

## STUDYING THE EFFECT OF LULLABY ON SOME OF PHYSIOLOGICAL FACTORS

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### ARTICLE INFO

#### Received:

03<sup>th</sup> Jun 2017

#### Accepted:

29<sup>th</sup> Nov 2017

#### Available online:

14<sup>th</sup> Dec 2017

**Keywords:** *lullaby, physiological responses, preterm infants, suction, Neonatal intensive care unit (NICU).*

### ABSTRACT

**Objectives:** Determining the effect of lullabies on some physiologic and behavioral responses during endotracheal suctioning in premature infants in neonatal intensive care unit. **Design:** Single-blind randomized clinical trial. **Setting and conduct:** 25 infants qualified for the study are randomly assigned to A and B groups by using the sealed envelope method. The lullaby is played for the babies in group A before and after the suctioning and then it will not be played for the next 24 hours. The order is reversed for the babies in group B. In both groups, the babies are filmed for 20 minutes and heart rate, blood oxygen saturation and behavioral states are recorded by APIB scale. Finally, the changes in the physiological and behavioral parameters of the two groups are compared. **Participants including major eligibility criteria:** Postnatal age 1 to 28 days after birth; gestational age 28 to 36 weeks; neonate's need to endotracheal suctioning; no sedative medicine use during the past 24 hours; no maternal drug or sedative abuse; neonatal hearing ability (having startle reflex); no congenital malformation; no evidence of grade II or higher intraventricular hemorrhage or neurological disorders; not having used invasive procedures for the baby for at least 3 hours; endotracheal tube insertion at least 24 hours earlier. **Major exclusion criteria:** Parents' unwillingness to continue cooperating in research; symptoms of physiological instability in the infant. **Interventions:** Playing lullaby before and after the suctioning. **Main outcome measures (variables):** Heart rate, blood oxygen saturation, and behavioral responses.

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**To Cite This Article:** Mitra Edraki, Nooshin Beheshtipour, Seyyed Mostajab Razavi, Zahra zahadatpour, (2017), "Studying the effect of lullaby on some of physio-logical factors", *Pharmacophore, 8(6S), e-1173552.*

### Introduction

Alive infants that born before the 37<sup>th</sup> week of pregnancy since the first day of the last menstrual are preterm according to the World Health Organization (WHO). Preterm birth is one of the great difficulties that threaten community health. Preterm birth is the most important cause of disease and morality of infants but what is more important is lasting disabilities of infants that are alive. While there are some difficulties in evolution of different body systems that cause evolutionary delays and neurological disorders, advances in medicine and nursing care increased the survival chances of infants and their adaptation to extra uterine life [2]. Statistics International Center reported birth of nearly 15 million preterm infants. There are about 12.9% preterm infants [3]. Each infant faces 16 stressful and painful procedures in intensive care unit (ICU). These procedures are as follows: intubation, insertion of tube inside the chest, nasogastric tube, bloodletting, out of end tracheal tube, surgery, suction, etc. This method varies for an infant 2-14 times daily [5]. Primary goal of caring of ill and preterm infants is to keep breathing; on this basis most of infants usually need oxygen and mechanical ventilation through an artificial way such as endotracheal tube. One way of caring of these infants is to suction the respiratory secretions in order to keep the airway open and clean. This procedure

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can be stressful and painful. On the other hand, it has some side effects such as hypoxia, reduced or irregular heartbeat, increased intracranial pressure, Atelectasis, mild and severe bleeding, tracheobronchial tearing, emphysema, Pneumothorax, infection, heart attack and even death [6]. Most of the procedures that doctors and nurses do in NICU are painful and infant cannot tolerate them according to research of Simons et al [7]. Only, 20.8% of painful procedures are cured through pharmaceutical treatment and non-pharmaceutical treatment methods according to Carbajal's research [8]. Pharmaceutical alongside non-pharmaceutical methods are effective in pain and stress control according to Mathew's et al research. These methods include the controlled stimulations of different senses (senses of smell, hearing, touch, ...) that can control stress and pain of infants without any side effect before painful procedures [11]. In recent years concerns about side effects of drugs have led to more tendencies toward use of non-pharmaceutical interventions in order to relieve diagnostic procedures and treatment [9]. Since researchers have diagnosed the early maturation of auditory system in preterm infants, they have done various researches in order to study the effect of auditory stimulations on infants. These researches showed that music is known as a complement care and natural and non-invasive stimulation that is used to achieve evolutionary and treatment goals of infants treatment bedridden in NICU [12, 5]. Long-term exposure of infant with surrounded sound that is more than 75Db may cause disruption and loss of hearing in infants as continuous use of harmful drugs, so standard control of the sound in the infant's environment is very important [13].

