupational competence.

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Emotional health refers to the ability to respond positively, under friendly or hostile situations. It reflects an individual's emotional state and their surroundings, and the ability to participate in leisure and play activities. The emphasis on 'friendly or hostile situation' and the 'reflection on the state of the emotional state and its surroundings' indicate the ability to cope with the stress experienced during the adolescent growth process (Seiffge-Krenke, 2013: 3).

Korean adolescents spend most of their day at school, and therefore, most of the stress they experience originates at school. Since the school space involves social relations with teachers and friends, and activities associated with academic achievement, the adolescents experience a great deal of stress due to challenges related to school, friends, teachers and environment at school. Therefore, it is necessary to develop a strategy to reduce the stress involving adolescents at school (Lim, *et. al.*, 2013).

The United Nations Children's Fund (UNICEF) has published several comparative reports on the quality of life of children in developed countries (Bradshaw, *et. al.*, 2013). Accordingly, the Korea Institute for Health and Social Affairs and Yonsei University Social Development Institute confirmed the academic stress index of Korean adolescents according to the 'children's subjective well-being in rich countries (ages 11, 13, and 15 years)'. The results showed that the academic stress index of Korean youth was 50.5%, which is the highest among the 29 countries surveyed by UNICEF. In addition, among the stressors, 54.4% and 34.4% reported that they were stressed by 'school life' and 'family life', respectively, and 67.2% responded that they were stressed in 'career'. In particular, 'study' was the top factor underlying the stress followed by "study" (35.3%), "occupation" (25.6%), and "appearance and health" (16.9%).

Indeed, adolescence presents with a possible developmental crisis due to rapid physical, cognitive, social and emotional growth, and is therefore, vulnerable to stress (Hollis, *et. al.*, 2013). Too much stress on students can lead to social problems such as misconduct as well as poor quality of life. In addition, students may be more vulnerable to stress situations because they have less advanced defense mechanisms than adults (Khoshkerdar & Raeisi, 2020). Adolescents are also vulnerable to suicide (Pompili, *et. al.*, 2009). Therefore, more attention and approach are needed for the stress of adolescents. The psychological challenges of Korean youth are very serious. In 2019, 39.9% of middle and high school students were stressed with their everyday life usually, 28.2% of middle and high school students experienced depressive mood in the past year (Ministry of Gender Equality and Family & Statistics Korea, 2019). According to the 15th Korea Youth Risk Behavior Web-based Survey (KYRBWS), 39.9% of middle and high school students in Korea experienced stress in everyday life, and the stress was higher in high school students (42.4%) than in middle school students (37.2%). Female high school students (48.8%) were more stressful than male high school students (31.7%) (Korea Centers For Disease Control & Prevention, 2019). This finding suggests that female adolescents are more vulnerable to stress than male adolescents (Hampel & Petermann, 2006; Perry & Pauletti, 2011). Female adolescents were found to feel four times more stressful, even in the same event compared to male adolescents (Seiffge-Krenke, 2013). And, female high school students seem to use maladaptive coping styles more than male high school students (Al-Bahrani, *et. al.*, 2013). Therefore, it is necessary to develop and apply a strategy to reduce the stress and establish coping strategies for female high school students.

According to Seo (2009), aromatherapy was effective in reducing stress levels and stress responses in adolescents. Studies related to Mindfulness-based stress reduction

(MBSR) programs have been conducted in some adults. Recently, there are also data that support the use of MBSR program in children and adolescents reliving perceived stress (Ali, *et. al.*, 2017; Klingbeil, *et. al.*, 2017; Johnstone, *et. al.*, 2016), enhanced the level of the problem-focused coping of the stress coping, and reduced the level of the depression (Kim & Han, 2014). Researchers have also found that the effectiveness of MBSR program on continuous significant effects on test anxiety and emotion regulation in female high school students (Shahidi, *et. al.*, 2017). However, studies on stress relief intervention programs for female high school students have been insufficient. Moreover, the stress relief program considering specific variables and mentoring related to the occurrence of stress in high school girls is insufficient.

Adolescents who lack adequate preparation and coping skills for stress may experience various stressful emotions (depression, anxiety, fear, and anger) and maladaptive behavioral problems such as violence and flight (Hollis, *et. al.*, 2013). Even if adolescents experience high levels of stress in a variety of areas, all adolescents are not stressed equally. Because of individual vulnerability to stress, cognitive appraisal, coping style, and social support system, responses to stress can vary. Since stress coping styles and adaptation patterns in adolescence represent an index for the prediction of stress management styles and adaptation patterns in adulthood, develop an appropriate stress coping strategy in adolescence is a very important task in order to prevent psychological diseases and to support psychological growth. Increased social interest in adolescent stress has led to the development of programs and desirable coping strategies for the youth. Programs that assist adolescents with stress problems mainly identify desirable coping behavior, especially stress experience and symptoms, identify the causes and develop coping strategies. Furthermore, development of self-management behaviors for self-regulation are targeted via behavioral interventions. Despite the increased number of programs for adolescent stress management recently, the progress is not adequate for field implementation. Therefore, to develop a more effective program, it is important to design an appropriate program based on common factors identified in adolescent stress relief programs via empirical studies. It is necessary to develop a stress relief program for youth that can be used in the field. Based on these reasons, the present study is aimed to examine the effectiveness of a stress relief program targeting school stress, stress response, and stress coping styles among female high school students.

