The Effects of Mind Subtraction Meditation on Depression, Social Anxiety, Aggression, and Cortisol Levels of Elementary School Children in South Korea

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**Title:** The Effects of Mind Subtraction Meditation on Depression, Social Anxiety, Aggression, and Cortisol Levels of Elementary School Children in South Korea

그리고 타액 코티졸 수치에 있어 실험이 대조군에 비해 사후 검사가 통계적으로 유의미하게 낮아졌음을 보여주었다. 이는 비교적 짧은 실행기간에도 불구하고 학교 기반 마음수련 명상 프로그램이 초등학교 고학년의 사회, 행동적 정신건강 증진에 효과적인 방법이 될 수 있음을 시사한다. 논문에서는 마음수련 명상의 기본 원리와 실행 방법이 간단히 소개되며 여타 명상법들의 임상 적용 효과들도 논의된다.

주제어: 마음수련, 초등학생, 학교기반 명상 프로그램, 우울, 사회불안, 공격성, 타액 코티졸, 스트레스, 공분산분석

**Background**

This present study focuses on utilization of Mind Subtraction meditation which had been gaining attention worldwide, including South Korea (Lee, 2012). Previous studies in the Mind Subtraction meditation showed effective reductions in anxiety, depression, stress, and aggression in youth, college students, and educators (Jeong, 2005; Kim, 2010; Kim, 2012; Kim, Yoo, Lee, & Son, 2013). Specifically, this study was conducted to verify the effectiveness of the school-based meditation program on depression, social anxiety, aggression, and salivary cortisol levels, which is a measure of physiological stress level.

**Literature Review**

Based on a 2012 survey, Korea Youth Counseling & Welfare Institute (2013) reported there had been a three-fold increase in youth counseling since 2008 due to depression and suicidal ideations; and counseling needs of youth with suicide attempts/self-mutilations increased six times. About 30% of youth experienced suicidal ideations with top two reasons being poor academic performance.
(42.7%) and family conflict (24.2%), according to Korea National Youth Policy Institute (2014). A recent 2014 survey by Korea Health Promotion Foundation also showed over a half of teenagers had suicidal thoughts; nearly one in three said they felt very depressed (Wall Street Journal Korea, 2014); and the number of youth suicides increased 57 percent since 2001 (Koreaherald.com, 2013).

Social anxiety is also one of psychological symptoms that are most commonly experienced and it occurs in social situations or activities (Kim, Cho & Lee, 2000). Some report 12 to 13 years of age as the typical age when social anxiety is noticed with elementary school years seen as an important period in development of social anxiety symptoms (Kwon, Park & Kim, 2013; Oh & Yang, 2003).

Aggression, another variable in this study, is defined as all types of behaviors with intend to hurt or harm another individual (Roh & Kim, 2013). It is known that children with higher levels of aggression have poorer level of social adaptation than children with lower levels of aggression; and there is a tendency of increasing problematic behaviors as the children get older (Hong & Rho, 1983; Kim, 2010).

Lastly, cortisol hormone levels were measured in this study, which had been shown to be a good measurement for stress levels in human beings (Kim, Jang, Kim & Kim, 2012) and it has been well-studied in many populations, including children, as an important measurement of biologic reactivity to stress (Spratt et al., 2012). In children, several studies indicate salivary cortisol level is a simple and reliable method to measure stress levels in pediatric populations such as children with autism and children who are in foster care (Schupp, Simon & Corbett, 2013; van Andel, Jansen, Grietens, Knorth, & van der Gaag, 2014).
Method

1. Participants of the research

A total of 23 students in the experimental group consisted of 13 boys and 10 girls; and a total of 19 students in the control group consisted of 7 boys and 12 girls.

2. Research design

This study used a nonequivalent group comparison with pretest and posttest design to examine the effects of a school-based meditation program on depression, social anxiety, aggression, and salivary cortisol levels of elementary school students. The experimental group was given the meditation program sessions four times a week with 30 minutes per session, for a total of 8 weeks (see Table 1). The control group was given reading sessions with same frequencies as the experimental group: four times a week with 30 minutes per session, for a total of 8 weeks.

