Pandan Leaves (Pandanus Amaryllifolius) Aromatherapy and Relaxation Music to Reduce Dental Anxiety of Pediatric Patients

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Abstract

Anxiety is one type of emotional disorders that can cause a major problem and frequently experienced by patients who will undergo examinations and dental treatment, particularly pediatric patients, causing children delaying and refusing to undergo dental treatment. Few methods can be done to reduce the anxiety level, both pharmacological and non-pharmacological, including the use of aromatherapy and music therapy. Pandan leaves are one of the plants commonly used as an aromatherapy ingredient in Indonesia. One of the types of music that is commonly used in anxiety treatment is relaxation music.

To determine the effect of pandan leaves aromatherapy and relaxation music to reduce the anxiety level of pediatric patients undergoing dental treatment.

This research was conducted in four groups with four different treatments: control group, pandan leaves aromatherapy group, relaxation music group, and combination group. Each group consisted of 20 samples. Patients recieved dental treatment (fissure sealant) for the first time. Measurements of blood pressure and pulse rate as indicators of anxiety were done before and after treatment using digital sphygmomanometer.

There were significant differences of blood pressure and pulse rate between the control group and the other groups, while the most significant difference experienced by the combination group ($p<0.05$).

Pandan leaves aromatherapy and relaxation music can reduce the anxiety level of the pediatric patients undergoing dental treatment.

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Introduction

Anxiety is a condition that is characterized by intense feeling of dread, accompanied by somatic symptoms that indicate a hyperactive autonomic nervous system.[1] It is one type of emotional disorders related to unforeseen situations or considered dangerous. Observable physiological signs are sweating, increasement of blood pressure, tachycardia, palpitations, dry mouth, diarrhea, muscle tension, and hyperventilation.[2] Anxiety impairs cognition and may produce distortions of perception.[3] Worldwide prevalence of dental anxiety is high, reaching 6-15% of the population and usually starts from childhood (51%) and teens (22%).[4] A study showed that 25% of young school age children (5-7 year) underwent dental treatments experiencing severe anxiety, 50% moderate anxiety, and 20% experiencing mild anxiety.[5]

Helping pediatric patients to overcome fear and anxiety can improve regularity and scheduled visitation to the dentist and ultimately improve the patient's life quality.[6] Both utilizing pharmacological and non pharmacological materials has been done to reduce anxiety level, one of the method is by aromatherapy.[7] One of the plants that can be used as an aromatherapy ingredient is pandan leaves. Pandan is a monocotile plant of the family *Pandanaceae* that is commonly found in Southeast Asia, particularly Indonesia. Pandan leaves have a distinctive aroma and contain

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alkaloids, flavonoids, and tannins that produce sedative effects, overcoming pain and anxiety, and reducing anxiety. [8]

In addition to aromatherapy, music therapy is one way to overcome anxiety without any side effects compared to the use of sedative drugs that can cause subjective side effects.[9] Since the ancient Greeks era music has been used as a means to alleviate pain and help patients to cope with painful emotions such as anxiety, sadness, and anger.[10] Classical music is commonly selected for music relaxation therapy, because the elegance and clarity of the musical elements that is considered able to improve concentration, memory, and perception of the listener.[11] Previous study emphasized that the use of orange essence oil aromatherapy while doing dental treatment in pediatric patients can relieve anxiety.[6] Other study proved that classical music has an influence in reducing pediatric patient's anxiety during the plaque control record treatment.[12]

This study intend to conduct a research using pandan leaves aromatherapy and relaxation music, to assess whether these methods are able to reduce the anxiety level of pediatric patients undergoing dental treatment. The study focused on measuring blood pressure and pulse frequency while the patients were treated for fissure sealant application.

Materials and methods

This study was an experimental research with pre-post groups design. The population were students of Santa Clara Catholic Elementary School, Surabaya in 1st grade. Inclusion criteria were aged 5-7 years old, the first permanent molar tooth had erupted, and good health condition. Students with a history of any dental treatment, psychiatric disorder or mental retardation, systemic disease, and currently use any medication are excluded from the study.

Sample were divided into 4 groups: control (without aromatherapy and music/ group 1), pandan leaves aromatherapy (Group 2), relaxation music (Group 3), and combination (Group 4) (n=80). The samples were given an informed consent and signed by their parents. This study was approved by the ethical committee of Faculty of Dental Medicine, Universitas Airlangga (No: 189/KKEPK.FKG/VIII/2016).

