Clinical Study on the Effect of Aromatic Plants on Stress and Appetite Control in 20s Women

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Abstract

Purpose: This study explores the health complications, such as binge eating, resulting from extreme weight control methods driven by distorted body perception. In cases where the desired weight is not achieved, increased stress levels are observed. Notably, adolescents and young women constitute 1-3% of the nervosa prevalence rate, with women representing 90% of this demographic. This highlights the significance of addressing stress-induced nervosa. The objective is to evaluate the effects of inhaling pomegranate scent on stress and appetite control among women in their 20s.

Methods: Participants were instructed to spray a designated fragrance 1-2 times onto a scent strip, inhale it from approximately 5cm away from the nose, and then complete stress questionnaires and appetite evaluations. The data were processed and analyzed using SPSS 26.0.

Results: Among overweight participants, a decline in appetite was observed after inhaling the scent (M=4.11) compared to before (M=6.67). Despite this decrease, the variations in appetite across different groups did not show a statistically significant difference. However, the study found a notable reduction in stress levels associated with appetite after inhaling the pomegranate scent, with post-inhalation stress scores (M=20.38) being significantly lower than pre-inhalation scores (M=49.33). These results suggest the effectiveness of pomegranate scent in reducing appetite-related stress.

Conclusion: The findings indicate that inhaling pomegranate scent may help reduce stress levels in women in their 20s, aiding in the management of stress-related appetite issues. This research is expected to contribute valuable insights for the development of fragrance products aimed at reducing stress and controlling appetite.

Keywords: Fragrance ingredients, Scent inhalation, Appetite control, Stress, Punica granatum

Introduction

1. Necessity of research

In a social environment that excessively values thinness, young women are increasingly experiencing distorted perceptions of their own bodies. This trend leads to behaviors where individuals, even those who are normal or underweight, perceive themselves as overweight, resulting in extreme weight control practices (Kang & Kim 2015; Choi & Kim, 2019). These methods can cause health issues like nutritional imbalances and binge eating. In addition, failing to achieve the desired weight through such extreme measures often leads to emotional problems, including anxiety and stress. Stress related to body shape and weight also contributes significantly to nervosa (Nam et al., 2014). Individuals with this condition are highly susceptible to stress, frequently resorting to binge eating as a coping mechanism to escape negative emotions. Notably, adolescents and young women account for 1-3% of nervosa cases, with women making
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up 90% of this demographic (Ihm, 2011). Addressing stress-induced nervosa is thus essential. While medication is a common treatment approach, there is an increasing focus on alternative therapies, such as scent inhalation, which are cost-effective and efficient (Lee et al., 2011).

Current research on appetite control using inhalation methods is limited, especially regarding stress-induced binge eating behavior among young women, particularly those in college (Lee & Kim, 2015; Choi & Kim, 2019). In addition, stress-induced binge eating behavior among female college students in their 20s is an important issue that needs to be addressed. This study aimed to explore the impact of inhaling pomegranate scent on stress reduction and appetite control in female college students in their 20s both before and after experimental treatment. It proposes this intervention method as a potential approach to address stress-induced binge eating among this demographic.

2. Scent inhalation

Scent inhalation, a non-invasive technique, involves absorbing essential oils from natural substances through the skin or olfactory system (Kim et al., 2014). When these oils are inhaled, they pass through the olfactory nerves to the brain and are also absorbed by the lungs, affecting the body as a whole. This method is known to enhance physical immunity and mental stability, effectively reducing symptoms associated with stress, such as increased blood pressure, heart rate, and cortisol levels (Kim & Lee, 2021). Moreover, scent inhalation suppresses the secretion of adrenal hormones like adrenaline and facilitates the release of other hormones and neurotransmitters, improving mental functions and diminishing stress responses (Kim & Lee, 2021; Seo & Park, 2003).