<Table 1> Schedule of Mind Subtraction meditation program

<table>
<thead>
<tr>
<th>Weeks: Tue, Wed, Thu, Fri (30 minutes each session)</th>
<th>Topic</th>
<th>Contents of meditation activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Orientation; knowing the mind</td>
<td></td>
<td>· Orientation to the program (purpose and methods)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· Knowing the false and true mind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· Knowing the reasons for subtracting the mind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· Knowing the method of subtraction and to practice</td>
</tr>
<tr>
<td>2 Throwing away of thoughts/misperceptions about family</td>
<td></td>
<td>· Talk about events with family</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· Finding memories and writing about family</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· Subtracting thoughts/misperceptions about family</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· Verbalize feelings after the subtraction</td>
</tr>
<tr>
<td>Weeks: Tue, Wed, Thu, Fri (30 minutes each session)</td>
<td>Topic</td>
<td>Contents of meditation activity</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| 3 | Throwing away of thoughts/misperceptions about school | • Talk about events in school (teachers and peers)  
• Finding memories and writing about school  
• Subtracting thoughts/misperceptions about school  
• Verbalize feelings after the subtraction |
| 4 | Throwing away of thoughts of inadequacy and dislikes | • Talk about memories of inadequacy and dislikes  
• Finding memories and writing about inadequacy and dislikes  
• Subtracting thoughts/misperceptions about inadequacy and dislikes  
• Verbalize feelings after the subtraction |
| 5 | Throwing away of thoughts of anxiety and worries | • Talk about memories of anxiety and worries  
• Finding memories and writing about anxiety and worries  
• Subtracting thoughts/misperceptions about anxiety and worries  
• Verbalize feelings after the subtraction |
| 6 | Throwing away of anger, irritation, and stress | • Talk about memories of anger, irritation, and stress  
• Finding memories and writing about anger, irritation, and stress  
• Subtracting thoughts/misperceptions about anger, irritation, and stress  
• Verbalize feelings after the subtraction |
| 7 | Throwing away of scary thoughts and fear | • Talk about memories of scary thoughts and fear  
• Finding memories and writing about scary thoughts and fear  
• Subtracting thoughts/misperceptions about scary thoughts and fear  
• Verbalize feelings after the subtraction |
| 8 | Throwing away of self (angry self, upset self, fighting self, stressed self, etc.) | • Talk about memories of self (what type of self exist?)  
• Finding memories and writing about self  
• Subtracting thoughts/misperceptions about self  
• Verbalize feelings after the subtraction |
3. Evaluative tools

A. Depression

Depression was measured using Children’s Depression Inventory (CDI) developed by Kovac (1981) which were translated into Korean by Han (1993). This measuring tool consisted of 27 items pertaining to 5 major factor areas related to negative mood, interpersonal problems, ineffectiveness, anhedonia, and negative self-esteem. The research by Han (1993) indicated Cronbach’s $\alpha$ as 0.81 and for this study Cronbach’s $\alpha$ was 0.810 (pretest) and 0.898 (posttest).

B. Social anxiety

To measure the elementary school students’ social anxiety, Social Anxiety Scale for Children – Revised (SASC-R) developed by LaCreca and Stone (1993), which was translated into Korean version by Moon and Oh (2002), was used. It included a total of 18 items on a 5-point scale; higher scores indicate severity of social anxiety. Moon and Oh (2002) stated Cronbach’s $\alpha$ as 0.87 and in this study it was 0.858 (pretest) and 0.937 (posttest).

C. Aggression

A Korean version (Park, 2007) of Aggression Questionnaire (BPAQ) developed by Buss and Perry (1992) was used to measure aggression levels of the students. In the study by Park (2007), Cronbach’s $\alpha$ as 0.91 and in this study it was 0.858 (pretest) and 0.888 (posttest).
D. Salivary cortisol testing

To evaluate the stress levels, physiological measurements of salivary cortisol were collected. Cortisol levels typically peak in the morning and are at lowest levels in the evening; and cortisol is secreted from the adrenal cortices in response to stress (Schupp, Simon & Corbett, 2013; Clow, Thorn, Evans & Hucklebridge, 2004; Shin, et al., 2011). It was deemed difficult to control for accurate sample collections at home for this study and the investigators decided to collect samples at the same time during school hours for consistency.

