

Original Article

THE EFFECTIVENESS OF SENSORY AUDIO THERAPY IN REDUCING ANXIETY AMONG TWELFTH-GRADE STUDENTS: A ROY ADAPTATION MODEL APPROACH

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ABSTRACT

Background: Anxiety is one of the most prevalent psychological problems among adolescents, particularly high school students who experience academic pressure, graduation examinations, and preparation for higher education. Persistent anxiety may impair learning concentration, social interaction, emotional well-being, and overall quality of life. According to Roy's Adaptation Theory, individuals respond to environmental stressors through adaptive or ineffective coping mechanisms. Therefore, nursing interventions that enhance adaptive responses are essential to reduce anxiety among adolescents.

Purpose: This study aimed to evaluate the effectiveness of Sensory Audio Therapy in reducing anxiety levels among twelfth-grade students at Senior High School 4 Bojonegoro, with Callista Roy's Adaptation Theory serving as the theoretical framework.

Methods: This quantitative study employed a pre-experimental one-group pretest-posttest design. Twenty-two students who met the inclusion criteria were selected using purposive sampling. Anxiety levels were assessed using the Hamilton Anxiety Rating Scale (HARS). Participants received a 20-minute Sensory Audio Therapy session in a quiet environment following a standardized intervention protocol. Data were analyzed using the Wilcoxon Signed Rank Test with a significance level of 0.05.

Results: Before the intervention, all participants (100%) experienced moderate anxiety. Following Sensory Audio Therapy, 54.5% of participants reported no anxiety, while 45.5% experienced mild anxiety. The Wilcoxon Signed Rank Test demonstrated a statistically significant reduction in anxiety levels ($p < 0.001$), indicating that the intervention effectively decreased anxiety among adolescents.

Conclusion: Sensory Audio Therapy effectively reduces anxiety levels among twelfth-grade students by promoting adaptive physiological and psychological responses consistent with Callista Roy's Adaptation Theory. This intervention is practical, non-invasive, cost-effective,

and may be implemented as a promotive and preventive mental health strategy in school settings.

Keywords: Adolescents, Anxiety, Callista Roy Adaptation Theory, Nursing Intervention, Sensory Audio Therapy.

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INTRODUCTION

Adolescence is a transitional developmental stage characterized by rapid physical, psychological, emotional, and social changes. During this period, adolescents are expected to adapt to increasing academic demands, interpersonal relationships, and future career planning. Failure to adapt effectively to these developmental challenges may lead to psychological problems, particularly anxiety. Anxiety among adolescents has become an important public health concern because it negatively affects academic performance, emotional stability, interpersonal relationships, and overall quality of life.

Academic-related anxiety is particularly common among twelfth-grade senior high school students who are preparing for graduation examinations and university entrance selection. Excessive anxiety may interfere with concentration, decision-making ability, sleep quality, and learning motivation, ultimately reducing academic achievement. If left untreated, prolonged anxiety may increase the risk of developing more severe mental health disorders during adulthood.

Recent studies have demonstrated that non-pharmacological interventions, particularly music therapy and sensory-based interventions, effectively reduce anxiety by promoting relaxation and decreasing physiological stress responses. Sensory Audio Therapy combines calming auditory stimulation with relaxation techniques to activate the parasympathetic nervous system, reduce sympathetic nervous system activity, and improve emotional regulation. Consequently, this intervention has attracted increasing attention as a simple, inexpensive, and non-invasive nursing intervention.

The theoretical foundation of this study is Callista Roy's Adaptation Theory, which views individuals as adaptive systems constantly interacting with internal and external environmental stimuli. Anxiety represents an ineffective adaptive response to stressors. Nursing interventions should therefore facilitate adaptive coping mechanisms to restore physiological and

psychological balance. Sensory Audio Therapy functions as a contextual stimulus that supports adaptive responses by promoting relaxation, emotional regulation, and psychological comfort.

Although previous studies have reported the effectiveness of music therapy in reducing anxiety among adolescents and adults, limited evidence specifically examines the effectiveness of Sensory Audio Therapy among Indonesian senior high school students using Callista Roy's Adaptation Theory as the conceptual framework. This gap highlights the need for further investigation regarding the effectiveness of this intervention within school-based mental health programs.

