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Article

The Effect of Swedish Massage and Lavender Aromatherapy on Adolescent Anxiety

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Abstract: Anxiety is a psychological problem frequently experienced by adolescents and can impact learning concentration, academic achievement, quality of life, and mental health. Swedish massage and lavender aromatherapy are complementary non-pharmacological approaches that provide tactile and olfactory relaxation stimuli, respectively. A quasi-experimental pretest–posttest control group design involved 44 female adolescents (22 intervention, 22 control) selected through purposive sampling. The intervention consisted of approximately 15-minute sessions, twice weekly for two weeks (four sessions). The control group received standard care. Anxiety was measured using the Hamilton Anxiety Rating Scale (HARS). Within-group differences were analyzed using Wilcoxon and Mann–Whitney U tests. The intervention group's mean HARS score decreased from 23.59 ± 9.80 to 12.27 ± 5.20 (reduction of 11.32 points), while the control group's score decreased from 21.50 ± 4.84 to 21.27 ± 4.29 (reduction of 0.23 points). The within-group reduction was significant in the intervention group ($p < 0.001$), but not in the control group ($p = 0.197$). The between-group comparison was also significant ($U = 39.00$; $Z = -4.777$; $p < 0.001$). The combined intervention was associated with lower anxiety scores among the female adolescents studied during the two-week period. Since the interventions were not evaluated separately and the study used a small, non-randomized sample without long-term follow-up, the findings should not be generalized beyond the study population or period.

Keywords: adolescent, anxiety, lavender aromatherapy, swedish massage, women

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1. Introduction

Adolescence is a developmental phase marked by significant biological, psychological, and social changes. During this period, adolescents face various demands, such as academic pressure, social dynamics, and family and environmental expectations. These conditions make adolescents vulnerable to anxiety.[1].

Teenagers aged 14-17 are in middle adolescence, facing various academic and social demands and preparing for the transition to the workforce or higher education. This period is marked by psychological changes and environmental pressures that can increase the risk of anxiety.[2]Anxiety is an emotional response in the form of feelings of fear, worry, and tension accompanied by physiological and behavioral symptoms, which arise when an individual faces a situation that is perceived as threatening or challenging. Anxiety is often triggered by academic factors such as final exams, vocational practice assignments, and graduation demands, as well as psychosocial

factors such as peer pressure, family expectations, and future uncertainty. In addition, biological and developmental factors in late adolescence, including hormonal changes and the formation of self-identity, also play a role in the emergence of anxiety. Changes in anxiety make adolescents more susceptible to emotional disorders, especially anxiety, which if not handled properly can impact academic achievement, social relationships, quality of life, and even increase the risk of mental disorders in adulthood.[3].

According to data from the World Health Organization (WHO), anxiety disorders are a leading cause of disease burden in adolescents, with a prevalence of approximately 5.3% in adolescents aged 15–19 years. Furthermore, anxiety disorders are a major contributor to Disability-Adjusted Life Years (DALYs) in the global adolescent population. Data from the 2022 Indonesia National Adolescent Mental Health Survey (I-NAMHS) showed that 3.7% of adolescents aged 10–17 years experienced anxiety disorders, while 5.5% experienced general mental disorders. Meanwhile, data from Central Java in 2025 indicated that 20% of adolescents aged 15–19 years were identified as having mental health disorders, requiring further assistance.[4].

Untreated anxiety can lead to decreased concentration in learning, sleep disturbances, decreased academic achievement, and increased risk of mental health disorders in adulthood. Various efforts have been made to reduce anxiety in adolescents, using both pharmacological and non-pharmacological approaches. However, pharmacological interventions often have limitations, such as potential side effects and low medication adherence in adolescents. Untreated anxiety can lead to decreased academic achievement, mental health disorders, and quality of life.[5].

Various efforts have been made to reduce anxiety in adolescents through pharmacological and non-pharmacological approaches. However, non-pharmacological interventions such as relaxation techniques, massage, and aromatherapy may provide complementary approaches to support anxiety management [5]. Swedish massage is a non-pharmacological intervention involving gentle and rhythmic movements that can promote physical relaxation and may support parasympathetic activity. Previous research has reported that a 15-minute Swedish massage was associated with reduced anxiety levels in patients experiencing anxiety before minor surgery. These findings suggest that Swedish massage may provide a practical relaxation-based approach for individuals experiencing anxiety [6]. Previous research by Baskoro (2024) found that providing a 15-minute Swedish massage can reduce anxiety in patients before minor surgery who experienced anxiety with an average level of anxiety before, namely moderate with an APAIS score of 19-21 and after in the mild category with a score of 12-14.[3].