Physiological factors indicate the human's health. Little changes in these factors often indicate health problems in humans [5]. Four important physiological indicators that are considered in caring of high risk infants in intensive care unit (ICU) are as follows: respiration, blood oxygen saturation, heart rate and body temperature. An efficient nurse should be aware of minor changes of these indicators and take some actions immediately that lead to the desired improvement in the function of the high-risk infants [3]. Arterial oxygen saturation is known as the fifth vital and crucial sign in infants. It is measured in all of the infants units continuously or intermittently. Oxygen is carried in two forms of combined with hemoglobin and free in blood. Pulse oximetry shows the percent of hemoglobin carries oxygen in the blood as (SPO<sub>2</sub>). Normal heart rate in infants is about 120-160 beats per minute. It varies based on behavior of infants. Heart rate of term infants is about 80-90 beats per minute in deep sleep mode. When infant wakes up, it increases [1]. Tachycardia means the number of heart rate is more than 160 beats per minute. It may relate to respiratory problems, anemia, congenital heart defect, hyperthermia, shock and supraventricular tachycardia [1].

#### **Infant endotracheal suction:**

Suction is used to clean secretion by negative pressure and a right size catheter. If one cannot keep the air-way open and remove the obstructions of respiratory tract due to accumulation of secretions, he/she needs suction, according to the definition of the North American nursing diagnosis association (NANDA). Goal of suction is draining lung secretions of a patient that cannot cough because of endotracheal tube. Discharge of secretions and clearing the air-way is effective by suction. Procedure of suction is by oxygen and proper ventilation but this procedure has some side effects such as pneumothorax, pneumonia, necrosis chip, atelectasis, pain, hypoxia, etc. Suction can also make the infant prone to bleeding in ventricles by raising the intracranial pressure, so suctioning the infant with endotracheal tube by mechanical ventilation is one of the most important responsibilities of nurses of intensive care unit (ICU) [14].

#### **Music therapy and lullabies:**

Music therapy is systemic use of music for making positive variations in behavioral and physiological signs by bradycardia, respiratory rate, blood pressure, level of metabolism, oxygen consumption, muscle stiffness, etc. [17] Non-pharmaceutical interventions are environmental and behavioral interventions that are used to control pain and stress based on the recent researches. Music intervention is one of the environmental care methods in which nurses change the environment so that their health and well-being improve. Use of music can reduce stress and even cure it. It is a non-pharmaceutical, enjoyable and accessible treatment [18]. Music has found a great room in our the physiological, mental, emotional, social and cultural needs and life. Music has a biological and physiological relation with human brain. Stimulant rhythm is biologic and fanciful because the most little rhythmic action motivates harmonic spiritual and physical tone [20]. Music motivates quickly the limbic system of brain. Studies indicate musical tranquilization reduces blood pressure, heartbeat and respiration and expiration, oxygen consumption rate and blood acid, too; also it reduces the brain waves from beta and stressful state to alpha which is lower; all of these changes lead to lassitude so reduce physiologically internal stress and pressure [21]. Lullabies belongs to verbal literature because all mothers recite them; they murmur them for their children, but none of them knows how and where she has learned them. Child becomes familiar with music and rhythm from the birth. Mother's heartbeat tranquilizes the embryo so having been born verbal rhythm and music are the most effective thing on the baby's spirit; then lullabies are of the oldest musical works throughout the world and are mixed with the hearers' spirits because of the tranquilizing voice [19]. In line with decreasing environmental and care stress and by virtue of the children's need concerning physiological stability this study was done to define the effect of lullaby on some of physiological factors due to endotracheal tube suction of preterm infants confined to bed in intensive care unit(ICU).