Therefore, this study aimed to determine the effectiveness of Sensory Audio Therapy in reducing anxiety levels among twelfth-grade students at Senior High School 4 Bojonegoro based on Callista Roy's Adaptation Theory.

METHODS

Study Design

This study employed a quantitative pre-experimental design using a one-group pretest-posttest approach. This design was selected to evaluate changes in adolescents' anxiety levels before and after the implementation of Sensory Audio Therapy. The study measured participants' anxiety levels at baseline (pretest), administered the intervention, and reassessed anxiety levels immediately after the intervention (posttest). The differences between pretest and posttest scores were analyzed to determine the effectiveness of the intervention.

Setting and Participants

The study was conducted on November 7, 2025, at Senior High School 4 Bojonegoro, East Java, Indonesia. The target population comprised all twelfth-grade students enrolled at the school. Participants were recruited using a purposive sampling technique based on predetermined inclusion and exclusion criteria. A total of 22 respondents fulfilled the eligibility criteria and participated in the study.

The inclusion criteria were: (1) Twelfth-grade students; (2) Students who experienced mild to moderate anxiety according to the Hamilton Anxiety Rating Scale (HARS); and (3) Students who agreed to participate by providing informed consent.

The exclusion criteria were: (1) Students receiving pharmacological treatment for anxiety; (2) Students diagnosed with severe psychiatric disorders; and (3) Students who were absent during either the intervention or posttest assessment.

Intervention

The intervention consisted of Sensory Audio Therapy using slow-tempo nature sounds to promote relaxation and reduce anxiety among twelfth-grade students. The nature-sound audio was obtained from the predetermined YouTube source and was used consistently throughout the intervention.

Each participant received the same audio recording for 20 minutes. The intervention was administered once for 20 minutes in a quiet, comfortable room with adequate lighting and minimal external stimuli. A smartphone connected to a sound system/speaker was used to deliver the audio. The volume was adjusted to a comfortable level, ensuring that it was neither too loud nor too low.

Before the intervention, the researcher explained the purpose, procedure, and duration of the therapy and obtained the participant's consent and readiness. Participants were then positioned comfortably and instructed to focus on the nature sounds while maintaining a relaxed state. External stimuli, including unnecessary noise and telephone interruptions, were minimized during the session. After 20 minutes, the audio was stopped, and participants were invited to describe their feelings and perceived changes following the intervention.

The intervention was implemented according to a standardized Standard Operating Procedure (SOP) adapted from Nur Fajariyah (2024). The same intervention procedure, audio, duration, equipment, and environmental conditions were applied to all participants to maintain intervention consistency (Nur Fajariyah, 2024).

Instruments and Data Collection

The primary research instrument was the Hamilton Anxiety Rating Scale (HARS), a widely used instrument for measuring anxiety severity. The HARS consists of 14 items, each rated on a five-point Likert scale ranging from 0 (not present) to 4 (very severe). The total score ranges from 0 to 56, with higher scores indicating greater anxiety severity.

The anxiety categories were classified as follows: No anxiety (< 14), mild anxiety (14-20), moderate anxiety (21-27), severe anxiety (28-41), very severe anxiety (42-56).

Data collection consisted of three stages: Pre-test assessment using HARS; administration of Sensory Audio Therapy; and post-test assessment using HARS immediately after the intervention.

Data Analysis

Data were processed using IBM SPSS Statistics. Prior to statistical analysis, data underwent editing, coding, scoring, data entry, and cleaning to ensure completeness and accuracy.

Descriptive statistics were used to summarize respondents' characteristics and anxiety levels using frequencies and percentages. Because the study compared paired observations obtained before and after the intervention, inferential analysis was performed using the Wilcoxon Signed Rank Test. Statistical significance was determined at $p < 0.05$ with a 95% confidence interval.

Ethical Consideration

Ethical approval for this study was obtained from the Health Research Ethics Committee of STIKES Rajekwesi Bojonegoro under approval number: 050/KEPK/LPPM.STIKes.R/X/2025

All participants received an explanation regarding the objectives, procedures, potential benefits, and possible risks of the study before participation. Written informed consent was obtained from all respondents. Confidentiality and anonymity were maintained throughout the study, and participants were informed that they could withdraw from the research at any stage without consequences.