3. The pomegranate

Belonging to the Punicaceae family, the pomegranate is a deciduous small tree or shrub known for its beneficial properties. Its flowers are recognized for preventing red spots and offering astringent and healing effects. Historically, parts of the pomegranate, including the bark, root, and fruit rind, have been used for their astringent, hemostatic, anti-pain, anti-inflammatory, and antibacterial qualities. The fruit itself is a rich source of minerals, vitamins (B1, B2, Niacin, C), amino acids, and fatty acids, which are effective for optic nerve health and energy metabolism. Ellagic acid, found in the rind, is noted for its antioxidant activity, reducing gastric acid secretion, and contributing to skin whitening and wrinkle prevention. The peel, high in tannins and plant estrogens, is also recognized for its effectiveness in reducing obesity (Rural Development Administration, 2020). Furthermore, Wee et al. (2015) confirmed in animal experiments that pomegranate concentrate affects menopausal symptoms such as osteoporosis, cardiovascular disease, and obesity. This effect was observed through improvements in abdominal and visceral fat as well as blood lipids in a concentration-dependent manner. Additionally, Na et al. (2016) discovered that serotonin, dopamine, and testosterone levels, which were increased due to sleep deprivation stress, were significantly reduced by the intake of pomegranate extract and caffeine.

4. Stress and appetite correlation

The societal emphasis on slimness, leading to distorted body image perceptions, often drives individuals towards extreme weight control measures. These methods, if not managed correctly, can lead to health problems such as anorexia and binge eating, with unachieved target weights contributing to anxiety and stress (Nam et al., 2009; Son, 2011). Binge eating, often a response to stress, can progress into nervosa, marked by consuming significantly larger amounts of food in a short period than usual, accompanied by behaviors like vomiting or medication use to prevent weight gain (Ihm, 2011). Nervosa is most common in individuals in their 20s to 30s, with women showing higher rates than men. Hart & Ollendick (1985) found that female college students exhibit more binge eating and nervosa symptoms compared to working women (Choi & Kim, 2019).

This pattern of repetitive binge eating and dieting in young women can hinder the maintenance of reduced weight or lead to weight gain due to irregular eating, potentially resulting in obesity. Moreover, the failure of extreme diets often increases feelings of depression, self-disgust, and guilt, highlighting the need to address binge eating behavior as a significant health concern (Chae, 2019).

Methods

1. Study participants

The study was conducted with 21 female students, aged 19 to 25, from E University in Seongnam-si, Gyeonggi-
do. Criteria for participant selection included no allergies to pomegranate, grapefruit, and sandalwood, absence of olfactory or neuropsychiatric disorders during the study, and exclusion of pregnant or medicated individuals. Detailed explanations of the study’s objectives and procedures were provided to the participants, and their consent for participation was obtained.

2. Research materials

In the experiment, grapefruit and sandalwood, selected based on their documented effectiveness in stress reduction, were used alongside pomegranate. The pomegranate fragrance, a high-concentration product from C&R Flavoring, was diluted to a 30% concentration. The grapefruit scent, comprised of 100% natural essential oil, and the sandalwood fragrance, a high-concentration fragrance oil, were both procured from Candleworks. A blend of these scents, in a 5:3:2 ratio of pomegranate, grapefruit, and sandalwood, based on studies showing their synergistic effects, was mixed with a perfume base to create a 15% eau de parfum for use in the study.

3. Study design

Participants first completed a pre-inhalation stress questionnaire and an appetite assessment, as detailed in Figure 1. They then inhaled the fragrance, sprayed 1–2 times onto a scent strip and held 5cm from the nose. Post-inhalation, they completed a post-stress questionnaire, and appetite assessments were conducted at 15-minute intervals for 60 minutes following the experiment.

We did not apply for an IRB because this study was experimental and did not involve any invasive activities such as drug administration or blood draws.

4. Measurement tools

1) Stress Response Inventory (SRI)

The stress questionnaire employed in the experiment was the Stress Response Inventory (SRI), developed by Koh et al. (1999). The SRI, designed to assess four types of stress responses—behavioral, cognitive, social, and emotional—consists of 39 items across four domains and utilizes a 5-point Likert scale for scoring, ranging from 0 to 4 points (Kim, 2006).