2. Objectives

The specific objectives are as follows: (1) to examine the effectiveness of a stress relief program on school stress, stress response, and stress coping and to compare the effects and influencing factors on stress response after stress relief program by school stress scores, (2) to identify the influencing factors on stress response before and after applying stress relief program and in the two groups.

II. Method

1. Research design

This study was designed as a non-equivalent comparison group pretest-posttest design to clarify the effects and influencing factors by stress relief program by school stress scores to mentor-mentee activity (<Figure 1>).

2. Participants

This study subjects included second grade, female high school students who were attending a female high school in Chungbuk Province and met the research selection criteria. The selection criterion was consented to participate in the study after understanding the purpose of this study.

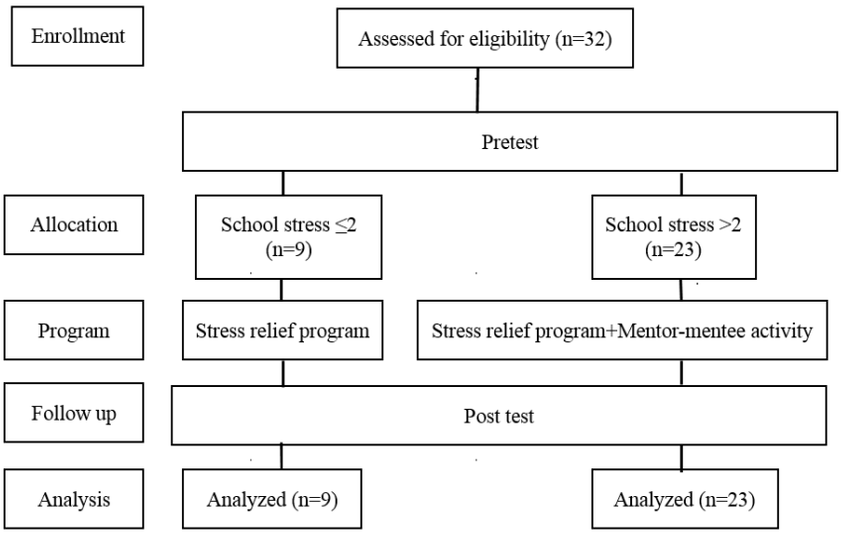

Figure 1. Flow diagram of the study (based on CONSORT statement)

The exclusion criteria were those who failed to obtain parental consent because they were involved in other stress relief programs or were underage. The purpose and method of the study was explained to the assistant principal of the school, the student head teacher, and the classroom teacher. We sent an official request to the school and received written informed consent from the students and their parents agreeing to participate in the study.

For an effect size (f2) of 0.82 used in a previous study (Hwang, *et. al.*, 2018), significance level (α) of 0.05, power ($1-\beta$) of 0.8, and the nine predictive variables, the sample size was 29 subjects, and so 32 subjects were required based on a predicted dropout rate of 10%.

3. Ethical considerations

The purpose of this study was to determine the effectiveness of the stress relief program. There was no direct risk to the subject, but since the subjects of the study were minor and vulnerable students, we obtained not only the subjects' consent but also the parental consent. The data obtained using the questionnaire were never used except for research purposes, and the subjects were informed that they would be anonymous and could withdraw at any time if they wanted without any penalty. The researcher explained the study purpose, content and methodology, and the subjects voluntarily provided their written consent after consultation with their parents. In order to ensure anonymity, a questionnaire was used to list the aliases that were known only to the subject. The collected data were coded by the research assistant.

4. Measurements

Since the questionnaires developed for adolescents was used for female high school students in the second year of general high school, one high school teacher and two professors in the nursing department reviewed the items to see if there were any problems that were not appropriate, such as gender characteristics, entrance examination environment, stress type, and so on. As a result of the questionnaires's facial validity, we received feedback that they could be used as they are.

1) Participant characteristics

The subjects' general characteristics were examined using a self-reported questionnaire. General parameters

such as regular religion, smoking, drinking, and menstrual cycle were recorded as 'yes' or 'no'. Economic status and grades were recorded as 'upper, middle, and lower' categories. Smartphone usage time was recorded in a narrative form.

2) Stress response

Stress response is the individual reaction to the cause of stress (Lee, 2006: 7). It was measured using a 27-item questionnaire involving the daily stress response inventory for adolescents validated for adolescents by Bae & Kim (2014) to measure the daily stress response of adolescents. This tool consists of three sub-factors such as physical stress response (15 items), behavioural stress response (6 items), and emotional stress response (9 items). Each item is structured and rated on a 3-point Likert scale (1 = not at all, 2 = occasionally, and 3 = frequently), which indicates that the higher the score, the higher was the stress response. In Bae & Kim (2014), the Cronbach's α was .93, and it was found to be .95 in this study.