In addition to massage therapy, lavender aromatherapy has been used as a complementary approach for anxiety. Lavender contains compounds such as linalool and linalyl acetate that have been associated with relaxing and anxiolytic effects through olfactory stimulation [7]. The results of previous research from Safitri (2025) lavender aromatherapy through a diffuser for 15 minutes can reduce the anxiety level of eighth grade adolescents before the exam with an average anxiety level before being 31.04 and after being 10.08. These findings provide a basis for considering lavender aromatherapy as another complementary approach to anxiety management.[3].

The combination of Swedish massage and lavender aromatherapy was considered in this study because the two interventions provide complementary forms of sensory stimulation [8]. In line with Anoraga's research (2024), sweedish massage and lavender aromatherapy given twice a week with a duration of 15-30 minutes for 2 weeks can reduce stress in hypertension sufferers before the moderate stress level of

70% and after the moderate stress level of 55% and no stress 35% [9]. Swedish massage primarily provides tactile stimulation through rhythmic physical contact, whereas lavender aromatherapy provides olfactory stimulation through the inhalation of lavender aroma. Simultaneous exposure to these stimuli may support a more comprehensive relaxation experience than either sensory stimulus alone. Previous research has also examined the combination of Swedish massage and lavender aromatherapy and reported changes in stress-related outcomes. However, the available evidence has largely involved different populations and outcomes, and evidence specifically examining the combined intervention for anxiety among adolescents remains limited.

In the present study, Swedish massage was administered concurrently with lavender aromatherapy twice per week for two weeks, with each session lasting approximately 15 minutes. This intervention protocol was selected to provide repeated relaxation exposure during the study period. However, because the present study did not include separate Swedish massage-only and lavender aromatherapy-only groups, the independent contribution of each intervention component cannot be determined. Therefore, the findings are intended to describe the association between the combined intervention and changes in anxiety within the adolescent population studied during the two-week intervention period.

Although Swedish massage and lavender aromatherapy have each been investigated as complementary approaches to anxiety or stress, research specifically evaluating their combined application among adolescents remains limited. Therefore, this study was conducted to analyze the association between combined Swedish massage and lavender aromatherapy and anxiety levels among female adolescents. The findings are expected to provide preliminary evidence regarding the use of this combined approach within the specific adolescent population and intervention period examined in this study.

2. Materials and Methods

This study used a quasi-experimental design with a pretest–posttest control group design approach to analyze the effect of Swedish massage and lavender aromatherapy on adolescent anxiety levels. The study population was 50 female adolescents from RW 04 in Mertasinga Village, North Cilacap District. The sample consisted of 44 respondents determined using purposive sampling based on the Slovin formula, then divided into an intervention group (n=22) and a control group (n=22). Group allocation was determined by the researcher based on specific considerations.

The inclusion criteria were female adolescents who experienced anxiety and were willing to participate in the study. Participants were excluded if they were receiving pharmacological treatment for anxiety, had a known allergy to lavender, had a skin condition in the area to be massaged, or were unwilling to participate. Participants who withdrew from the study, did not complete the intervention sessions or assessment procedures, or developed health conditions that prevented them from completing the intervention were classified as dropouts. The combined Swedish massage and lavender aromatherapy intervention was administered twice a week for two consecutive weeks, resulting in a total of four intervention sessions. Each session lasted approximately 15 minutes. Swedish massage was performed using five techniques: effleurage, petrissage, friction, tapotement, and vibration, with light to moderate pressure. The lavender essential oil preparation was made by mixing 2–3 drops of lavender oil with 10 mL of virgin coconut oil (VCO). The lavender preparation was applied during the massage in a calm and comfortable environment. Specifically, lavender aromatherapy was administered through topical application during the