2) Appetite Assessment Scale

The Appetite Assessment Scale, created by Kim et al. (2005) was used to measure appetite. This scale assesses appetite at 15-minute intervals over a 60-minute duration, using a 10-section Visual Analog Scale (VAS) ranging from 0 (no appetite) to 10 (highest appetite).

5. Data analysis

Data was analyzed using the statistical software SPSS 26.0. Demographic statistics of participants were explored through frequency analysis. The impact of scent inhalation on stress was evaluated using paired-samples T-tests. Differences in appetite stages according to BMI were investigated using a two-way

<table>
<thead>
<tr>
<th>BMI</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (less than 18.4)</td>
<td>5</td>
<td>23.8</td>
</tr>
<tr>
<td>Normal (18.4 to 24.9)</td>
<td>6</td>
<td>28.6</td>
</tr>
<tr>
<td>Overweight (25.0 to 29.9)</td>
<td>9</td>
<td>42.9</td>
</tr>
<tr>
<td>Obesity (30.0 to 34.9)</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 1. BMI body mass index frequency
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repeated-measures ANOVA. The significance threshold for the experiment was set at a confidence interval of $p<0.05$.

**Results and Discussion**

1. **Demographic statistics of participants**

1) Body mass index (BMI) frequency

The BMI distribution among the study participants is shown in Table 1. 5 individuals were underweight (23.8%), 6 were of normal weight (28.6%), 9 were overweight (42.9%), and 1 was obese (4.8%), as shown in Table 1.

2. **Assessment of pre- and post-stress effects**

Table 2 presents the analysis of stress levels before and after scent inhalation. The findings show a significant reduction in post-inhalation stress scores ($M=20.38$) compared to pre-inhalation scores ($M=49.33$), with statistical significance ($t=6.555$, $p<0.001$). This indicates that inhaling the pomegranate scent effectively reduces stress.

3. **Evaluation of pre- and post-appetite effects**

In this study, variations in BMI and appetite at six different stages were observed among the participants. The study revealed that in overweight individuals, there was a decrease in appetite after inhaling the scent (post-inhalation $M=4.11$) compared to before (pre-inhalation $M=6.67$) as shown in Table 3. However, such a reduction in appetite was not observed in participants categorized as underweight, normal weight, or obese. These results indicate that the effectiveness of inhaling pomegranate scent for appetite control appears to be limited, prompting the need for further investigation.

The analysis focused on differences in appetite stages related to BMI, as shown in Table 4, demonstrated that the interaction effect between appetite scores, groups of participants, and the timing of measurements ($F^2=0.367$, $p>0.05$) did not show statistical significance. This finding suggests that there were no significant differences in appetite changes among various groups. The variations in appetite scores, when analyzed through repeated measures analysis of variance, considering both the group and timing of measurements, were found no change. As a result, the study concludes that the effect of pomegranate scent inhalation on controlling appetite is minimal.