3) School stress

School stress is a negative psychological state caused by schoolwork, feelings of tension, concerns, fear, depression, and anxiety. It was measured using a 42-item questionnaire developed by Lim, *et. al.* (2013) to analyse the concept of school stress. The tool consists of six sub-factors designed to measure concepts such as study stress, relationship stress, and school-related stress. It includes 5 items of study stress, 7 items of school environmental stress, 8 items of friend-related stress, 10 items of teacher stress, 5 items of test stress, and 7 items of grade stress. Each item was measured on a 5-point scale ranging from 1 ('not at all') to 5 ('very strongly'). The higher the score, the higher was the study stress. The Cronbach`s $\alpha$ at the time of development by Lim, *et. al.* (2013) was .93, and the Cronbach`s α was .93 in this study.

4) Stress coping

Stress management may occur using an aggressive coping strategy to identify the cause and actively assist to alleviate the stress, and a passive coping mechanism via cognitive conversion to control internal thought processes and personal emotions (Kim & Lee, 1986). Based on the scale developed by Folkman & Lazarus (1984), we used a Korean version, which was validated and modified by Kim & Lee (2016). The scale consists of four sub-domains based on the problem (6 items), social support (6 items), emotional reduction (6 items), and hope (6 items). The aggressive coping strategy was determined according to the combined scores of problem-oriented and social support-seeking items. The passive coping strategy was determined by summing the scores of emotional reduction and wishful thinking items. Each item was answered on a scale of 4 points ranging from 1 ('do not use') to 4 ('use very much'), suggesting that the higher the score, the more likely it was that the coping strategy would be used. In Kim's (1999) study, Cronbach's α was .80 for problem coping, .76 for social support coping, .66 for emotional reduction coping, and .60 for hope coping. In this study, Cronbach's α was .66 for problem coping, .50 for social support coping, .53 for emotional reduction coping, and .69 for hope coping. The Cronbach's α of the total tools was found to be .79.

5. Data collection procedure

To control the intervention of the third variable related to examinations and school events, data collection was conducted four weeks after the midterm exam. To control exogenous variables affecting dependent variables, the data were collected from two weeks before the intervention and were not exposed to stress conditions. The preliminary

survey period ranged between November 14, 2018 and November 20, 2018. After the preliminary investigation, the stress relief program was conducted four times in total for two weeks from November 21, 2018 to December 4, 2018 twice a week. A post-survey was conducted between December 16, 2018 and December 20, 2018, around two weeks after the program implementation.

6. Development and implementation of stress relief program

1) Development of stress relief program

The stress relief program was based on Lazarus & Folkman (1984) stress and coping model. In this model, where stress was assessed as a threat to the individual's well-being, individuals used coping strategies via cognitive evaluation, and the consequences of adjustment to stress included physiological changes, negative or positive emotions, social functioning, and physical health (Lazarus & Folkman, 1984).

The coping resources of female high school students involved individual external resources and mentoring by nursing students who applied stress-related theories and coping methods combined with individual internal resources, which included interventions to identify and improve communication skills and problem-solving abilities.

The cognitive assessment stage included cognitive restructuring related to school stressors and stress coping styles. The aggressive coping strategies included managing stress using knowledge and education and sharing stress experience (adjustment and maladjustment). Strategies for study-related stress included sharing and expanding individual stress relief experiences, and training for progressive muscle relaxation. The coping strategy for personal communication involved implementation of repetitive self-assertion narratives and receiving feedback from mentors. In addition, to strengthen the passive coping skills, the program included a positive perception of personal strengths, such as expression of feelings, i.e., 'I am a good person'.

2) Preparation of stress relief program

Nursing students who act as mentors in group mentoring and mentor-mentee activities were 25 students who completed a curriculum on stress-related theories, the effects of stress on the body and mind, and strategies for coping with stress during a semester. Volunteer nursing students were recruited by posting a research plan on the nursing department homepage. The role of mentor in group mentoring and mentor-mentee activities was trained for 1 hour per week for 2 weeks before the program.

3) Implementation of stress relief program

The stress relief program was conducted in both groups. Students of low-stress group were performed by group mentoring, and students of high-stress group added mentor-mentee activities individually by mentor-mentee matching after group mentoring (<Figure 2>). Mentor-mentee activities for students of high-stress group were individually set by mentor-mentee to contact each other by phone. Mentor-Mentee activity allows mentees to freely talk about stress situations, stress reactions, emotions caused by stress, and stress coping when they want to talk to a mentor in a stressful situation. The mentor encourages mentee to positive-emotional self-expression, and sharing successful strategies for school stress situations has been added. Based on these stress relief programs, this study investigated changes in school stress, stress response, and coping strategies. The stress relief program conducted in this study consisted of four sessions for a total of 90~100 minutes each. To facilitate the high school students participating in the experiment, the program was conducted after school over four sessions to accommodate the students schedule.

The contents of the program were designed to promote the goals of the stress relief program to reduce school stress and stress response and improve stress coping strategies (<Figure 2>).