massage, in accordance with the intervention protocol used in this study. The control group received standard care without the combined Swedish massage and lavender aromatherapy intervention. Anxiety levels were measured using the Hamilton Anxiety Rating Scale (HARS), which consists of 14 items with a total score ranging from 0 to 56. HARS assessments were conducted before the intervention (pretest) and after the intervention period was completed (posttest). The HARS was administered and scored by the researcher in accordance with standardized HARS assessment procedures. To ensure measurement consistency, the same assessment procedures were applied at both pretest and posttest. Participants were informed about the study procedures, potential benefits, possible risks, confidentiality of information, and their right to withdraw from the study. Participant safety was monitored throughout the intervention in accordance with the research protocol. Before statistical analysis, the data distribution was examined to assess normality. Differences in anxiety scores before and after the intervention within each group were analyzed using the Wilcoxon signed-rank test, whereas differences in changes in anxiety scores between the intervention and control groups were analyzed using the Mann–Whitney U test.

3. Results

3.1 Characteristics of Respondents' Anxiety Levels

Table 1. Respondent Characteristics

Characteristics	Intervention Group n (%)	Control Group n (%)	Total n (%)
Age (years)			
14 years old	2 (9.09%)	3 (13.64%)	5 (11.36%)
15 years old	4 (18.18%)	3 (13.64%)	7 (15.91%)
16 years old	6 (27.27%)	5 (22.73%)	11 (25.00%)
17 years old	10 (45.45%)	11 (50.00%)	21 (47.73%)
Education Level			
Junior High School	3 (13.64%)	4 (18.18%)	7 (15.91%)
Senior High School / Vocational High School	19 (86.36%)	18 (81.82%)	37 (84.09%)

This study involved 44 respondents evenly divided into intervention (n = 22) and control (n = 22) groups (Table 1). Based on age characteristics, the majority of respondents were 17 years old, accounting for 45.45% in the intervention group and 50.00% in the control group (47.73% in total). In terms of education level, most respondents were enrolled in Senior High School / Vocational High School, comprising 86.36% in the intervention group and 81.82% in the control group (84.09% in total). Overall, the distribution of age and education characteristics across both groups demonstrated a homogenous profile.

3.1.1 Frequency of Respondents' Anxiety Level Categories (HARS) Before Intervention

Table 2. Frequency Distribution of Anxiety Level Categories (HARS) Before Intervention

HARS Category	Intervention Group n (%)	Control Group n (%)
No worries	2 (9.1)	0 (0.0)
Mild anxiety	8 (36.4)	10 (45.5)
Moderate anxiety	7 (31.8)	9 (40.9)
Severe anxiety	2 (9.1)	3 (13.6)
Extreme anxiety	3 (13.6)	0 (0.0)
Total	22 (100)	22 (100)

Based on Table 2, the results of the anxiety level measurement (HARS) before the intervention, most adolescents in the intervention group were in the mild anxiety category, as many as 8 respondents (36.4%), followed by moderate anxiety as many as 7 respondents (31.8%), very severe anxiety as many as 3 respondents (13.6%), and 2 respondents (9.1%) were in the no anxiety and severe anxiety categories. In the control group, most respondents were also in the mild anxiety category, as many as 10 respondents (45.5%), followed by moderate anxiety as many as 9 respondents (40.9%) and severe anxiety as many as 3 respondents (13.6%). There were no respondents in the no anxiety or very severe anxiety category in the control group. This distribution indicates that the initial conditions of both groups were dominated by mild to moderate anxiety levels. This category data is in accordance with the descriptive statistical output which shows the average HARS category of 2.77 ± 1.15 in the intervention group and 2.68 ± 0.78 in the control group.

3.1.1Frequency of Respondents' Anxiety Level Categories (HARS) After Intervention

Table 3. Frequency Distribution of Anxiety Level Categories (HARS) After Intervention

HARS Category	Intervention Group n (%)	Control Group n (%)
No worries	13 (59.1)	0 (0.0)
Mild anxiety	8 (36.4)	10 (45.5)
Moderate anxiety	1 (4.5)	9 (40.9)
Severe anxiety	0 (0.0)	3 (13.6)
Extreme anxiety	0 (0.0)	0 (0.0)
Total	22 (100)	22 (100)

Based on Table 3. The results of the anxiety level measurement (HARS) show that the provision of Swedish massage and lavender aromatherapy, the majority of respondents in the intervention group experienced a decrease in anxiety levels to no anxiety as many as 13 respondents (59.1%), while 8 respondents (36.4%) were still in the mild anxiety category and only 1 respondent (4.5%) was in the moderate anxiety category. There were no more respondents experiencing severe or very severe anxiety. In contrast, the distribution of categories in the control group was relatively

unchanged, with the majority of respondents remaining in the mild anxiety category (45.5%) and moderate anxiety (40.9%), and there were still 3 respondents (13.6%) with severe anxiety. This finding is in line with the average value of the HARS category which decreased from 2.77 to 1.55 in the intervention group, while the control group remained relatively constant (2.68 to 2.73).

