

## THE EFFECTS OF SANDALWOOD AROMATHERAPY (*Santalum album*) AND BOSSA NOVA MUSIC ON ANXIETY LEVELS OF PEDIATRIC PATIENTS UNDERGOING TOPICAL FLUORIDE TREATMENT

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### ABSTRACT

**Background:** Anxiety is a condition characterized by strong fear, followed by somatic symptoms that indicate a hyperactive autonomic nervous system. This is a type of emotional disorder that is associated with unexpected and considered dangerous situations. The anxiety of pediatric patients will reduce the treatment success rate. Reducing the anxiety of pediatric patients is very important to increase the treatment success rate. **Purpose:** The purpose of this study was to analyze the effect of sandalwood aromatherapy and bossa nova music on the anxiety levels of pediatric patients undergoing dental treatment. **Methods:** This research was conducted in four groups with four different treatments: the control group, the sandalwood aromatherapy group, the bossa nova music group, and the combination group. Each group consisted of 26 subjects. All 104 patients were treated with topical fluoride treatment for the first time. Blood pressure and pulse measurements as indicators of anxiety were performed twice on each sample, before treatment and after treatment. Blood pressure and pulse were measured with a digital sphygmomanometer. **Results:** There was a significant enhancement in the difference in blood pressure and pulse in the control group and a significant reduction in the difference in blood pressure and pulse in the other group ( $p < 0.05$ ). **Conclusion:** Sandalwood aromatherapy and bossa nova music can reduce anxiety levels in pediatric patients undergoing dental treatment, with the largest reduction in anxiety levels in the group treated with a combination of sandalwood aromatherapy and bossa nova music.

**Keywords:** sandalwood aromatherapy, bossa nova music, blood pressure, pulse, children

### INTRODUCTION

Anxiety is a kind of emotional disorder associated with unexpected or considered dangerous situations. Physiological signs that can be observed are sweating, increased blood pressure, tachycardia, dry mouth, diarrhea, muscle tension, and hyperventilation. The prevalence of anxiety for worldwide dental patients is considered high, reaching 6-15% of the population and usually starting from childhood (51%) and adolescents (22%)<sup>1</sup>. A study showed that 25% of primary-school-age children undergoing dental treatment experienced severe anxiety, 50% moderate anxiety, and 20% mild anxiety<sup>2</sup>.

Aromatherapy is a relaxation therapy media that uses aromatic essence extracts from plant parts. The purpose of using aromatherapy is to treat and improve physical and psychological health<sup>3</sup>. Aromatherapy essential oil stimulates receptors in the nose, then the information is transmitted further to areas in the brain that control emotions and provide information to the hypothalamus, which is a regulator of the internal system of the body so that it reacts to stress<sup>4</sup>.

Sandalwood is one of 22 species of the genus *Santalum* in the world and is a commercial species through Santalol oil that is widely used as a feedstock for aromatherapy<sup>5</sup>. Sandalwood has a distinctive aroma. This aroma comes from the main content of sandalwood, Santalol. The

quality of sandalwood oil is determined by the content of  $\alpha$ -santalol and P-santalol.  $\alpha$ -santalol and P-santalol are sesquiterpene organic compounds<sup>6</sup>. Through aromatherapy, sandalwood oil is widely used to relieve anxiety, stress, and depression. This oil has neuroleptic, calming, and bronchial dilatation effects<sup>7</sup>.

Music has components in the form of tone and rhythm that can provide psychological and physiological influence on the body. When sound stimulation vibrates in the eardrum, it is then transmitted to the central nervous system, precisely in the limbic system. One of the limbic system functions is neurophysiology which deals with emotions, feelings, and sensations<sup>8</sup>. Music elements that have the potential to cause relaxation effects are a stable tempo, stability or gradual change in volume, rhythm, timbre, pitch, harmony, consistent tone texture, predictable harmony modulation, proper cadence (harmonization), predictable melody lines, repetitive material, fixed structures and shapes, steady timbre, and not too many accents<sup>9</sup>.

Bossa nova is a Brazilian music genre, which was developed and popularized in the 1950s and 1960s and is currently one of the best-known Brazilian music genres in the world. The phrase bossa nova literally means "new trend" or "new wave". Bossa nova, which is a lyrical blend of samba and jazz, gained a great interest in the 1960s. Bossa nova music contains elements of music that have the potential to provide a relaxing effect. Music that has a relaxing effect has a close connection with brain waves, which can reduce brain waves to reach low levels and can cause humans to experience various forms of physiological changes in the body, such as decreased blood pressure, pulse frequency, and respiration frequency<sup>10</sup>. This study aims to analyze the effect of sandalwood aromatherapy and bossa nova music on the anxiety level of pediatric patients undergoing dental treatment. The analysis was seen through three indicators of anxiety, namely systolic blood pressure, diastolic blood pressure, and the number of heart rate per minute.