#### **Study Method:**

In this study having taken the permissions of Nursery College authorities, research environment, the hospital authorities and newborn special cares ward authorities and taken into consideration the moral principles the parents' consent letters regarding their preterm infants with related features who were confined to bed in ICU the children were examined. The demographic

form was taken through the data registered in the files and interview with the parents. The samples were selected by easy sampling method in random order in two groups. Close envelop method was used to allocate randomly the samples so 'A' and 'B' states were taken into consideration from the sampling commencement in first day and written separately on two similar envelopes; then one envelop was opened randomly for each infant. If it was 'A', the infant was a test subject and was a witness in next time (After 24 hours) and if it was 'B', the infant was witness and was a case in next time (After 24 hours). Finally each infant was examined two times; 50 cases were examined totally. The infants' hearing was examined by evaluating startle reflex and response to the stimulant and if it had such reflex, it was entered into the study. These infants were in stable thermal and physiological conditions (36.50 - 37.06 ° C); their heartbeat was 120-160 per minute; the oxygen saturation was 88 - 95 percent. The researcher examined the suction need every 2- 3 hours and prepared the necessary devices in appropriate to the infants' conditions according to the hospital standards and directions and did the endotracheal tube suction by virtue of the checklist. In state 'A' the lullaby was connected to the infant's ear by controlled decibel ten minutes before to ten minutes after the suction by headphone; the lullaby was in Persian containing four songs with popular poems (Their titles: Dreams of cloth, Pistachio flower, hill flower and wooden horse). The speed to play was 'ANDANTE' meaning calm and fluent played by the choir. In state 'B' to prevent the environmental sonic effect on the infant a headphone was used and it was evaluated without lullaby ten minutes before to ten minutes after the infant suction. The physiological factors (Heartbeats and oxygen saturation in this study) were registered by the researcher aid who observed the infant monitor in two minute intervals from ten minutes before to ten minutes after the suction in both 'A' and 'B'. The sample universe included 25 ones after statistical consultation considering the significance rate 95 percent and test potential of 90 percent by the formula:

$$n = \left\{ \frac{2\sigma^2 \times (1 - \rho)(z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_2 - \mu_1)^2} \right\}$$

The measures to enter into the study included: the parents' consent regarding the study participation, embryo of 28 - 37 week age, the newborn age of 1 - 28 days, the newborn need for endotracheal tube suction, no use of pain killer for the infant from 24 hours before, no use of any pain killer by the mother, the newborn able to hear (With startle reflex), without any maternal abnormality, no hemorrhage in the skull more than grade 2 or neurologic disorders, no invasive procedure for the infant at least from three hours before and laying the tubes into the trachea at least from 24 hours before. The measures to eliminate the case(s) from the study: lack of the parents' consent to cooperate with the study and instability of the infant's physiological conditions.

The data collection devices: demographic data form, pulse oximeter device, headphone, phonometer and movie camera. The form was issued by the researcher according to the researches related to the study included: the infant name, infant's code, sex, Apgar score in first and fifth minutes and weight when it was born, mother's age, pregnancy age, newborn age, during the study, abdominal hemorrhage and its rate in the infant. The form data were accessible through the data registered in the file and interview with the parents.

The pulse oximeter: the device is digital – electronic by which two variables namely the infants' heartbeats and blood oxygen saturation were measured so having connected the electricity for the device and the sensor probe to the infant's right hand the device was controlling the heartbeats and the blood oxygen saturation and they were shown on the monitor. In this study the software Sound Meter Pro, version 2, 2, 4 was used to control the lullaby decibel broadcasted in the defined environment.

Movie camera: The infants' behavioural responses during the suction were registered by a movie camera. A movie camera specialist did it. The camera was T 700, Sony, made in Japan.

Headphone: The lullaby was broadcasted by a Sony headphone with 105 decibel sensibility and 100 milivolt broadcasting power in both 'A' and 'B' states from ten minutes before to ten minutes after the pulse oximeter operation under filming; then the films were examined for necessary changes concerning physiological measures. The data were analyzed by statistical descriptive method including abundance, variance, mean and standard deviation and deductive statistics including parametric and nonparametric tests and the software SPSS; first the questionnaire choices were coded to analyze the data in a manner that each choice had a number and SPSS was used to define the proportion of the data entry, change and analysis. The statistical test of the case are independent T-test, even T and Mann- Whitney.

### Study findings

By virtue of the study done on 25 infants the minimum and maximum ages of the infants in the womb were 28 and 36 weeks, respectively with age mean almost  $2.70 \pm 31.20$  and the minimum and maximum age after birth until the study 2 and 21 days, respectively with the mean almost  $5.35 \pm 8.04$  and also the minimum and maximum Apgar scores of first minute were  $2.04 \pm 5.76$  and of fifth minute were 5 and 10 with mean  $1.77 \pm 7.84$ . The minimum and maximum infant weights were 700 g and 3,300 g, respectively with the mean  $1,493.40 \pm 616.26$ . The mothers' age was 19 - 38 with the mean  $4.98 \pm 29.70$ . Nine subjects were female (36 percent) and 16 ones were male (64 percent); 32 percent (8 ones) were born normally and 68 percent (17 ones) were born by cesarean operation.