3.2 Differences in the levels of anxiety of adolescents before and after in the intervention group and the control group

Table 4. Level of anxiety of adolescents before and after in the intervention group and control group

Group	Before			After			Difference	P value
	Min	Max	Mean±SD	Min	Max	Mean±SD		
Intervention	9	47	23.59 ± 9.80	3	23	12.27 ± 5.20	11.32	0,000
Control	14	30	21.50 ± 4.84	15	29	21.27 ± 4.29	0.23	0.197

Based on Table 4, In the intervention group, the mean HARS score decreased from 23.59 ± 9.80 before the intervention to 12.27 ± 5.20 after the intervention, representing a mean reduction of 11.32 points. The Wilcoxon signed-rank test indicated a statistically significant pretest–posttest difference ($Z = -3.703$, $p < 0.001$), with an estimated effect size of $r = 0.79$. In the control group, the mean HARS score decreased slightly from 21.50 ± 4.84 to 21.27 ± 4.29, representing a mean reduction of 0.23 points. This change was not statistically significant ($Z = -1.291$, $p = 0.197$), with an estimated effect size of $r = 0.28$. Descriptively, the difference in mean reductions between the intervention and control groups was 11.09 points. Thus, descriptively, the decrease in anxiety scores was much greater in the group that received Swedish massage and lavender aromatherapy..

3.3. Influence Swedish Massage and Lavender AromatherapyOn Adolescent Anxiety

Table 5. Differences in anxiety levels of adolescents in the intervention group and the control group

Group	n	Mean rank	r	P value
Intervention	22	13.27	0.72	0,000
Control	22	31.73		

Based on Table 5. The Mann–Whitney U test comparing the HARS-related variable reported in the SPSS output showed a statistically significant difference between the groups ($U = 39.00$, $Z = -4.777$, $p < 0.001$). The mean rank was 13.27 in the intervention group and 31.73 in the control group. The corresponding effect size calculated as $|Z|/\sqrt{N}$ was $r = 0.72$, indicating a large rank-based effect. Thus, the provision of Swedish massage and lavender aromatherapy shows a significant effect on the level of anxiety of adolescents compared to the control group.

4. Discussion

The findings of this study indicate that the combined Swedish massage and lavender aromatherapy intervention was associated with a greater reduction in anxiety scores among female adolescents than standard care. The mean Hamilton

Anxiety Rating Scale (HARS) score in the intervention group decreased from 23.59 ± 9.80 at baseline to 12.27 ± 5.20 after the two-week intervention, representing a reduction of 11.32 points. In contrast, the control group showed a relatively small decrease, from 21.50 ± 4.84 to 21.27 ± 4.29, corresponding to a reduction of 0.23 points. These findings were supported by the within-group analysis and the between-group comparison, which demonstrated a statistically significant difference ($p < 0.001$). However, these results should be interpreted as evidence of an association between the combined intervention and reduced anxiety rather than definitive proof that the intervention alone caused the observed improvement.

The baseline characteristics of the intervention and control groups provide important context for interpreting these findings. Both groups consisted of 22 participants, and their age and educational distributions were descriptively similar. Participants aged 17 years constituted 45.45% of the intervention group and 50.00% of the control group, while senior high school or vocational high school students accounted for 86.36% and 81.82%, respectively. Regarding baseline anxiety categories, mild to moderate anxiety predominated in both groups. Nevertheless, some differences were present: the intervention group included two participants without anxiety and three with very severe anxiety, whereas the control group had no participants in either category. The baseline mean HARS scores were 23.59 in the intervention group and 21.50 in the control group. Although these findings suggest some descriptive similarities between the groups, differences in the distribution of anxiety categories and the non-random allocation of participants should be considered when interpreting the results. Therefore, similarity in demographic characteristics alone should not be regarded as evidence of complete baseline equivalence.