Data collection and analysis

The pretest data were collected from the experimental and control groups on the first day of the program in the first week. The posttest data were collected from the groups on the same last day of the program. To analyze the effect of the meditation program, t-tests were used to compare the pretest and posttest scores in depression, social anxiety, aggression, and salivary cortisol levels. Through ANCOVA (analysis of covariance), the differences in intervention results were analyzed with controlling for pretest scores.

Results of the research

The effect of the school-based meditation program on students’ depression is shown in Table 2. Before the program, depression mean score for the experimental group was 5.91; for the control group was 12.42. The experimental group’s scores were low, which was statistically significant (p<.001). After the program, the
The experimental group was lower (4.52) than the control group (12.39) (p<.001). Analyzing by ANCOVA to control for the previous scores, the experimental group was still lower (7.34) than the control group (8.79), but it was not statistically significant (p=.347). These changes in scores may be analyzed as occurring due to pretest average score differences, not due to the meditation program.

<Table 2> The effect of school-based Mind Subtraction meditation on depression

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest M (SD)</th>
<th>Pretest t</th>
<th>Posttest M (SD)</th>
<th>Posttest t</th>
<th>Adjusted Mean M (SE)</th>
<th>Adjusted Mean F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>5.91 (3.46)</td>
<td>-4.201***</td>
<td>4.52 (4.79)</td>
<td>-4.075***</td>
<td>7.34 (.92)</td>
<td>.907 (.347)</td>
</tr>
<tr>
<td>Control group</td>
<td>12.42 (5.98)</td>
<td></td>
<td>12.39 (7.53)</td>
<td></td>
<td>8.79 (1.06)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8.86 (5.73)</td>
<td></td>
<td>7.98 (7.23)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001

Table 3 shows analyzed results of social anxiety pretest and posttest. Mean pretest score for the experimental group was 31.18; and for the control group was 36.22, which showed no significance difference in social anxiety (p=.119). After the program, the social anxiety mean scores for the experimental group were lower (30.44) than the control group (46.29), which was statistically significant (p=.001). With ANCOVA to control for the previous pretest scores, the experimental group was lower (31.08) than the control group (44.20) (p=.001). This analysis demonstrated effectiveness of the school-based meditation program in reducing social anxiety, regardless of the pretest scoring on social anxiety.
<Table 3> The effect of school-based Mind Subtraction meditation on social anxiety

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Adjusted Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>t</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Experimental</td>
<td>31.18 (8.84)</td>
<td>-1.597</td>
<td>30.44 (8.81)</td>
</tr>
<tr>
<td>Control group</td>
<td>36.22 (11.14)</td>
<td>46.29 (15.38)</td>
<td>44.20 (2.71)</td>
</tr>
<tr>
<td>Total</td>
<td>33.45 (10.13)</td>
<td>37.18 (14.28)</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001

The analyzed effect on aggression (see Table 4) demonstrates pretest aggression mean scores for the experimental group was lower (36.36) than the control group (46.35), which was statistically significant (p=.012). After the program, the experimental group was lower (30.74) than the control group (45.94) (p<.001). Through an analysis using ANCOVA to control for the previous pretest scores, the experimental group was still lower (32.42) than the control group (44.12) (p=.001); demonstrating the effectiveness of the meditation program on reducing aggression, regardless of the pretest scores.