**Table 1:** Comparing the infants' heartbeats ten minutes before and ten minutes after the suction in the lullaby and silent groups

Step \ Group	Lullaby		Silent		Test rate	Significance rate
	DS	Mean	DS	Mean		
10 minutes before suction	20.90	129.36	20.43	131.55	0.89	0.39
10 minutes after suction	16.55	130.32	17.73	139	7.49	<0.001
Significance	0.133		<0.001		-	-

By virtue of Table 1 although the heartbeat rate in lullaby group is less than the silent one ten minutes before the suction independent 'T' test indicates no significant difference regarding the infants' heartbeat mean ten minutes before the suction between the two groups ( $P = 0.39$ ). The heartbeat mean is significantly lower in the lullaby group than the silent one ten minutes after the suction ( $P < 0.001$ ). Compared to the infants' heartbeat mean in the two steps before and after suction in each group (Done based on even 'T' test) there is no significant statistical difference between the heartbeat mean before and after the suction in the lullaby group ( $P = 0.133$ ), but the heartbeat mean is statistically different before and after the suction in the silent group ( $P < 0.001$ ).

**Table 2:** Comparing the infants' heartbeats ten minutes before and ten minutes after the suction in the lullaby and silent groups

Heartbeat changes regarding basic state \ Group	Lullaby		Silent		Test rate	Significance rate
	DS	Mean	DS	Mean		
Before suction	4.48	2.20	3.35	0.84	2.70	0.009
After suction	7.15	0.008	8.39	9.50	0.54	0.64
Significance	0.136		<0.001		-	-

By virtue of Table 2 the Mann – Whitney test indicted no significant difference between the infants' heartbeat changes compared to basic state in lullaby and silent groups before and after the suction ( $P = 0.009$  and  $P = 0.64$ ), but by virtue of the Wilcoxon test the changes were not significantly different in the lullaby group before and after the suction while they were significant considering the significance rate ( $p < 0.001$ ) in the silent state.

**Table 3:** Comparing the infants' mean oxygen saturation percentage ten minutes before and after the suction in the lullaby and silent groups

Step \ Group	Lullaby		Silent		Test rate	Significance rate
	DS	Mean	DS	Mean		
10 minutes before suction	0.14	94.88	0.25	94.77	0.79	0.56
10 minutes after suction	3.59	97.29	3.77	95.88	0.65	0.92
Significance	0.010		0.334		-	-

By virtue of Table 3 the independent 'T' test indicated no significant difference regarding the infants' blood saturation ten minutes before and after the suction between the lullaby and silent groups (Ten minutes before the suction it was  $p = 0.56$  and ten minutes after the suction it was  $p = 0.92$ ), but by virtue of the even 'T' test there was a significant difference regarding the blood saturation before and after the suction in the lullaby group ( $P = 0.001$ ) while such difference did not exist in the silent group.

**Table 4:** Comparing the mean changes of the infants' heartbeat to the basic state in the lullaby and silent groups

Group	Lullaby		Silent		Test rate	Significance rate
	DS	Mean	DS	Mean		
Heartbeat changes regarding basic state						
Before suction	4.48	2.20	3.35	0.84	2.70	0.009
After suction	7.15	0.008	8.39	9.50	0.54	0.64
Significance	0.136		<0.001		-	-

By virtue of Table 4 the Mann – Whitney test indicated no significant difference between the infants' heartbeat changes in the lullaby and silent groups before and after the suction ( $P = 0.009$  and  $P = 0.64$ ), but by virtue of the Wilcoxon Test the changes were not significant in the lullaby group while they were significant in the silent group according to the significance rate ( $P < 0.001$ ).