The results showed that Swedish massage and lavender aromatherapy twice a week for two weeks resulted in significant changes in anxiety levels in the intervention group. This change was demonstrated by a shift in the distribution of anxiety categories toward lower levels after the intervention. The number of respondents experiencing no anxiety increased from 2 (9.1%) before the intervention to 13 (59.1%) after the intervention. In the moderate anxiety category, the number of respondents decreased from 7 (31.8%) to only 1 (4.5%).

The statistical methods were selected according to the paired pretest–posttest design and the assessment of data distribution. The Wilcoxon signed-rank test was used to examine changes in HARS scores within each group because the measurements were obtained from the same participants before and after the intervention, and a non-parametric approach was appropriate for the data characteristics. The Mann–Whitney U test was used for the comparison between the independent intervention and control groups. For this comparison, the variable analyzed should be explicitly identified in the statistical methods and results; if the intention is to compare intervention-related changes, the analysis should use each participant's change score between pretest and posttest. The Wilcoxon test showed a significant reduction in the intervention group ($Z = -3.703$, $p < 0.001$), whereas the change in the control group was not statistically significant ($Z = -1.291$, $p = 0.197$). The between-group analysis also indicated a statistically significant difference ($U = 39.00$, $Z = -4.777$, $p < 0.001$), with reported mean ranks of 13.27 and 31.73 for the intervention and control groups, respectively. These findings support a difference between the study groups; however, the exact interpretation of the between-group test depends on whether the analyzed variable was the posttest score or the change score. The normality assessment results and the precise variable entered into the Mann–Whitney test should therefore be clearly reported to ensure methodological transparency.

Furthermore, no more respondents with severe or very severe anxiety were found after the intervention. These findings indicate that Swedish massage combined with lavender aromatherapy is not only associated with quantitative changes in anxiety scores but also with a shift in the distribution of respondents' anxiety levels toward lower levels.

Anxiety can be accompanied by various somatic responses, such as muscle tension, restlessness, changes in breathing patterns, and increased alertness. These conditions indicate that anxiety is not only a psychological experience but also involves the body's response to stress. In adolescents, anxiety is often triggered by biological factors, academic demands, social relationships, rapid changes in self-identity, neurotransmitter imbalances, and autonomic nervous system responses [10]. Untreated anxiety disorders are associated with depression, sleep disturbances, and a broader decline in quality of life. Effective and safe interventions for this population represent an urgent public health need [11].

The significant reduction in anxiety in the intervention group can be understood from the characteristics of Swedish massage, which provides structured tactile stimulation. In this study, Swedish massage was performed using effleurage, petrissage, friction, tapotement, and vibration techniques with light to moderate pressure for approximately 15 minutes per session. The intervention was delivered twice a week for two weeks and conducted in a calm and comfortable environment. This sequence allowed participants to experience targeted relaxation, both through the physical stimulus of touch and through a calmer psychological state during the intervention.

Swedish massage is a massage technique that focuses on soft tissue manipulation through gentle movements such as effleurage, petrissage, friction, tapotement, and vibration [5]. A classic massage technique that aims to promote physical relaxation by stimulating the parasympathetic nervous system, increasing blood circulation, and reducing stress hormones. Evidence suggests that massage can lower cortisol (the stress hormone) levels, increase the production of endorphins and serotonin, which play a role in regulating mood and stress, and increase the activity of the parasympathetic nervous system, which is associated with feelings of calm [12]. Mehrabian (2022) reported that aromatherapy massage (lavender, chamomile, rosemary) significantly reduced anxiety scores ($p < 0.0001$) compared to the control group. Intervention: 20-minute massage, 3x/week for 6 weeks [12].

This mechanism can be linked to the autonomic nervous system's response to relaxation stimulation. Anxiety is generally associated with increased alertness and physiological activation, while the experience of relaxation can help reduce this tension. Regular, soothing touch during massage has the potential to support the dominance of the parasympathetic response, leading to greater relaxation. Massage, through regular, rhythmic touch, can provide a calming sensory stimulus, helping to reduce the physical tension that accompanies anxiety. The repetitive massage movements also provide sensory attention to the body, allowing respondents to focus more on the sensation of relaxation experienced during the intervention. Thus, the physical relaxation effects achieved through massage have the potential to support a reduction in overall anxiety responses. Lavender aromatherapy is thought to contribute to anxiety reduction through stimulation of the olfactory system. Volatile compounds found in lavender, particularly linalool and linalyl acetate, have been extensively studied for their potential relaxing effects. When lavender scent is inhaled, the odor stimulus is received through the olfactory system and subsequently connects to areas of the brain involved in emotional regulation and stress responses. Therefore, exposure to lavender aroma during interventions has the potential to help

