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The Effects of Music Therapy on the Physiological Response of Asthmatic Children Receiving Inhalation Therapy

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ABSTRACT

The clinical manifestation of asthma in children can interfere with their daily activities. Music therapy may become one of the alternative approaches to making children feel comfortable during inhalation therapy. The aim of the study was to identify the effects of music therapy on the physiological response of asthmatic preschool and school-age children receiving inhalation therapy. This study used a quasi-experimental, nonequivalent control group with a pre-test–post-test design. The 44 respondents consisted of preschool and school-age children assigned to intervention and control groups. The results showed a significant difference in average oxygen saturation, heart rate, and respiratory rate between the control and intervention groups before and after intervention ($p < \alpha$; $\alpha = .05$). Music therapy can be used as a nursing intervention to improve the physiological response of children with breathing problems.

KEYWORDS

Asthmatic; inhalation; music therapy; physiological response

Introduction

Asthma is a chronic inflammatory disorder of the airway resulting in episodes of respiratory airflow obstruction (Widagdo, 2015). A person who experiences inflammation often shows symptoms usually associated with widespread reversible airflow obstruction (Pearce & Asher, 2014). According to Soraya (2014), asthma is a chronic disease that often occurs in children, with common symptoms including chronic cough, wheezing, shortness of breath, and chest pain. These conditions can lead to disruption of the child's activities, such as sleep disturbance, tiredness during activities, and school absences due to the need to visit the Emergency Department. Based on data from the World Health Organization (WHO, 2013), it is estimated that 334 million people globally have asthma and that most of them are children.

According to Sliwka, Wloch, Tynor, and Nowobilski (2014), the prevalence of asthma among countries varies between 1% and 18%. The Global

Asthma Report (2014) further estimated that 14% of children and 8.6% of young adults experienced asthma. Pearce and Asher (2014) explained that the typical symptom of asthma, wheezing, is often found in children. This symptom may cause discomfort for children when an episode of asthma occurs. According to Wu et al. (2014), the goal of asthma treatment in children is to maintain and control clinical symptoms and to improve lung function so that they can live a normal life. Supriyatno and Nataprawira (2002) recommended that asthma drugs be administered parenterally, orally, or via inhalation, with the aim of stopping or preventing attacks as soon as possible.

The majority of children who are hospitalized because of health problems, including asthma, will experience anxiety, mood swings, and loss of freedom (Hendon & Bohon, 2008). Music therapy is a therapy that uses melody, rhythm, and sound harmonization in order to make children feel comfortable while receiving inhalation therapy. Music can facilitate relaxation and comfort, help to remedy depression and anxiety during treatment, improve quality of life, and have a positive effect on the patient healing process (Sliwka et al., 2014). The tempo of music can be used to harmonize physiological states including heart rhythm and respiratory rate (McDonald, 2001).

Music therapy is a noninvasive intervention that can be used to maintain and restore both physical and mental health. According to Chivington (2016), physiological responses often show signs of anxiety or pain, manifested in increases in heart rate and respiratory rate. The results of Ariani's (2013) study also highlighted that there is a significant relationship between music therapy and the physiological responses and anxiety behavior of school-age children during hospitalization. Diseases, painful procedures, unfamiliar environments, and feelings of isolation from family can make children feel fear, anxiety, and pain, thus leading to feelings of discomfort (Brewer & Lucas, 2012).

A study by Longhi, Pickett, and Hargreaves (2015) showed that live music in the hospital where the study was undertaken has effectively helped patients relax. Their study highlighted that live music significantly affects physiological responses such as heart rate, oxygen saturation, and pain in pediatric patients with heart or respiratory problems and will therefore increase their sense of comfort. Longhi et al. (2015) explained that it is important to provide a supportive and comfortable environment for hospitalized children in order to help control pain, reduce anxiety and improve quality of life, thereby maximizing the effects of treatment. Arnon and colleagues (2006) suggest music therapy as a non-pharmacological tool for distracting children's attention in order to encourage them to focus on something other than the pain which lead in reducing stress or discomfort and also relieving pain.

Methods

This quantitative research used a quasi-experimental, nonequivalent control group with a pre-test–post-test design. Music therapy as a form of intervention was given to the intervention group and the control group. The subjects were preschool children (3–5 years) and school-age children (6–12 years) with indications of asthma who were receiving inhalation therapy. Consecutive sampling was used. The study was conducted at the Emergency Department of one district hospital and two pediatric hospitals in an Indonesian province. The ethical principles used in the study include respect for human dignity and providing asthmatic children receiving inhalation therapy with the opportunity to benefit from music therapy. Prior to conducting the research, researchers obtained a letter of ethical permission from Faculty of Nursing Universitas Indonesia.

The data collection tools consisted of an observation sheet that includes respondent characteristics and monitors physiological responses such as oxygen saturation, heart rate, and respiratory rate; a questionnaire to determine asthma severity level based on symptoms; a timer to calculate respiration rate; headphones for listening to music; and a pulse oximeter to measure oxygen saturation and heart rate. Validity and reliability tests were performed for the questionnaire. The researchers constructed technical procedures for the control and intervention groups. Data analysis was carried out using SPSS.