7. Data analyses

The collected data were analyzed using the SPSS 23.0 program. The characteristics of the subjects and variables were analyzed using frequency and percentage, mean, and standard deviation (SD). After dividing into two groups based on pretest school stress scores, homogeneity tests were implemented with the chi-square test, Fisher's exact test, and independent t-test. The effect of stress relief program was analyzed via paired t-test. The differences in variables between two groups after applying the stress relief program were analyzed with ANCOVA after controlling for pretest scores as a covariate. Effects of school stress and stress coping on stress response were analyzed using stepwise regression analysis. The cut-off for statistical significance was $p<.05$. Statistical significance was $p<.05$.

Session	Contents	Contents		Time (min)
		Low-stress group (school stress ≦2)	High-stress group (school stress >2)	
1	Overview of stress relief program	• The goal of the stress relief program, its overall content, procedures and methods, and the introduction of its members • Rules for program participation • Definition of stress and stress symptoms	• The goal of the stress relief program, its overall content, procedures and methods, and the introduction of its members • Rules for program participation • Definition of stress and stress symptoms • Mentor-mentee activity - Mentor-mentee matching - Mentor-mentee ice breaking	90~100
2	Sharing stress experience, self-assertion training	• Sharing of stress experience: Confirmation of emotions and thoughts about stressors, sharing of stress reduction strategies and effects • Design of personal benefit balloons • Self-assertion training - Stress scenarios in relation to teacher or the students - Personal messaging strategy to cope with stress situations • Discussion of the effects of coping resources on stress assessment	• Sharing of stress experience: Confirmation of emotions and thoughts about stressors, sharing of stress reduction strategies and effects • Design of personal benefit balloons • Self-assertion training - Stress scenarios in relation to teacher or the students - Personal messaging strategy to cope with stress situations • Discussion of the effects of coping resources on stress assessment • Mentor-mentee activity - Freely talk about stress situations, stress reactions, emotions caused by stress in a stressful situation by phone	90~100
3	Specific cognitive reconstruction, stress reduction strategies	• Explaining cognitive assessment of stress, and rational coping and irrational coping strategies • Case study: Practice to distinguish between rational coping and irrational coping methods • Writing a coping record - Recall of the most stressful situations and coping strategies experienced under school stress - Conversion of previous irrational coping into rational coping strategies • Education in stress reduction strategies - Progressive muscle relaxation - Imagery therapy	• Explaining cognitive assessment of stress, and rational coping and irrational coping strategies • Case study: Practice to distinguish between rational coping and irrational coping methods • Writing a coping record - Recall of the most stressful situations and coping strategies experienced under school stress - Conversion of previous irrational coping into rational coping strategies • Education in stress reduction strategies - Progressive muscle relaxation - Imagery therapy • Mentor-mentee activity - Positive emotional self-expression	90~100
4	Sharing stress experience and reduction strategies via individual case studies and role play	• Explaining the elements of assertion behavior strategies • Case study: assertive, passive, and aggressive behaviors • Role play practice - School stress scenario - Application of stress coping strategy • Sharing stress relief program impressions	• Explaining the elements of assertion behavior strategies • Case study: assertive, passive, and aggressive behaviors • Role play practice - School stress scenario - Application of stress coping strategy • Mentor-mentee activity Sharing successful strategies for school stress situations • Sharing stress relief program impressions	90~100

Figure 2. Protocol of stress relief program

Ⅲ. Results

1. Participants

The participants of this study were profiled as follows: 17 (53.1%) obsessed with religion, 30 (93.8%) at a medium economic level, and 13 (40.6%) with irregular menstrual cycle. One (3.1%) subject smoked and seven (21.9%) consumed alcohol. The grade of the subjects with middle level was 25 (78.1%), and the average smartphone usage time was 4.66 ± 3.20 hours (<Table 1>). When the researcher divided into two groups according to the pretest school stress scores, low-stress group (less than 2 points) was 9 and high-stress group (more than 2 points) was 23.

2. Homogeneity test between the two groups

The characteristics of the participants were homogeneous in the two groups (<Table 1>). The preliminary measured emotional stress response hope stress coping, and school stress did not differ between the two groups (<Table 2>).

3. Effects of stress relief program between the two groups

The total mean score of the stress response ($t = 4.34$, $p < .001$), and its sub-items such as behavioral ($t = 3.65$, $p = .001$), emotional ($t = 3.97$, $p < .001$), and physical stress ($t = 3.29$, $p = .002$) were statistically significantly decreased after the stress relief program. After the stress relief program, among the sub-items of school stress, the study stress decreased significantly ($t = 2.34$, $p = .026$) and among the sub-items of stress coping, emotional stress coping decreased significantly after the program ($t = 2.74$, $p = .010$). Since the pre-test scores were not homogeneous between the two groups, pre-test scores were treated as covariates. The scores for stress response, school stress, and stress coping did not differ between the two groups (<Table 3>).