## MATERIALS AND METHODS

This study was an experimental study with a cross-sectional approach. The population of this study was the first-grade students of Santa Clara Surabaya Elementary School. This study was performed in children aged 5-7 years and in a healthy condition. The subjects of this study had never received dental treatment before, did not use drugs, and had no psychiatric disorders, mental retardation, and systemic diseases.

In this study, 104 subjects were divided into four groups consisting of control group, sandalwood aromatherapy group, bossa nova music group, and combination group. Each group consisted of 26 subjects. Each subject was given an informed consent signed by their parents. This research has been tested by the ethics committee of the Faculty of Dental Medicine, Universitas Airlangga (No: 170 / HRECC.FODM / VII / 2018).

This research was conducted at the School Health Unit of Santa Clara Elementary School in Surabaya. The subjects were instructed to sit in a dental chair for five minutes before getting topical fluoride treatment. Blood pressure and pulse were measured before and after topical fluoride treatment using a digital sphygmomanometer. Provision of sandalwood aromatherapy and bossa nova music was carried out during topical fluoride treatment. Statistical analysis was performed using Welch's ANOVA and Games-Howell.

## RESULTS

Table 1 shows the mean and standard deviation of the differences in systolic, diastolic, and pulse for each group. In each group, the normality test was performed using the Kolmogorov-Smirnov test. The normality test result showed a significant value in the four groups ( $p > 0.05$ ): group 1 was  $p = 0.413$ , group 2 was  $p = 0.320$ , group 3 was  $p = 0.618$ , and group 4 was  $p = 0.620$ . Homogeneity of variance was tested using the Levene test, and the results of the four groups were not significant, which was  $p = 0.000$ . These results indicated that

the data were not homogeneous.

**Table 1.** The mean and standard deviations of the differences of systolic, diastolic, and pulse of each group.

	Systolic Mean ± SD	Diastolik Mean ± SD	Pulse Mean ± SD
Group 1	9,38 ± 13,82	9,15 ± 11,88	9,38 ± 14,93
Group 2	-6,84 ± 13,57	-4,69 ± 8,44	-3,03 ± 8,82
Group 3	-1,19 ± 2,90	-1,77 ± 3,04	-1,12 ± 3,64
Group 4	-7,08 ± 3,49	-5,19 ± 4,61	-7,31 ± 8,59

**Table 2.** Games-Howell results.

Varia	Treatment	Significant Value(p)			
		Control	Aromatherapy	Music	Combination
Systolic	Control	-	<b>0.000*</b>	<b>0.004*</b>	<b>0.000*</b>
	Aromatherapy		-	<b>0.186</b>	<b>1.000</b>
	Music			-	<b>0.000*</b>
	Combination				-
Diastolic	Control	-	0.000*	<b>0.001*</b>	<b>0.000*</b>
	Aromatherapy		-	<b>0.360</b>	<b>0.993</b>
	Music			-	<b>0.015*</b>
	Combination				-
Pulse	Control	-	<b>0.004*</b>	<b>0.008*</b>	<b>0.000*</b>
	Aromatherapy		-	<b>0.735</b>	<b>0.184</b>
	Music			-	<b>0.003*</b>
	Combination				-

Note: (\*) There is a significant difference (p < 0.05)

The mean of the three indicator variables in the control group was positive (+), which means that this data showed an increase in value between the data after treatment and before treatment. In the aromatherapy, bossa nova music, and the combination treatment group, negative mean values (-) were obtained for the three indicator variables, which means that this data showed a decrease in value between the data after treatment and before treatment. Furthermore, Welch's ANOVA test was conducted to find out the significant differences between the four groups. The results of the significance values obtained were p = 0.000, which means that there were significant differences between the four groups.

Table 2 shows the results of the Games-Howell test. The Games-Howell test was carried out to analyze further significance between groups. The results obtained showed that there were significant differences in the values of the three indicators between the control group and the three treatment groups, p < 0.05. In addition, there were also significant differences in the values of the three indicators between the bossa nova music group and the combination group; systolic was p = 0,000, diastolic was p = 0,015, and heart rate was p = 0,003. Three indicator values

between the sandalwood aromatherapy group and the bossa nova music group, and between the sandalwood aromatherapy group and the combination group, did not show any significant differences.