This study was conducted to determine the effect of inhaling

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sortation</th>
<th>Average</th>
<th>Standard</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td>Before scent inhalation</td>
<td>49.33</td>
<td>29.67</td>
<td>6.555***</td>
<td>0.000</td>
</tr>
<tr>
<td>Stress</td>
<td>After scent inhalation</td>
<td>20.38</td>
<td>19.69</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sortation</th>
<th>Underweight</th>
<th>Normal</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appetite</td>
<td>Before</td>
<td>M 3.60, SD 2.79</td>
<td>M 5.50, SD 2.88</td>
<td>M 6.67, SD 2.50</td>
<td>M 2.00, SD 0.00</td>
</tr>
<tr>
<td>Appetite</td>
<td>Immediately Scent inhalation</td>
<td>M 3.60, SD 1.95</td>
<td>M 6.50, SD 2.07</td>
<td>M 5.56, SD 2.35</td>
<td>M 2.00, SD 0.00</td>
</tr>
<tr>
<td>Appetite</td>
<td>After 15 min</td>
<td>M 3.80, SD 1.48</td>
<td>M 6.00, SD 2.53</td>
<td>M 5.33, SD 2.12</td>
<td>M 5.00, SD 0.00</td>
</tr>
<tr>
<td>Appetite</td>
<td>After 30 min</td>
<td>M 3.80, SD 1.30</td>
<td>M 6.50, SD 2.07</td>
<td>M 5.22, SD 2.11</td>
<td>M 5.00, SD 0.00</td>
</tr>
<tr>
<td>Appetite</td>
<td>After 45 min</td>
<td>M 3.80, SD 1.92</td>
<td>M 6.33, SD 1.03</td>
<td>M 4.78, SD 2.33</td>
<td>M 6.00, SD 0.00</td>
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<tr>
<td>Appetite</td>
<td>After 60 min</td>
<td>M 4.20, SD 1.92</td>
<td>M 6.33, SD 1.63</td>
<td>M 4.11, SD 2.57</td>
<td>M 6.00, SD 0.00</td>
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</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td>Inter group</td>
<td>BMI</td>
<td>98.823</td>
<td>3.00</td>
<td>32.941</td>
<td>2.468</td>
<td>0.097</td>
<td></td>
</tr>
<tr>
<td>Appetite</td>
<td>Period</td>
<td>7.502</td>
<td>1.490</td>
<td>5.036</td>
<td>0.487</td>
<td>0.566</td>
<td></td>
</tr>
<tr>
<td>Within group</td>
<td>BMI× Period</td>
<td>52.283</td>
<td>4.469</td>
<td>11.698</td>
<td>1.131</td>
<td>0.367</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>262.050</td>
<td>25.327</td>
<td>10.347</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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pomegranate fragrance on stress and appetite control in female university students in their 20s. As a result of inhaling a 15% eau de parfum containing pomegranate, grapefruit and sandalwood in a 5:3:2 ratio, the post–inhala
tion stress score was significantly lower than the pre–inhala
tion stress score, confirming that pomegranate scent inhalation is an effective inter
vention for stress reduction. These results are consistent with previous studies that have confirmed the effectiveness
of scent inhalation for stress reduction, such as Jung & Song
(2018), who confirmed that scent inhalation with a 2:2:1 blend
of bergamot, lavender, and sandalwood was effective in reducing stress in intensive care unit nurses, Nam et al., (2009), who
confirmed that a 2:1:1 blend of lavender, bergamot, lemon,
and rose was effective in reducing stress in intensive care unit
nurses: 1:2:1, and Ko et al., (2013), who found that inhalation
of a blend of meichang, lavender, and rose in a ratio of 3:5:2
was effective in reducing anxiety and stress in nursing students,
which is similar to the present study. As a result of the above
study, it is believed that it can be used as an appropriate stress
management method that can be easily applied to female
college students in their 20s who experience binge eating due to
stress without being limited by time and place. However, since
this study was conducted only on students at E University in
Seongnam-si, Gyeonggi-do, and the results of appetite control
before and after inhalation were not available, we suggest a
follow–up study on the effects of pomegranate scent inhalation
on stress and appetite control on female college students in their
20s nationwide based on the results of this study.

For data analysis, the SPSS 26.0 software was utilized. Results
showed that in overweight participants, appetite decreased
after inhaling the scent (post–inhala
tion M=4.11) compared
to before (pre–inhala
tion M=6.67). However, this change in
appetite was not statistically significant when compared across
different groups, suggesting that pomegranate scent inhalation’s
effect on appetite control is limited. Conversely, a significant
reduction in stress levels was observed post–inhala
tion (M=20.38)
in comparison to pre–inhala
tion (M=49.33), indicating the
scent’s effectiveness in reducing stress. Thus, the pomegranate
scent extract appears to be helpful in decreasing stress related
to appetite control among women in their 20s, which could
potentially aid in preventing stress–induced binge eating.

Therefore, based on the results of this study, we propose a
follow–up study on stress and appetite control using
pomegranate scent inhalation among female university students
in their 20s nationwide. We also expect that the results of this
study will provide basic data for future stress management
methods using pomegranate fragrance and for the development
of fragrance products related to stress improvement and appetite
control.

Author’s contribution

YJC, NYK and GRK contributed equally to this work. YJC
and GRK designed the research and analyzed the data, NYK
collected data, YJC, NYK and GRK wrote the manuscript
with assistance from DYP, SHC, GHK and YHP.