4. Factors affecting Stress Response after Applying Stress Relief Program in the two groups

To investigate the factors affecting stress response, religion, perceived economic level, menstrual cycle,

Table 1. Participant characteristics and homogeneity test between two groups (N = 32)

Characteristics		Total (n=32)	School stress ≦2 (n=9)	School stress >2 (n=23)	χ^2 or t (p)
		N (%) or Mean ± SD			
Religion	Yes	17 (53.1)	5 (15.6)	12 (37.5)	.03 (1.000*)
	No	15 (46.9)	4 (12.5)	11 (34.4)	
Perceived economic level	High	2 (6.3)	1 (3.1)	1 (3.1)	0.51 (.490*)
	Middle	30 (93.8)	8 (25.0)	22 (68.8)	
	Low	0 (0.0)	0 (0.0)	0 (0.0)	
Menstrual cycle	Regular	19 (59.4)	7 (21.9)	12 (37.5)	1.76 (.249*)
	Irregular	13 (40.6)	2 (6.3)	11 (34.4)	
Smoking	Yes	1 (3.1)	0 (0.0)	1 (3.1)	0.40 (1.000*)
	No	31 (96.9)	9 (28.1)	22 (68.8)	
Drinking	Yes	7 (21.9)	4 (12.5)	3 (9.4)	3.73 (.076*)
	No	25 (78.1)	5 (15.6)	20 (62.5)	
Grade	High	4 (12.5)	2 (6.3)	2 (6.3)	2.12 (.346*)
	Middle	25 (78.1)	7 (21.9)	18 (56.3)	
	Low	3 (9.4)	0 (0.0)	3 (9.4)	
Average smartphone usage time (hours/day)		4.66 ± 3.20	4.78 ± 2.64	4.61 ± 3.44	0.13 (.896)

*Fisher's exact test

Table 2. Homogeneity test between two groups (N = 32)

Variables	Item	Total (n=32)	School stress ≦2 (n=9)	School stress >2 (n=23)	*t*	*p*
		Mean ± SD				
Stress response	27	1.79 ± 0.47	1.55 ± 0.58	1.88 ± 0.38	-1.82	.080
Behavioral	6	1.95 ± 0.51	1.74 ± 0.53	2.04 ± 0.48	-1.51	.142
Emotional	8	1.83 ± 0.57	1.50 ± 0.64	1.94 ± 0.49	-2.09	.045
Physical	13	1.65 ± 0.47	1.50 ± 0.61	1.71 ± 0.41	-1.17	.250
School stress	42	2.20 ± 0.46	1.65 ± 0.31	2.42 ± 0.29	-6.53	<.001
Study	5	2.48 ± 0.71	1.87 ± 0.49	2.71 ± 0.64	-3.58	.001
School environment	7	2.55 ± 0.71	1.90 ± 0.70	2.81 ± 0.53	-3.95	<.001
Friendship	8	1.42 ± 0.48	1.01 ± 0.04	1.58 ± 0.48	-5.66	<.001
Teacher	10	1.74 ± 0.56	1.28 ± 0.39	1.92 ± 0.51	-3.40	.002
Test	5	3.16 ± 0.68	2.56 ± 0.78	3.40 ± 0.46	-3.80	.001
Grade	7	2.52 ± 0.73	1.86 ± 0.71	2.78 ± 0.56	-3.87	.001
Stress coping	24	3.07 ± 0.41	3.06 ± 0.50	3.08 ± 0.37	-0.17	.869
Problem	6	3.36 ± 0.80	3.44 ± 0.74	3.11 ± 0.78	1.09	.284
Social support	6	3.14 ± 0.54	2.98 ± 0.66	3.17 ± 0.56	-0.83	.412
Emotional reduction	6	2.40 ± 0.48	2.78 ± 0.49	2.63 ± 0.44	0.79	.438
Hope	6	3.15 ± 0.43	3.02 ± 0.56	3.41 ± 0.40	-2.19	.037

Table 3. Comparison of the main variables after stress relief program between the two groups (N = 32)