## DISCUSSION

In a normal physiological body, the stimulation obtained will be transmitted by the hypothalamus to the two-body systems, namely the endocrine system and the autonomic nervous system. In the endocrine system, cortisol is secreted by the zona fasciculata and the zona reticularis. The adrenal gland also has a medulla that secretes epinephrine and norepinephrine. These three secretions from the cortex and medulla of the adrenal gland will affect the work of the heart and blood vessels, which causes an increase in blood pressure and the pulse<sup>11</sup>. An autonomic nerve is divided into two systems, namely the sympathetic nervous system and the parasympathetic system. The sympathetic nervous system can accelerate the heart rate and narrow the blood vessels so that blood pressure will increase. Conversely, the parasympathetic system can maintain the heart at a normal rate and widen blood vessels so that blood pressure will decrease<sup>12</sup>.

In this study, the control group received topical fluoride applications without being given aromatherapy and bossa nova music, so that in this group, no additional stimuli had the opportunity to increase or decrease children's anxiety levels. The results obtained were a positive average from differences in systolic blood pressure, diastolic blood pressure, and the number of pulses. The increase in the value of the three indicators explained that pediatric patients experience anxiety. In the sample group carried out sandalwood aromatherapy, the body showed an olfactory aromatherapy sandalwood stimulation response by decreasing the contraction of muscles in the organ, producing a relaxed feeling and followed by a decrease in blood pressure and the number of heartbeats per minute. Aromatherapy is one of the methods for body care and healing diseases by using essential oils. This essential oil can affect brain activity through the nervous system that is associated with the sense of smell so it stimulates an increase of neurotransmitters related to the recovery of psychological conditions such as emotions, feelings, thoughts, and desires<sup>13</sup>.

In the group treated with bossa nova music, auditory stimulation of bossa nova music affected the work of the adrenal glands by reducing the secretion of epinephrine and norepinephrine. The reduction of these two catecholamine hormones affects the work of the sympathetic nerves and parasympathetic nerves. The autonomic nervous system responds by decreasing cardiac work and vasodilation. Thus, the value of blood pressure and the number of heartbeats per minute will decrease, which also indicates that the anxiety level of pediatric patients is also reduced<sup>14,15</sup>.

In the combination group, impulses that support relaxation are stronger than just giving sandalwood aromatherapy, or just giving bossa nova music. This is evidenced by the results of descriptive statistics that show differences between the three indicators, in which the result of the combination group is greater than the other groups. However, the Games Howell test only showed a significant difference between the combination group and the music group, whereas there was no significant difference between the combination group and the aromatherapy group. These results explain that in the combination group, sandalwood aromatherapy has a greater role in reducing children's anxiety levels than bossa nova music. This result occurs because children appear to be more interested in sandalwood aromatherapy than bossa nova music so that aromatherapy impulses entering through the sense of smell work more effectively than auditory impulses from bossa nova music. Aromatherapy is more effective in providing a relaxing effect than music because the subjectivity level of music is greater than aromatherapy, so the possibility of subjects not liking the type of music being played is high. If the music played is not liked by the subject, then the sample will not be interested in listening to the music

and the music impulses run less effective in reducing the level of anxiety<sup>16</sup>.

This study involved 104 subjects consisting of 44 boys and 60 girls. From the results obtained, boys have greater anxiety than girls. This can be seen from the average value difference between the three indicators in the control group. The average difference between the three indicators shows that boys in the control group are greater than girls, which means that increased anxiety is greater in boys than girls. These results are in accordance with the statement that girls are more adaptive to anxiety than boys, so boys experience more anxiety during treatment compared to girls<sup>17</sup>. Theoretically, it is also explained that boys tend to be more aggressive than girls, so boys are more difficult to adapt to the new environment than girls<sup>18</sup>. In the other three treatment groups, no gender effect was found because there were no significant differences in value between the three indicators.

The difference in age of the sample cannot be assessed in all treatment groups because of the uneven distribution of age of the sample. From 104 samples, only 2 children aged 5 years and 4 children aged 7 years, while children aged 6 years were 98 children. This uneven distribution of age results in an assessment that cannot be done on the effects of the age, the effectiveness of sandalwood aromatherapy, and the effectiveness of bossa nova music on children's anxiety levels.

## CONCLUSION

Based on the results of the study, it was concluded that sandalwood aromatherapy and bossa nova music affected the anxiety levels of pediatric patients undergoing dental treatment. Combination group is the most effective group in reducing anxiety levels.

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