Results

The study was conducted from April to May 2017 and involved 44 respondents who were preschool and school-age children. The respondents were assigned to intervention and control groups, with 22 respondents in each group. Most of the respondents (27 children, 61.4%) were of school age (6–12 years), and some (17 children, 38.6%) were of preschool age (3–5 years). The highest prevalence of asthma was among the boys: 26 (59.1%) of the children were boys and 18 (40.9%) were girls. The severity of asthma was mostly intermittent (26 children, 59.1%), with some mild persistent (18 people, 40.9%). The independent *t*-test and Mann–Whitney *U* test were used to analyze differences in physiological responses including oxygen saturation, heart rate, and respiratory rate after inhalation therapy in the group receiving routine hospital care and the group receiving music therapy. The results of the analysis can be seen in the tables below.

Tables 1 and 2 show that there is a significant difference between the control group and the intervention group ($p < \alpha$; $\alpha = .05$) in the oxygen saturation variable. Table 1 also reveals that there was no significant difference in heart rate or respiratory rate between the control group and the

Table 1. Differences in the average oxygen saturation of asthmatic children after inhalation therapy in the group receiving routine hospital care and music therapy in Pekanbaru, May–June 2017 ($n = 44$).

Variable: Oxygen Saturation	<i>n</i>	Mean Rank	Sum of Ranks	<i>p</i> value
Intervention	22	17.3	381	.005
Control	22	27.6	609	

Table 2. Differences in the average heart rate and respiratory rate of asthmatic children after inhalation therapy in the group receiving routine hospital care and music therapy in Pekanbaru, May–June 2017 ($n = 44$).

Variable	<i>n</i>	Mean	<i>p</i> value
Heart Rate			
Control	22	122.8	.445
Intervention	22	118.5	
Respiratory Rate			
Control	22	30.3	.808
Intervention	22	27.4	

Table 3. Average difference in the physiological responses of asthmatic children before and after inhalation therapy in control and intervention groups in Pekanbaru, May–June 2017 ($n = 44$).

Variable	Mean	SD	<i>n</i>	<i>p</i> value
Oxygen Saturation				
Control	1.36	0.95	22	.000
Intervention	2.5	0.91	22	
Heart Rate				
Control	3.86	10	22	.003
Intervention	16	15.1	22	
Respiratory Rate				
Control	3.9	4.4	22	.000
Intervention	10.1	3.8	22	

intervention group. This study also found that the severity level of asthma based on symptoms showed a significant relationship ($p < \alpha$; $\alpha = .05$) to physiological response, while age and gender variables did not show a significant association with physiological response.

It can be seen from Table 3 that there was a significant difference between the average oxygen saturation, heart rate, and respiratory rate before and after inhalation therapy in the control group and intervention group ($p < \alpha$; $\alpha = .05$).

Discussion

According to Larsen et al. (2014), asthma is a complex disease with a number of triggers, both genetic and environmental factors. Chronic airway inflammation is a major feature of asthma. The study by Radhakrishnan et al. (2014) showed that the mean age at diagnosis with asthma in children was 3 years old. The study found that age had no significant relationship with

physiological responses including oxygen saturation, heart rate, and respiratory rate. This may be because there are many factors that can influence physiological response, such as temperature, emotion, drugs, bleeding, and postural changes (Potter & Perry, 2010). Moreover, the results revealed that more boys have asthma than girls.

According to Sunyataningkamto et al. (2004), male toddlers have a smaller airway diameter than female toddlers, which will increase the prevalence of respiratory disease and wheezing in boys compared to girls. Radhakrishnan et al. (2014) also explained that a physical examination performed on children with asthma is an attempt to distinguish between types of asthma, namely persistent asthma or temporary asthma. Furthermore, Rietveld, Kolk, Prins, and Colland (2007) suggested that the severity level of asthma influences wheezing in children. This will be reflected in the symptoms of dyspnea. The difference between the objective and subjective symptoms of asthma will determine the choice of asthma treatment. Management of asthma has a number of aims: to maintain activity; to preserve lung function; to prevent symptoms and repeated exacerbations; to provide optimal therapy; and to help children live a normal life. This study found that music stimulates the autonomic nervous system to produce a relaxed state. Because of this, the body will achieve physiological balance. According to Tuner et al. (2010), the impact of the music stimulus is a reduction in the production of catecholamine, which decreases oxygen consumption and leads to an improvement in oxygen saturation.

According to Bradt (2009), the rhythm of the music played should match physiological rhythm; this can be achieved by changing the music gradually until it affects physiological response. Music can potentially eliminate or reduce the need for pharmacological therapy. According to Sam, Rustina, and Syahreni (2013), one way to minimize the use of oxygen in infants is to give music therapy. The study showed significant average differences before and after music therapy in oxygen saturation, heart rate, and respiratory rate in infants using mechanical ventilation. Music is one of the preferred distraction techniques by children at their early childhood. According to Klassen and colleagues (2008), music has a positive impact on emotions and physiological response. Lee (2015) describes music as an effective complementary therapy for reducing procedural pain, cancer or chronic pain, and treatment-related pain.

Conclusion

In summary, this study suggests that music therapy had an influence on the physiological response of asthmatic children before and after inhalation therapy. There were also differences in oxygen saturation after inhalation therapy in the control and intervention groups. However, the study found no differences in heart rate or respiratory rate after inhalation in either the

control group or the intervention group. This study recommends that music therapy be used in nursing care to improve physiological response in asthmatic children receiving inhalation therapy.

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