<Table 4> The effect of school-based Mind Subtraction meditation on aggression

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Adjusted Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>t</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Experimental</td>
<td>36.36 (7.78)</td>
<td>-2.719*</td>
<td>30.74 (8.17)</td>
</tr>
<tr>
<td>Control group</td>
<td>46.35 (13.52)</td>
<td>45.94 (11.61)</td>
<td>44.12 (2.46)</td>
</tr>
<tr>
<td>Total</td>
<td>40.72 (11.64)</td>
<td>36.97 (12.22)</td>
<td></td>
</tr>
</tbody>
</table>
The result of analysis on cortisol levels is listed on Table 5. Before the program, the experimental group’s mean score was 0.052 and the control group was 0.080, which was statistically significant (p=.024). After the program, the experimental group mean score was lower (0.046) than the control group (0.073) (p<.001). Using ANCOVA to control for the pretest scores, it was shown that the experimental group was lower (0.049) than the control group (0.070) (p=.003). Regardless of the pretest scores, the program was shown to be effective in lowering cortisol levels in the elementary school students.

<Table 5> The effect of school-based Mind Subtraction meditation on salivary cortisol levels

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Adjusted Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SE)    F</td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>.052 (.024)</td>
<td>.046 (.021)</td>
<td>.049 (.004)</td>
</tr>
<tr>
<td>group</td>
<td>-2.407*</td>
<td>-4.074***</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>.080 (.046)</td>
<td>.073 (.021)</td>
<td>.070 (.005)</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.064 (.038)</td>
<td>.058 (.025)</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001

Discussion

Even though social anxiety mean scores were significantly reduced after the meditation program was given, depression mean scores did not show statistically significant reductions. This was also noted in other research studies related to meditation (Lim, 1996; Lee, 2007). Korean research studies on adults with MBSR approaches
also reported a decrease in social anxiety, but were not able to reduce depression (Lee, Jun, Kim & Gim, 2012; Kim, Kim, Ahn, Seo & Kim, 2013). These results suggest that there may be factors other than anxiety that needs to be taken into account to improve depression.

Secondly, the results of this study showed that the meditation is helpful in improving mental health status of the elementary school students in terms of social anxiety, aggression, and cortisol levels. These results were similar to other previous Mind Subtraction meditation research studies (Kim & Cha, 2011; Kim, 2012; Kim, 2009).

Thirdly, this study also demonstrated effectiveness of the Mind Subtraction meditation in aggression reduction in the elementary school students. This finding is similar to other research studies which also showed a reduction in aggression after attending the meditation program (Cho, 2006; Choi, Lee & Cheon, 2006; Lee, 2009; Kang, 2013; Hwang, 2013; Singh et al., 2007; Kim, Yoo, Lee & Son, 2013).

Lastly, an analysis of salivary cortisol showed stress levels of the students were effectively reduced by the meditation program. Upon the analysis, the pretest cortisol levels for the experimental group were lower than the control group. After using ANCOVA to control for the pretest scores, the posttest cortisol levels were still shown to be lower than the control group; which demonstrated effectiveness of the program in reducing the cortisol levels.

Even though various research studies were conducted to evaluate stress through salivary cortisol levels (Bohnen, Nicolson, Sulon, & Jolles, 1991; Blood, Blood, Bennett, Simpson & Susman, 1994;
Alpers, Abelson, Wilhelm, & Roth, 2003), not many studies have examined salivary cortisol to explore the effects of meditation methods in children or youth. Although the results had shown positive effects, most meditation-related research studies used questionnaires to survey stress reduction. By seeking to measure a physiological indicator of stress, this study contributed to a new approach in evaluating the effectiveness of a school-based meditation program in elementary school students.

**Conclusion**

This study demonstrated improvements in social anxiety, aggression, and stress in elementary school students receiving the school-based Mind Subtraction meditation program. Because these positive effects of the meditation program were possible with a short duration of meditation sessions offered during the school year, this suggests practicality and usefulness of such program for application in a variety of diverse healthcare settings.

Limitations of this study and recommendations for future studies are discussed. First, the sample size was small and there was no randomization with the groups, which would impact generalization of the findings. In the future, it is suggested that a larger sample size and randomization of the groups should be considered for this type of study. Secondly, this study only examined pretest and posttest during 8 weeks and did not evaluate the changes on a more long-term basis. A follow up assessment of long term duration would be suggested in future studies. Thirdly, salivary cortisol levels were measured only once per pretest and posttest, and is a limitation. It is
recommended that in the future, repeated testing and analysis should be considered for salivary cortisol levels.

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