Variables	Total (n=32)				School stress ≦2 (n=9)	School stress >2 (n=23)	F^*	*p*
	Pretest	Posttest	*t*	*p*	Posttest	Posttest		
	Mean ± SD	Mean ± SD			Mean ± SD	Mean ± SD		
Stress response	1.79 ± 0.47	1.33 ± 0.40	4.34	<.001	1.17 ± 0.15	1.36 ± 0.44	1.32	.266
Behavioral	1.95 ± 0.51	1.55 ± 0.49	3.65	.001	1.37 ± 0.29	1.55 ± 0.56	2.33	.144
Emotional	1.83 ± 0.57	1.31 ± 0.50	3.97	<.001	1.08 ± 0.11	1.38 ± 0.58	0.02	.876
Physical	1.65 ± 0.47	1.30 ± 0.40	3.29	.002	1.14 ± 0.20	1.26 ± 0.35	2.15	.160
School stress	2.20 ± 0.46	2.09 ± 0.71	0.83	.414	1.82 ± 0.69	2.11 ± 0.68	0.21	.651
Study	2.48 ± 0.71	2.12 ± 0.66	2.34	.026	1.78 ± 0.50	2.13 ± 0.66	1.57	.226
School environment	2.55 ± 0.71	2.34 ± 0.82	1.15	.259	2.13 ± 0.90	2.27 ± 0.75	0.02	.892
Friendship	1.42 ± 0.48	1.37 ± 0.54	0.51	.617	1.26 ± 0.40	1.30 ± 0.45	0.01	.944
Teacher	1.74 ± 0.56	1.63 ± 0.68	0.78	.441	1.46 ± 0.74	1.65 ± 0.65	0.48	.497
Test	3.16 ± 0.68	3.19 ± 1.29	-0.11	.916	2.73 ± 1.30	3.33 ± 1.33	0.02	.877
Grade	2.52 ± 0.73	2.50 ± 1.15	0.09	.930	2.06 ± 1.02	2.64 ± 1.17	0.15	.706
Stress coping	3.07 ± 0.41	3.01 ± 0.36	0.75	.457	2.91 ± 0.56	3.04 ± 0.21	1.40	.252
Problem	3.21 ± 0.77	3.35 ± 0.81	-0.92	.363	3.43 ± 0.92	3.36 ± 0.77	0.01	.937
Social support	3.12 ± 0.59	3.14 ± 0.54	-0.12	.901	3.17 ± 0.74	3.18 ± 0.56	0.17	.684
Emotional reduction	2.68 ± 0.45	2.34 ± 0.43	2.74	.010	2.20 ± 0.51	2.36 ± 0.38	1.75	.202
Hope	3.30 ± 0.49	3.12 ± 0.42	1.71	.099	2.83 ± 0.49	3.24 ± 0.34	3.58	.075

*ANCOVA covariates: pretest scores

smoking, drinking, the grade was treated as dummy variables, and average smartphone usage time, school stress, and stress coping were treated as continuous variables. Nine factors were used to select variables based on a significance cut-off of p<.05, and a stepwise multiple regression analysis was performed to remove variables

based on a significance cut-off of p<.10 (<Table 4>).

The regression model for stress response satisfied the requirements for regression analysis and was statistically significant because the tolerance was more than 0.1 and the variance inflation factor was less than 10, demonstrating that there was no problem of multicollinearity. Stress response was significantly influenced by the menstrual cycle, average smartphone usage time, study, teacher, grade stress and social support stress coping before stress relief program, and its explanatory power in the regression model constructed by these six variables was 72.0% (F=12.09, p<.001). After the stress relief program, only friendship stress significantly influenced stress response, whose explanatory power in the constructed regression model was 33.0% (F=15.18, p=.001).

The regression model for stress response in the low-stress group also satisfied the requirements for regression analysis because there was no problem of multicollinearity and it was statistically significant. In the low-stress group, grade stress was the only significant factor influencing stress response before stress relief program, and its explanatory power in the constructed regression model was 82.0% (F=38.51, p<.001) and hope stress coping was the only significant factor influencing stress response after stress relief program, and its explanatory power in the constructed regression model was 66.0% (F=16.27, p=.005).

Table 4. Factors influencing stress response in the two groups before and after stress relief program (N = 32)

Variables	Total (n=32)				School stress ≦2 (n=9)				School stress >2 (n=23)			
	Pretest		Posttest		Pretest		Posttest		Pretest		Posttest	
	β	*t (p)*	β	*t (p)*	β	*t (p)*	β	*t (p)*	β	*t (p)*	β	*t (p)*
Intercept		5.86 (<.001)		4.42 (<.001)		0.66 (.531)		10.21 (<.001)		4.34 (.001)		3.53 (.002)
Menstrual cycle (ref.=regular)	0.26	2.25 (.036)										
Smoking (ref.=no)									-0.49	-2.70 (.017)		
Average smartphone usage time	-0.38	-3.03 (.007)										
Study stress	0.54	3.62 (.002)							0.48	2.96 (.010)		
Teacher stress	-0.48	-3.17 (.005)										
Grade stress	0.48	3.66 (.002)			0.92	6.21 (<.001)						
Friendship stress			0.59	3.90 (.001)							0.51	3.00 (.008)
Problem stress coping											-0.37	-2.14 (.046)
Social support stress coping	-0.65	-5.20 (<.001)							-0.68	-3.66 (.003)		
Hope stress coping							-0.84	-4.03 (.005)				
F (p)	12.09 (<.001)		15.18 (.001)		38.51 (<.001)		16.27 (.005)		10.10 (.001)		9.98 (.001)	
Adj. R^2	0.72		0.33		0.82		0.66		0.62		0.47	
Tolerance	0.48~0.81		1.00		1.00		1.00		0.65~0.86		0.89	
Variance inflation factor	1.24~2.10		1.00		1.00		1.00		1.16~1.55		1.12	

The regression model for stress response in the high-stress group also satisfied the requirements for regression analysis. In the high-stress group, smoking, study stress, and social support stress coping were significant factors influencing stress response before stress relief program, and its explanatory power in the constructed regression model was 62.0% (F=10.10, p=.001) and friendship stress and problem stress coping were significant factors influencing stress response after stress relief program, and its explanatory power in the constructed regression model was 47.0% (F=9.98, p=.001).