This study was conducted at school student health unit. The subjects were instructed to sit on the dental chair for 5 minutes before starting the treatment (fissure sealant application). Blood pressure and pulse rate was measured before and after the treatment. Blood pressure was measured using digital sphygmomanometer (Omron, India) and pulse rate was measured within 1 minutes on radial artery. During treatment, pandan aromatherapy (Bali Tropical, Bali, Indonesia) and music relaxation (classical music) were played. Statistical analysis was conducted using Anova and Tukey HSD.

Results

The mean and standart deviation of the difference in systolic blood pressure, diastolic blood pressure, and pulse rate on each goup is showed in Table 1. A nonparametric test was conducted using the *Kolmogorov-Smirnov* test. The analysis showed all four treatment groups were statistically significant ($p > 0.05$), Group 1 p=0.376, Group 2 p= 0.661, Group 3 p= 0.426, Group 4 p= 0.557. The homogeneity of variance was tested using *Levene* test and the result was that the entire data were statistically significant ($p > 0.05$), systole difference p= 0.051, diastole difference p=0.385, and pulse difference p=0.808.

	Systole $\bar{x} \pm SD$	Diastole $e\bar{x} \pm SD$	Pulse Rate $\bar{x} \pm SD$
Group 1	11.60 ± 8.152	9.05 ± 8.062	10.80 ± 7.544
Group 2	-2.45 ± 5.951	-1.50 ± 6.755	-0.75 ± 8.503
Group 3	-0.30 ± 6.997	0.60 ± 5.807	-0.35 ± 7.436
Group 4	-6.85 ± 5.143	-6.00 ± 4.888	-8.30 ± 6.837

Table 1. Mean and standard deviation value of the difference in systolic blood pressure, diastolic blood pressure, and pulse rate on each group.

The result of *Tukey HSD* test showed Group 1 positive (+) values on the mean difference of systole, diastole, and pulse rate, which means there was an increasing in values in the data before and after treatments. Group 2 obtained negative (-) values on the mean

difference of systole, diastole, and pulse rate, which means there was a decreasing in values from before and after treatments. Group 3 indicated positive (+) value on the mean difference of diastolic blood pressure, but negative (-) value on the mean difference of systolic blood pressure and pulse rate. While in Group 4 there were negative (-) values on the mean difference of systole, diastole, and pulse rate.

One-Way ANOVA test was conducted and obtained significance value of p= 0.000 on all three mean difference variables ($p < 0.05$), indicates there were significant differences among the four treatment groups on these three variables. The statistical analysis was continued using *Tukey HSD* test. The analysis results showed that there were significant differences on the mean difference in systole, diastole, and pulse rate between control group and the three experimental groups, p= 0.000. In addition, there was also a significant difference in those three aspects between Group 3 and Group 4 (systole p=0.014, diastole p= 0.010, pulse rate p=0.08). There was also significant difference in the pulse rate mean between Group 2 and Group 4 (p=0.013). Other comparison between Group 2 and Group 3 (systole p= 0.738, diastole p= 0.0736) between Group 2 and Group 4 (mean difference in systole and diastole) revealed no significant difference.

Discussion

Anxiety is a psychological symptom of unpleasant incident or discomfort along with a sign that something undesirable will happen.[13] Anxiety is the manifestation of individual nature and perceptions rooted in a person to anticipate the feeling of being threatened. When anxiety was prolonged, it can turn into anxiety disorders.[14] Dental anxiety is the main factor that hinders patients' visits to the dentist.[15]

Aromatherapy is a treatment method using certain aroma stimuli media derived from certain plant materials.[16] Previous studies showed inhaling aromatherapy can reduce a person's anxiety level.[17,18] This study used pandan leaves aromatherapy product as pandan leaves are considered to possess the compounds that induce a sedative effect that will reduce anxiety level.[19] Relaxation music is one kind of music considered to be able to stimulate the brain to produce *α*-wave and brings a relaxing effect on the listeners. Relaxation music can help overcoming anxiety caused by psychological effect, such as by lowering blood pressure, pulse rate, and respiraton rate so that the patient becomes more relaxed and calm.[20] Relaxation music used in this study was the orchestration of classical music (songs composed by Mozart, Chopin, Handel, Bach, and Vivaldi) that have bigger impact to anxiety level compared to other types of music.[21]