RESULTS

Respondents' Anxiety Levels Before the Intervention

Table 1. Characteristics of Respondents and Anxiety Levels Before Sensory Audio Therapy (n = 22).

Characteristics	Frequency	Percentage
	n	%
Anxiety Category		
No Anxiety	12	54.5%
Mild Anxiety	10	45.5%
Total	22	100%
Age (Years)		
16 Years	0	0%
17 Years	17	77.3%
18 Years	5	22.7%
19 Years	0	0%
Total	22	100%
Class		
XII-1	3	13.6%
XII-2	1	4.5%
XII-3	2	9.1%
XII-4	4	18.2%
XII-5	4	18.2%
XII-6	2	9.1%

XII-7	2	9.1%
XII-8	2	9.1%
XII-9	2	9.1%
Total	22	100%

Source: Primary Data Respondents Before Intervention.

Table 1 presents the characteristics of the respondents and their anxiety levels before the intervention. The respondents were characterized according to gender, age, and class. Before receiving Sensory Audio Therapy, all 22 respondents (100%) experienced moderate anxiety. No respondents were categorized as having mild or severe anxiety.

Anxiety Levels After the Intervention

Table 2. Distribution of Respondents' Anxiety Levels After Sensory Audio Therapy (n = 22).

Characteristics	Frequency	Percentage
	n	%
Anxiety Category		
No Anxiety	0	0%
Mild Anxiety	0	0%
Moderate Anxiety	22	100%
Severe Anxiety	0	0%
Total	22	100%

Source: Primary Data Respondents After Intervention.

Table 2 presents the respondents' anxiety levels after receiving Sensory Audio Therapy. The results showed that all 22 respondents (100%) were categorized as having moderate anxiety after the intervention. No respondents were categorized as having no anxiety, mild anxiety, or severe anxiety.

Effect of Sensory Audio Therapy on Anxiety Levels

Table 3. Wilcoxon Signed Rank Test Comparing Anxiety Levels Before and After the Intervention (n = 22).

Rank	N	Mean Rank	Sum of Rank
Negative Ranks (PostTest<PreTest)	22	11.50	253.00
Positive Ranks (PostTest>PreTest)	0	0.00	0.00

Source: Secondary Data Output Data Results Through SPSS.

Based on Table 3 the Wilcoxon Signed Rank Test demonstrated a statistically significant reduction in anxiety levels following the intervention ($p < 0.001$). All 22 respondents showed

lower anxiety scores after receiving Sensory Audio Therapy, as indicated by the 22 negative ranks and the absence of positive ranks or ties. These findings confirm that every participant experienced an improvement in anxiety levels after the intervention.

The results provide strong evidence that Sensory Audio Therapy effectively reduces anxiety among twelfth-grade students. The intervention promoted positive psychological adaptation by reducing anxiety symptoms and enhancing emotional stability.

DISCUSSION

This study demonstrated that Sensory Audio Therapy significantly reduced anxiety levels among twelfth-grade students at Senior High School 4 Bojonegoro. Before the intervention, all respondents (100%) experienced moderate anxiety. Following the intervention, anxiety levels decreased substantially, with more than half of the participants (54.5%) reporting no anxiety and the remaining respondents (45.5%) experiencing only mild anxiety. Furthermore, the Wilcoxon Signed Rank Test showed a statistically significant difference between pretest and posttest anxiety scores ($p < 0.001$), confirming the effectiveness of Sensory Audio Therapy in reducing anxiety among adolescents.

The reduction in anxiety observed in this study may be explained by the physiological effects of auditory stimulation. Relaxing audio activates the parasympathetic nervous system while suppressing excessive sympathetic nervous system activity. This process decreases the secretion of stress hormones, including cortisol and catecholamines, resulting in reduced heart rate, lower muscle tension, improved emotional regulation, and an overall sense of psychological relaxation. Consequently, adolescents become more capable of managing academic stressors and emotional challenges.

These findings are consistent with previous studies reporting that music-based and auditory relaxation interventions effectively reduce anxiety among adolescents, university students, and patients experiencing psychological stress. Previous research has demonstrated that exposure to calming auditory stimuli promotes relaxation, enhances emotional stability, improves concentration, and reduces physiological responses associated with anxiety. Therefore, the present findings strengthen existing evidence supporting the effectiveness of non-pharmacological interventions for anxiety management in educational settings.