Ⅳ. Discussion

Adolescents experience a unique developmental period and stress can increase rapidly in various aspects of daily and school life. High school students in Korea experience increased stress more than at any time during their lifetime because they cannot enjoy the basic time to satisfy individual needs through frequent changes in the entrance examination system. Especially, female adolescents are vulnerable to stress, and therefore, intervention programs and policies are required. Depending on individual ability to cope with the stressful situation, stress can be a serious challenge or an opportunity for growth. Therefore, stress relief programs are needed for the effective management of stress among female adolescents. However, the efficacy of programs to relieve stress in female adolescents is not completely known. Therefore, the purpose of this study was to evaluate the effect of stress relief programs on school stress, stress response, and stress management styles among female high school students. The findings suggest that the stress relief program is feasible, acceptable, and potentially effective for practical application.

Previous research reported that the treatment of aroma essential oil inhalation reduced perceived stress levels and stress response (anxiety, blood pressure, pulse, saliva cortisol) in female high school students (Seo, 2009: 362). Also, MBSR is an effective intervention in adolescents (Ali, *et. al.*, 2017; Kim & Han, 2014; Kingbeil, *et. al.*, 2017). These research has found that MBSR can significantly reduce somatic syndromes and improving functional disability, symptom impact, and anxiety (Ali, *et. al.*, 2017). According to Kim & Han (2014), the MBSR program has had enhanced the level of the problem-focused coping of the stress coping, and reduced the level of the depression in female middle school students. Other researchers tested that the MBSR has had continuous significant effects on test anxiety and emotion regulation in female high school students (Shahidi, *et. al.*, 2017). However, these methods require a lot of time and effort for female high school students to learn, and it is difficult to sustain them individually. To reduce the stress of female high school students, interventions that are cost-effective and readily available to the subjects should be sought.

There has been very little research testing the efficacy of stress relief interventions among female high school students. Therefore, the stress relief model program of this study guided by the stress and coping model of Lazarus & Folkman (1984), was designed to relieve the stress of female adolescents. The program emphasized a reduction in school stress and stress response, and enhanced stress coping strategies. The stress relief program designed by this study was tailored for high school female adolescents. Lazarus & Folkman (1984) suggested a new perspective on stress, claiming that it is important to understand how individuals interpret and accept stress rather than stress itself. In other words, rather than explaining stress as a specific variable, it is necessary to understand stress at an organic level in order to adapt to various environmental phenomena by emphasizing the importance of psychological perception in addition to environmental or individual

responses. According to the stress-coping model, how an individual appraises a stressor determines how he or she copes with or responds to the stressor. The characteristic of this study's program is that nursing students are mentors and female high school students are mentees. We hypothesized that the mentoring program utilizing nursing students would positively impact on the appraisal of school stress, stress response, and coping strategies among female high school students. The findings of this study showed a positive effect on the stress relief program. The program effectively ameliorated school stress, stress response, and stress coping styles among female adolescents. While previous studies failed to analyze the association between stress relief program and school stress, stress response, and stress coping styles, these findings highlight the possibility that heightened school stress in female adolescents may affect stress response and in turn, increase the passive stress coping styles.

The participants were asked to complete the School Stress Questionnaire for adolescents developed by Lim, *et. al.* (2013). The scale consisted of 42 items grouped under six subscales: study stress, school environment stress, friendship stress, teacher stress, test stress, and grade stress. Our study revealed no statistically significant changes in the total mean score of school stress. However, study stress, which is a subscale of school stress, decreased significantly because of the low baseline school stress. Also, the result reflected the characteristics of Korean culture, consistent with the findings of Lim, *et. al.* (2013) suggesting that a higher self-esteem was associated with a higher level of study stress, although it was difficult to directly compare it with the same instrument or with a study without high school girls. In addition, Sung, *et. al.* (2013) also found that the higher the school stress of adolescents, the lower was the ego-resilience, social support, and adaptation to school life. Female adolescents evaluate perceived interpersonal stress and used higher degrees of social support (Hampel & Petermann, 2006). Therefore, it is necessary to identify the factors underlying these results based on further research, and to identify ways to reduce study stress.

Especially, there was a significant decrease in stress response after the female adolescents underwent the stress relief program. The participants were asked to complete the Daily Stress Response Inventory for Adolescents developed by Bae & Kim (2014). This scale consisted of 27 items grouped under three subscales: behavioral stress response, emotional stress response, and physical stress response. Total stress response, and behavioral, emotional and physical stress was significantly lower in female adolescents following the stress relief program, suggesting the effectiveness of the intervention. The adolescent two-group cross-over design reported previously demonstrated the effect of aromatherapy on stress and stress response (Seo, 2009: 362). Therefore, it is necessary to identify the specific components of the stress relief program and to evaluate the effect.