The results on Group 1 showed no decreasement in blood pressure and pulse rate, indicates the increasement of anxiety level. According to the previous studies, patients become anxious when facing a treatment, causing increasement in blood pressure, pulse rate, and respiratory rate.[22,23] The results on Group 2 showed decreasement in blood pressure and pulse rate after the treatment, it indicates reduction of anxiety level. The anxiety reduction effect due to pandan leaves aromatherapy was significant compared to anxiety level occured in the control group. Aromatherapy can affect the patient psychologically and physically.[24] Aromatherapy pandan leaves (Pandanus Amaryllifolius) contain alkaloids and it affected the gamma-aminobutyruc acid (GABA) receptors. GABA receptoris an important target for hypnotic-sedative components in humans that can cause relaxation and decrease anxiety level. The results of this study affirms the previous studies, showing that aromatherapy inhalation applied for Intensive Care Unit (ICU) patients is effective reducing anxiety level and improving patients' sleep quality.[25]

The results of Group 3 showed decreasement in blood pressure and pulse rate after treatment, point that auditory stimuli can put a person into relaxed state.[26] Previous study stated that music therapy can reduce sleep problems, relaxing, and eliminating unpleasant feelings.[27] Listening to music with soft and soothing rhythm with the tempo of 60-80 per minute causing decreasement of the body rhythm, because the body adjusts to the rhythm of the music.[28] Music also affects the decreasement in sympathetic nerve responses, resulting vital signs decreasement.

The results of this research showed relaxation music is less significant compared to pandan leaves aromatherapy in affecting the reduction of anxiety level, although there were several samples that experienced the opposite. This insignificancy presumably because the subject might have never heard the instrumental classical music. Individual taste of music plays an important role in reducing the anxiety.[29] The more familiar an individual to a piece of music, the greater effect on the respose.[30]

Significant differences of reduction in anxiety level using relaxation music and pandan leaves aromatherapy can also be affected by different response pathways of each stimulus. Pandan leaves in aromatherapy treatment contributed to the decreasement in muscle contraction and made the samples relaxed, increasing of β-endorphins secretion, decreasing of ACTH secretion, and the effect on the sympathetic and parasympathetic nervous system.[19] While in relaxation music treatment, it induced the similar physiological effects, except for the potential actions or muscle contraction.[23]

Research results on group 4 revealed mean difference of the three variables was negative (-) and the largest mean difference among other treatment groups. Group 4 showed the highest decreasement in blood pressure and pulse rate, indicates the highest reduction of anxiety level. By combining the pandan leaves aromatherapy and relaxation music treatments, the samples received two types of stimulation that affects on body relaxation. These results were in accordance with previous studies which stated that the combination of aromatherapy and music therapy may result in reduction in anxiety level more compared to the use of aromatherapy or music therapy alone.[31]

Compared to the Group 3, combination treatments significantly reduces sample's anxiety level. But in comparison to Group 2, significant differences occurred only in the mean difference of pulse rate. This can be caused by the work function of the heart in systolic and diastolic pressure. The heart, as a body generator, functions to pump blood and work hard to ensure that the mean pressure throughout the arterial system in the cardiac cycle is always the same in all organs. Blood pressure needs to be in constant rhytm so that systemic blood flow remains smooth.[23]

There are several factors that influencing the difference of anxiety level reduction on samples. The main factor is the different mechanisms of individual's anxiety level reduction, varied from easy to feel relax to more difficult and very tense. Time lapse is also another important factor. The time difference in receiving treatment (received treatment in the morning as they arrived at school or in the afternoon after break hour), a sense of familiarity with the school's conditions, coupled with tiredness and fatigue after morning activities could affect blood pressure and pulse rate. This occurs due to the influence of time (morning/afternoon) on the condition of β-endorphins in the body, level β-endorphins in the body is at its highest in the morning (around 9 am) and its lowest point in the evening (around 8 pm).[32] Appearance of a dental care operator might be the factor causing difference of anxiety level reduction. A study observed changes in childrens' heart rate, showing increasement by 10 beats per minute abouve the initial state when they saw a dentist dressed in a white coat.[33] The gender differences did not affect the scale of anxiety level reduction. Based on data analysis, there was no significant difference in the value of mean difference of systole, diastole, and pulse rate between male and female samples in each treatment group. The absence of gender influence on the reduction in anxiety is implied on the previous studies related to anxiety level.[34,35,36]

Conclusions

Based on the study results, the use of pandan leaves aromatherapy and relaxation music affect the reduction in anxiety level of pediatric patients undergoing dental treatment and the highest reduction significantly occurred in patients treated with a combination of pandan leaves aromatherapy and relaxation music.