From the perspective of Callista Roy's Adaptation Theory, anxiety represents an ineffective adaptive response to environmental stimuli. According to Roy, individuals continuously interact with internal and external stimuli through coping mechanisms that

determine whether adaptive or maladaptive responses occur. Academic examinations, graduation requirements, and preparation for higher education function as focal stimuli that may trigger anxiety among adolescents. Sensory Audio Therapy serves as a contextual stimulus that enhances adaptive coping mechanisms by promoting relaxation and facilitating emotional regulation. Consequently, participants demonstrated improved adaptive responses, as reflected by the significant reduction in anxiety levels after the intervention.

Another important finding is that all respondents experienced decreased anxiety scores following the intervention, as indicated by the absence of positive ranks and ties in the Wilcoxon analysis. This result suggests that every participant benefited from the intervention regardless of individual differences. Such consistency indicates that Sensory Audio Therapy may be broadly applicable as a school-based nursing intervention for promoting adolescent mental health.

The effectiveness of Sensory Audio Therapy can also be attributed to its practical characteristics. Unlike pharmacological interventions, this therapy is non-invasive, inexpensive, easy to administer, and associated with minimal risk of adverse effects. These advantages make it highly feasible for implementation by school nurses, community health nurses, teachers, and other healthcare professionals as part of promotive and preventive mental health programs.

Despite these promising findings, several limitations should be considered. The study employed a one-group pretest-posttest design without a control group, making it difficult to completely exclude the influence of external factors. In addition, the relatively small sample size and the inclusion of participants from only one senior high school may limit the generalizability of the findings. Future studies are therefore recommended to employ randomized controlled trial designs, include larger and more diverse populations, compare different forms of audio therapy, and evaluate the long-term effectiveness of repeated interventions.

Overall, the findings indicate that Sensory Audio Therapy is an effective nursing intervention for reducing anxiety among adolescents. By enhancing adaptive responses consistent with Callista Roy's Adaptation Theory, this intervention contributes to improved psychological well-being and supports the development of comprehensive school-based mental health services.

IMPLICATION AND LIMITATIONS

The findings of this study indicate that Sensory Audio Therapy is an effective non-pharmacological nursing intervention for reducing anxiety among twelfth-grade students. This intervention can be integrated into school health programs as a simple, safe, cost-effective, and easy-to-implement strategy for promoting adolescents' mental health. School nurses, counselors, and teachers may incorporate Sensory Audio Therapy into stress management and mental health promotion programs to help students cope with academic-related anxiety.

From a theoretical perspective, this study supports Callista Roy's Adaptation Theory, demonstrating that appropriate nursing interventions can enhance adolescents' adaptive responses to academic stressors. The findings also contribute to the growing body of evidence supporting sensory-based interventions in nursing practice.

This study has several limitations. First, the use of a one-group pretest-posttest design without a control group limits the ability to establish a causal relationship between the intervention and the observed reduction in anxiety levels. Second, the relatively small sample size ($n = 22$) and the inclusion of participants from a single senior high school may limit the generalizability of the findings. Third, anxiety was measured immediately after the intervention; therefore, the long-term effects of Sensory Audio Therapy were not evaluated. Future studies are recommended to use randomized controlled trial designs, involve larger and more diverse populations, and include long-term follow-up assessments to further examine the effectiveness of Sensory Audio Therapy.

CONCLUSION

This study demonstrated that Sensory Audio Therapy significantly reduced anxiety levels among twelfth-grade students at Senior High School 4 Bojonegoro. Before the intervention, all participants experienced moderate anxiety, whereas after the intervention, most respondents reported no anxiety and the remainder experienced only mild anxiety. The Wilcoxon Signed Rank Test confirmed a statistically significant reduction in anxiety levels following the intervention ($p < 0.001$).

These findings indicate that Sensory Audio Therapy is an effective, safe, practical, and cost-effective nursing intervention for managing adolescent anxiety. Consistent with Callista Roy's Adaptation Theory, the intervention promotes adaptive physiological and psychological responses, enabling adolescents to cope more effectively with academic stressors. Sensory

Audio Therapy is therefore recommended as a promotive and preventive mental health strategy within school health services.

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AI ASSISTANCE STATEMENT

The author did not use artificial intelligence (AI) tools in preparing this manuscript.

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