create a calmer psychological state. This effect becomes even more relevant when aromatherapy is combined with other physically relaxing activities, such as massage. This research aligns with research by Rapaport et al. (2021), which compared responses after six and twelve weeks of Swedish Massage. In 11 participants who underwent follow-up therapy, the average HARS score decreased from 19.91 at baseline to 10.00 after six weeks and 6.91 after twelve weeks. The largest decrease occurred in the first six weeks, amounting to 9.91 points, while the following six weeks resulted in a decrease of 3.09 points. These findings suggest that the benefits of Swedish Massage on anxiety are particularly evident in the initial phase of the intervention.[13].

Massage combined with aromatherapy has a greater effect on reducing anxiety than massage without aromatherapy. This demonstrates the synergistic potential of tactile stimulation (massage) and smell (aromatherapy) in influencing the autonomic and central nervous systems [14]. The combination of Swedish massage and lavender aromatherapy is thought to have a synergistic effect in reducing anxiety. Swedish massage provides physical relaxation through stimulation of the parasympathetic nervous system, while lavender aromatherapy has a psychological effect through the limbic system. The combination of these two therapies is expected to significantly reduce anxiety scores in adolescents compared to no intervention.[5]. Systematic research shows that lavender aromatherapy is effective in reducing anxiety in adult and adolescent populations, both in clinical and nonclinical settings.[8]. Aromatherapy can improve sleep quality and reduce symptoms of stress, which are closely correlated with anxiety.[11][15]. Thus, lavender aromatherapy offers a relatively safe and acceptable approach to the adolescent population. Nevertheless, the present study evaluated the combined intervention and did not include separate massage-only and aromatherapy-only groups. Consequently, the independent contribution of each component and the presence of a synergistic effect cannot be established. Furthermore, the observed improvement may have been influenced by other factors, including the attention and interpersonal interaction provided by the researchers, the opportunity to rest during the sessions, expectations regarding the intervention, and changes in participants' social or environmental circumstances during the study period. Because these factors were not independently controlled or measured, their possible contributions cannot be excluded. The results should therefore be interpreted cautiously and should not be attributed exclusively to the combined intervention.

In addition to frequency of administration, the duration of the intervention may also be a contributing factor to the study's results. In this study, the intervention was administered for approximately 15 minutes per session, four times over two weeks. Repeated administration allows respondents to experience relaxation more than once, so the intervention's effects are not dependent on a single exposure. The approximately 15-minute duration also allows respondents to experience the relaxation process without requiring excessive time. However, the relationship between frequency, duration, and effect size cannot be definitively determined based on this study because there were no groups with different intervention frequencies or durations.

The advantage of this study's intervention lies in the simultaneous administration of Swedish massage and lavender aromatherapy. Both interventions provide different but complementary forms of stimulation. Swedish massage provides tactile stimulation through touch and rhythmic movement, while lavender aromatherapy provides olfactory stimulation through aroma. Theoretically, this combination can create a more comprehensive multisensory relaxation experience

than using either stimulus alone. This study aligns with the research of Anoraga et al. (2024) who provided more specific support for the use of the combination of Swedish massage and lavender aromatherapy. The study used an experimental design with a pretest-posttest control group in 54 hypertensive patients. The intervention, a combination of Swedish massage and lavender aromatherapy, was administered to assess changes in stress levels and blood pressure. The Mann-Whitney test showed a p-value of 0.000 after the intervention, indicating a difference in stress levels between the intervention and control groups. In the intervention group, the proportion of respondents with moderate stress decreased, and most respondents were in the mild stress category after the intervention.[5].

Empirical evidence regarding the benefits of lavender for anxiety has also been reported by Kim et al. (2021) through a systematic review and meta-analysis. This study specifically evaluated the effectiveness of lavender on anxiety, depression, and several physiological parameters. The results of the study indicate the potential anxiolytic effects of lavender, although the magnitude of the effect may vary based on the characteristics of the intervention and the study population. Kim et al.'s (2021) findings support the findings of this study, which suggest that lavender can be used as a component of a complementary intervention to help reduce anxiety.[16].