Declaration of Interest

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References

1. Faisal GG, Raddef AS. Depression, anxiety, and stress among diabetic and non-diabetic patients with periodontitis. Journal of International Dental and Medical Research. 2017; 10(2):248-252.
2. Masitahapsari BN, Supartinah A, Lukito E. Management anxiety using modeling method of tooth extraction on child using topical anesthetic. Dental Journal. 2009; 1(1): 79-92.
3. Radeef AS, Faisal GG. Assessment of depression, anxiety and stress symptoms among patients with periodontal disease. Journal of International and Medical Research. 2017; 10(2):260-264.
4. Rehatta VC, Kandou J, Gunawan PN. Anxiety in child tooth extraction at Bahu Manado Hospital. Journal e-GiGi 2014; 2(2): 1-6. Available at http://ejournal.unsrat.ac.id/index.php/egigi/article/viewFile/5830/536 (accessed April 13, 2016).
5. Pravitasari A, Edi BW. The difference of anxiety level before and after coloring program among preschool-aged patients. Journal Nursing Studies. 2012; 1(1): 16-21.
6. Jafarzadeh M, Arman S, Pour FF. Effect of aromatherapy with orange essential oil on salivary cortisol and pulse rate in children during dental treatment: A randomized controlled clinical trial. Adv Biomed Res. 2013; 2: 10.
7. Arwani, Sriningsih I, Hartono R. The effect of aromatherapy application to patient's anxiety level before surgery using spinal anesthesia at Tugu Semarang Hospital. Semarang: Prosiding Conference Nasional PPNI Central Java.2013:83-7.
8. Hariana A. 262 Medical plants and its efficacy. Jakarta: Penebar Swadaya; 2013:163-4, 265.
9. Prasetyo EP. Function of music as a dental facility to decrese anxiety level. Dental Journal. 2005; 38(1): 41-4.
10. Soeparmin S, Suarjaya IK, Tyas MP. Function of music in decreasing child's anxiety level during dental treatment. Journal Faculty of Dentistry Universitas Mahasaraswati. 2008;6(1):1-2.
11. Campbell D. Mozart effect: utilize the power of music to induce critical thinking, creativity, and nourish the body. Translated by Hermaya T. Jakarta: Gramedia Pustaka Utama. 2002:38, 87-8, 96-8.
12. Riduan M, Noer M, Fitriana A. The effect of classical music therapy to anxiety level during dental treatment of Darul Ma'arif Padang junior highschool students (thesis). Padang: Universitas Andalas. 2016:32-8.
13. Keating-Biltucci MT. Fear and anxiety in the dental environment. RDH Magazine 2015; 31(7). Available at http://www.rdhmag.com/articles/print/volume-31/issue-7/features/fear-and-anxiety-in-the-dental-environment.html (accessed February. 16, 2016).
14. Nutt D, Ballenger J. Anxiety disorders: panic disorder and social anxiety disorder. 2nd ed. Turin: Lundbeck Institute-Blackwell Publishing. 2007:1-20.
15. Kirova DG. Dental anxiety among dental students. J IMAB. 2011; 17: 137-9.
16. Hartanto MM. The effect of sandalwood aromatherapy to short memory functions (thesis). Semarang: Universitas Diponegoro; 2014:8-9,14-5. Available at http://eprints.undip.ac.id/44834/ (accessed September. 13, 2015).
17. Davis C, Cooke M, Holzhauser K, Jones M, Finucane J. The effect of aromatherapy massage with music on the street and anxiety levels of emergency nurses. Australian Emergency Nursing Journal. 2005: 1-9.
18. Indrati D. The effectivity of lavender aromatherapy to affect pain level and anxiety level during labor kala I at Purwokerto Hospital (thesis). Jakarta: Universitas Indonesia. 2009. Available at http://www.lontar.ui.ac.id/file?file=pdf/abstrak-124684.pdf (accessed September 13, 2015).
19. Dalimartha S. Atlas medial plants Indonesia. 1st ed. Jakarta: Trubus Agriwidya; 2009:103-6.