In addition, the researchers divided the low-stress group (less than 2 points) and the high-stress group according to the pretest school stress scores to identify factors that influence stress response. After a stress relief program, in the low-stress group, hope stress coping was the only significant factor influencing stress response and its explanatory power in the constructed regression model was 66.0% (F=16.27, p=.005). In the high-stress group, friendship stress and problem stress coping were significant factors influencing stress response and its explanatory power in the constructed regression model was 47.0% (F=9.98, p=.001). This suggests that the low-stress group and the high-stress group have different factors that affect stress response. Since the factors affecting the stress response of the low-stress group and the high-stress group

differ, this should be taken into consideration when looking for ways to reduce the stress response according to the stress level of the female students. There is very little research using the tools used in this study, so the comparison is limited. The response to stress varies with individual interpretation and tolerance level, which leads to an appropriate coping response to stress. In another study, adolescents used emotional approaches more frequently than problem-solving strategies. Higher grades increased maladaptive coping strategies and decreased adaptive coping strategies. Additionally, female adolescents scored higher on maladaptive coping strategies and emotional distress than male adolescents (Hampel & Petermann, 2006). In a longitudinal study (Seiffge-Krenke, 2000), both functional and dysfunctional coping styles significantly increased and stabilized over time. An increase in age also increases the complexity of cognitive function and social maturity, and therefore, the ability to cope with an appropriate response mechanism to stressors also varies with the ability to see from others' perspectives. In a previous study, the prevalence of stress among nursing college students was 25%. In addition, religion, acceptance, and planning were reported as strategies for coping with stress (Masilamani, *et. al.*, 2019). Particularly, chronic exposure to stress in adolescence has been reported to have a significant effect on brain and behavior (Hollis, *et. al.*, 2013). Therefore, it is necessary to develop a stress relief program for female students in consideration of factors that may affect stress response and coping.

The study limitation relates to the difficulty in generalizing the results because the program was specifically designed for girls in a high school. The small number of subjects is also a limitation. Further, the evidence rating of the experimental effect is low due to uncontrolled exogenous variables because of the single group pretest-posttest design. Nonetheless, the study findings support the effects of a female-specific stress relief program. Results demonstrated that participation in stress relief programs significantly decreased the self-reported levels of study stress, stress response, and passive coping style. There were no statistically significant changes in school stress total score. However, study stress, which is a sub-factor of school stress, decreased significantly. Following the stress relief program, the total score of school stress decreased significantly compared with the baseline. The total mean score of stress responses and the sub-factor scores of behavioral, emotional, and physical stress responses were significantly decreased after the stress relief program. Thus, the stress relief program appears to be an acceptable intervention in this population with the potential for improvement. among subcategories of total stress response, behavioral, emotional, and physical stress response. Female adolescents in this study reported significant reductions in study stress, stress response and passive stress coping.

V. Conclusions

Female adolescents are a population at stress risk. Effective stress relief interventions are needed to improve the outcomes within this vulnerable group. The stress relief programs among female high-school students appear to be effective at reducing study stress, stress response, and passive coping style. After stress relief program, in the low-stress group, hope stress coping was the only significant factor influencing stress response and its explanatory power in the constructed regression model was 66.0%, and in the high-stress group, friendship stress and problem stress coping were significant factors influencing stress response and its explanatory power in the constructed regression model was 47.0%. These findings demonstrate that the stress relief program conducted under the school

settings has a beneficial impact on stress, stress response, and passive coping styles in Korean female adolescents. The stress relief program is an effective stress relief method for high school adolescents. High schools should provide opportunities to work through the stress related to school and studies by instituting appropriate and specialized programs.

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한국 여자 고등학생의 스트레스 완화 프로그램 적용 후 학교 스트레스 수준별 스트레스 반응에 미치는 영향 및 영향 요인

국문초록 본 연구의 목적은 스트레스 완화 프로그램이 학교 스트레스, 스트레스 반응 및 스트레스 대처에 미치는 영향을 조사하고 여자 고등학생의 학교 스트레스 수준에 따른 스트레스 완화 프로그램 후 스트레스 반응에 미치는 영향과 영향 요인을 비교하는 것이다. 연구대상은 32 명의 여자 고등학생이었다. 스트레스 완화 프로그램 후, 학교 스트레스가 낮은 그룹에서 스트레스 대처가 스트레스 반응에 영향을 미치는 유일한 요인이었고 구축된 회귀 모델에서 설명력이 66.0 % (F = 16.27, p = .005) 이었다. 학교 스트레스가 높은 그룹에서 우정 스트레스와 문제 스트레스 대처는 스트레스 반응에 영향을 미치는 중요한 요소였으며, 구축된 회귀 모델에서 설명력은 47.0 % (F = 9.98, p = .001)이었다. 여자 고등학생에서 스트레스 대처 전략을 향상시키는 스트레스 완화 프로그램은 학교 스트레스와 스트레스 반응 수준을 감소시키기 위해 고등학교 때부터 시행해야 할 것이다.

주제어 : 고등학교 여학생, 스트레스 완화 프로그램, 학교 스트레스, 스트레스 반응, 스트레스 대처

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