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Korea; Ga Hee Kim (Researcher), Wellmade Household &
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References


향기 식물을 이용한 20대 여성 스트레스 및 식욕 조절 임상 연구

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목적: 왜곡된 체형 인식으로 인해 부적절한 방법으로 무리한 체중조절을 시도하는 경우 폭식 등의 건강문제를 초래할 수 있으며, 이 상한 체중조절에 불과하고 목표 체중과 달성하지 못한 경우 스트레스와 같은 정서적 문제를 초래하기도 한다. 스트레스를 감소시키기 위해 폭식을 하게 되면 신경성 폭식증으로 이어지는데, 신경성 유병률 중 청소년과 젊은 여성이 1-3%를 차지하고 있으며, 그 가운데 90%가 여성이었다. 따라서 스트레스로 인한 신경성 폭식증은 중요한 문제로 다루어야 할 필요가 있다. 따라서 본 연구는 20대 여성대상자들 대상으로 석류 향을 흡입하였을 때, 스트레스와 식욕 조절 효과가 있는지를 검증하고자 한다. 방법: 실험 대상자들에게 제공된 향을 시험지에 1-2회 분사하여 코에서 5 cm 떨어뜨려 흡입한 뒤, 스트레스 설문지와 식욕평가표를 작성하도록 하였으며, 그 결과는 SPSS 26.0을 이용하여 분석하였다. 결과: 과체중인 실험 대상자들의 식욕이 향 흡입 전(M=6.67)보다 흡입 후(M=4.11) 점차 감소하였으나, 집단에 따른 식욕의 변화와 비교하였을 때 유의한 차이를 보이지 않았다. 하지만 식욕과 관련이 있는 스트레스에 대해서 분석한 결과 석류 향 흡입 후 스트레스 점수(M=20.38)가 석류 향 흡입 전 스트레스 점수(M=49.33)보다 유의하게 높은 것을 확인할 수 있었다. 이를 통해 석류 향이 식욕 조절과 관련이 있는 스트레스 감소에 도움이 된다고 볼 수 있다. 결론: 석류 향 흡입은 20 대 여성의 스트레스 감소를 감소시켜 식욕조절과 관련된 스트레스 감소에 도움이 될 수 있다고 볼 수 있으며, 본 연구 결과가 향후 스트레스 감소 및 식욕조절과 관련된 향기 제품 개발의 기초자료가 되기를 기대한다.

핵심어: 향기성분, 향기흡입, 심리적 식욕조절, 스트레스, 석류

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中文摘要

芳香植物对 20 多岁女性压力和食欲控制作用的临床研究

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目的: 这项研究探讨了由扭曲的身体知觉驱动的极端体重控制方法导致的健康并发症，例如暴饮暴食。如果未达到所需体重，则会观察到压力水平增加。值得注意的是，青少年和年轻女性占神经症患病率的 1-3%，其中女性占该人群的 90%。这凸显了解决压力引起的神经紧张的重要性。目的是评估吸入石榴香味对 20 多岁女性压力和食欲控制的影响。方法: 指导参与者将指定香味喷洒在香条上 1-2 次，从距鼻子约 5 厘米处吸入，然后完成压力问卷和食欲评估。使用 SPSS 26.0 对数据进行处理和分析。结果: 在超重的参与者中，与之前 (M=6.67) 相比，吸入气味后 (M=4.11) 食欲下降。尽管有所下降，但不同群体的食欲差异并未显示出统计学上的显著差异。然而，研究发现，吸入石榴香味后，与食欲相关的压力水平显著降低，吸入后压力评分 (M=20.38) 显著低于吸入前评分 (M=49.33)。这些结果表明石榴香味可以有效减少与食欲相关的压力。结论: 研究结果表明，吸入石榴香味可能有助于降低 20 多岁女性的压力水平，有助于管理与压力相关的食欲问题。这项研究预计将为开发旨在减轻压力和控制食欲的香料产品提供宝贵的见解。

关键词: 香氛成分，香氛吸入，心理食欲控制，压力，石榴