20. Cook EC. The uses of music and music therapy to decrease stress and anxiety during pregnancy: A systematic categorization of the literature. Thesis. Philadelphia: Drexel University. 2012:32-4, 41-3. Available at: https://idea.library.drexel.edu/islandora/object/idea%3A3869/datastream/OBJ/download/The_Uses_of_Music_and_Music_Therapy_to_Decrease_Stress_and_Anxiety_During_Pregnancy_A_Systematic_Categorization_of_the_Literature.pdf (accessed April 16, 2016).
21. Chafin S, Roy M, Gerin W, Christenfeld N. Music can facilitate blood pressure recovery from stress. British Journal of Health Psychology. 2004; 9(3): 393-403. Available at https://dx.doi.org/10.1348/1359107041557020 (accessed Desember 26, 2016).
22. Winter MJ, Paskin S, Baker T. 1994, Music reduces stress and anxiety of patients in the surgical holding area. J Post Anesth Nurs. 1994; 9(6): 340-3.
23. Ganong WF. Ganong's review of medical physiology. 20th ed. Translated by UP Brahm. Jakarta: EGC; 2008:133-5, 165-78, 218-25, 254-6.
24. Kyle G. Evaluating the effectiveness of aromatherapy in reducing levels of anxiety in palliative care patients: results of a pilot study. Complement Ther Clin Pract. 2006; 12(2): 148-55.
25. Cho MY, Min ES, Hur MH, Lee MS. Effects of aromatherapy on the anxiety, vital signs, and sleep quality of percutaneous coronary intervention patients in Intensive Care Units. Evidence-Based Complementary and Alternative Medicine: eCAM. 2013. Available at http://doi.org/10.1155/2013/381381 (accessed November 9, 2015).
26. Štolc S, Krakovská A, Teplan M. Audiovisual stimulation of human brain linear and nonlinear measures', Measurement Science Review. 2003; 3(2): 95-7.
27. Supriyadi AR, Nuraeni A, Supriyono M. The effectivity of music therapy to decresement of insomnia signs on elderly at Panti Werda Rindang Asih II Bongsari Semarang. Journal nursery and obstetrics 2014: 1-4. Available at http://ejournal.stikestelogorejo.ac.id/e-journal/index.php/ilmukeperawatan/article/download/207/232 (accssed April 13, 2016).
28. Shum A, Taylor BJ, Thayala J, Chan MF. The effects of sedative music on sleep quality of older community-dwelling adults in Singapore. Complementary Therapies in Medicine. 2014; 22: 49-56.
29. Varley P. Complementary therapies in dental practice. Sydney: Elsevier Australia. 1997:38-44.
30. Esmeralda CD, Harijono AT. Identification and classification of EEG signals to sound stimulation using wavelet extraction and spectral power. PROC ITB Sains & Tek. 2005; 37A(1): 69-92.
31. Cooke M, Holzhauser K, Jones M, Davis C, Finucane J. The effect of aromatherapy massage with music on the stress and anxiety levels of emergency nurses: Comparison between summer and winter. J Clin Nurs. 2007; 16(9): 1695-703. Available at http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2702.2007.01709.x/abstract (accessed 26 Desember, 2016).
32. Austin JH. Zen and the brain: toward an understanding of meditation and consciousness. Cambridge: MIT Press. 1998:219.
33. Kent GG, Blinkhorn AS. Management of the patient's behavior on dental practice. 2nd ed. Translated by JA Budiman. Jakarta. Jakarta; 2005:2, 71-3.
34. Knight WE, Rickard NS. Relaxing music prevents stress-induced increases in subjective anxiety, systolic blood pressure, and heart rate in healthy males and females. J Music Ther 2001; 38(4): 254-72. Available at https://www.ncbi.nlm.nih.gov/pubmed/11796077 (accessed Desember 26, 2016).
35. Seifi Z, Beikmoradi A, Oshvandi K, Poorolajal J, Araghchian M, Safiaryan R. The effect of lavender essential oil on anxiety level in patients undergoind coronary artery bypass graft surgery: A double-blinded randomized clinical trial. Iran J Nurs Midwifery Res. 2014; 19(6): 574-80. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4280720/ (accessed Desember 26, 2016).
36. Yommy E. Factors related to preoperative patient anxiety level in IRNA Bedah RSUP Dr. M.Djamil Padang tahun 2014 (thesis). Padang: Universitas Andalas. 2014.