The results of research by Tan et al. (2023) also support these findings. Through a systematic review and network meta-analysis of 44 randomized controlled trials involving 3,419 participants, Tan et al. found that the use of essential oils can reduce state anxiety and trait anxiety overall. Lavender showed a significant effect on the State Anxiety Inventory, with a weighted mean difference of approximately -5.41, and also showed an effect on the Trait Anxiety Inventory. These findings indicate that lavender has anxiolytic potential, supporting the results of this study.[17]. Although the instruments and respondent characteristics differed, the direction of the study results was consistent with the decrease in anxiety found after administration of lavender aromatherapy in this study.

Yoo and Park's (2023) research more specifically examined the effects of lavender essential oil inhalation on anxiety through a systematic review. The review included 11 studies with 972 participants and found that most of the studies reviewed showed a reduction in anxiety levels after lavender inhalation. The researchers concluded that lavender inhalation is a potential anxiolytic intervention and is worthy of use as a complementary approach, although studies with stronger design and methodological quality are still needed. These results are relevant to this study because they demonstrate a consistent direction of lavender's effects on anxiety, even though the administration method in this study was carried out in conjunction with massage.[18].

The findings of Luan et al. (2023) are also related to the results of this study. Through a meta-analysis of inhalation aromatherapy on test anxiety in college students, Luan et al. showed that inhalation aromatherapy can help reduce anxiety. Although the study respondents were college students and not adolescents, both groups are in a developmental context facing educational demands and psychosocial pressures. Therefore, these results support the idea that aromatherapy may be a potential non-pharmacological approach to help manage anxiety in the education age group.[19].

This study also has several limitations. First, the sample was relatively small, comprising only 44 female adolescents recruited through purposive sampling from a single community setting. This limits the generalizability of the findings to adolescents with different demographic and psychosocial characteristics. Second, the intervention period was relatively short, consisting of four sessions over two weeks.

Although a reduction in anxiety was observed after the intervention, the study did not assess whether the improvement was maintained over a longer period. Third, the quasi-experimental design and non-random group allocation may have introduced selection bias and left room for differences between the groups that were not captured by the measured baseline characteristics. In addition, participants were aware of receiving the intervention, which may have influenced their expectations and self-reported anxiety-related responses. The attention received during the massage sessions and the relaxing environment may also have contributed to the observed changes. Finally, the absence of separate intervention groups prevented the evaluation of the individual effects of Swedish massage and lavender aromatherapy.

Despite these limitations, the findings provide preliminary evidence that the combination of Swedish massage and lavender aromatherapy may be a promising complementary approach to anxiety management among female adolescents in the population studied. Future research should involve larger and more diverse samples, randomized group allocation where feasible, longer intervention and follow-up periods, and appropriate attention-control conditions. Studies comparing Swedish massage alone, lavender aromatherapy alone, the combined intervention, and standard care would also help determine the contribution of each component and whether their combination provides additional benefits. These improvements would strengthen the evidence regarding the effectiveness, durability, and applicability of this intervention for adolescent anxiety management..

5. Conclusion

He findings of this study indicate that the combination of Swedish massage and lavender aromatherapy was associated with a reduction in anxiety levels among female adolescents during the two-week intervention period. The mean Hamilton Anxiety Rating Scale (HARS) score decreased from 23.59 ± 9.80 to 12.27 ± 5.20 in the intervention group, representing a reduction of 11.32 points, whereas the control group showed a reduction of 0.23 points. The between-group comparison demonstrated a statistically significant difference ($p < 0.001$). However, these findings should be interpreted in the context of the study's methodological limitations, including the relatively small sample of 44 participants, purposive sampling, non-random group allocation, and short intervention period without long-term follow-up. Furthermore, because Swedish massage and lavender aromatherapy were administered together, the independent contribution of each component could not be determined. Therefore, the findings provide preliminary evidence of an association between the combined intervention and reduced anxiety in the female adolescents studied and should not be generalized to all adolescents experiencing anxiety or interpreted as evidence of long-term effectiveness. Future research should involve larger and more diverse samples, longer intervention and follow-up periods, and comparative designs examining Swedish massage alone, lavender aromatherapy alone, the combined intervention, and standard care. These approaches would help clarify the contribution of each intervention component and establish the sustainability and broader applicability of the observed benefits.

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