**Table 5:** Comparing the mean changes of the infants' blood oxygen saturation percentage changes to the basic state in the lullaby and silent groups

Group	Lullaby		Silent		Test rate	Significance rate
	DS	Mean	DS	Mean		
Blood saturation percentage changes regarding basic state						
Before suction	14.80	3.96	14.31	4.06	- 0.420	0.67
After suction	15.20	1.54	12.37	2.95	- 1.47	0.14
Test rate	- 2.75		0.985		-	-
Significance	0.01		0.33		-	-

By virtue of Table 5 the Wilcoxon test indicated no significant difference between the infants' blood saturation percentage changes in the lullaby and silent groups before and after the suction (Significance rate 0.14 and 0.067, respectively), also by virtue of the Mann-Whitney Test the changes were not significant in the lullaby and silent groups according to the significance rate (0.001 and 0.33).

#### Discussion and conclusion:

By virtue of the table's data there was no significant difference between the two groups regarding the heartbeat means ten minutes before and after the suction, but the heartbeat mean was significantly less in the lullaby group than the silent one. One of the factors to respond to the stress in the infants is the heartbeat increase [17]. The response to stress is done by neural system adaptation and endocrine to help hemostasis. In response to stress the adrenal modular cells and neural sympathetic system fibers become active and catecholamines (Adrenalin and noradrenalin) are released from the adrenal glands and increase the heartbeat, breathe and oxygen consumption [18]. Music with the effect on neural system (Limbic and automatic neural systems) creates the tranquilization response. The tranquilization response features include reduced heartbeat, deep respiration and regular asleep and repeated brain alpha waves created during asleep and wake [19]. So it seems the infants' heartbeat is less after the suction in the lullaby group because the infant is calmer after hearing the music. Considering there was no significant difference between the heartbeat means in the lullaby group before and after the suction (0.13) it can be concluded that the lullaby stabilized the heartbeat before and after the painful procedure while the heartbeat in the silent group was significant before and after the suction ( $p < 0/001$ ); this finding indicates that the heartbeat in the silent group increased compared to the lullaby group after the suction. Based on the findings in the table the heartbeat changes means are different in the two groups and lullaby music decreased the heartbeat and finally decreased the stress in the infants. In their study Signalò et al. (The Effect of Nonmedical Interferences of the Pain Due To Endotracheal Tube Suction, 2008) concluded that the senses motivation during painful procedure by virtue of PIPP measure decreases the pain and the infants' heartbeat increases less compared to the usual method [2]. In their study Amini et al. (Examining The Effect Of Two Different Types Of Music On The Physiological Measures namely heartbeat, oxygen saturation rate and the preterm infants' conditions during asleep and wake, 2013) concluded that the lullaby decreases significantly heartbeat and respiration compared to basic state during inter-

ference rates and after it [20]. The Tramo et al. (2011) findings (The Effect Of Music On Physiological Factors And Behavioural States During Painful Procedure On The Preterm Infants) indicated that the heartbeat and respiration rate increased during bleeding of heel in both test and control groups and almost all the infants began to cry during the procedure, but the heartbeat and cry rates decreased significantly in the group who heard the music 10 minutes after the heel bleeding compared to the witness group [5]. In Taiwan Chung (2007) in his study, 'The Effect Of Swaddling On Preterm Infant's Physiological Features During Suction' stated that the heartbeat of the swaddled infant was more stable than the control group and may maintain the preterm infant's energy [21]. The findings of the present study are in accordance with it.

Table 3 examined the infants' blood oxygen saturation percentage ten minutes before and after the suction in lullaby and silent groups; based on the independent 'T' test there was no significant difference regarding the oxygen saturation percentage means before suction between the two groups. Considering one of the infants' stress signs is the oxygen saturation percentage decrease [17]. Although the oxygen saturation percentage increased after the suction compared to before it in both groups, by virtue of the even 'T' test the oxygen saturation percentage increased significantly in the lullaby group after the suction than the silent group; it seems lullaby decreases the stress due to suction better than in the silent group. By virtue of the studies moderate and controlled music motivates neural system to create calmness, relaxation, tension decrease and more oxygenation [22]. The findings are in accordance with some other researches done in field of the effect of music on the oxygen saturation percentage in preterm infants; for example, in a study done by Collins et al. 17 restless 24-37 week infants had significantly increased oxygen saturation rate 10 minutes before and after the music play (23). Colman et al. did a study titled, 'Examining The Effect Of Female And Male Voices On The Preterm Infants' Physiological And Behavioural Responses'; 66 infants with 29.50 week age were examined for 50 minutes weekly. The control infants had ten minutes silence, 20 minutes music and then 20 minutes silence again; their oxygen saturation rate, heartbeat and distress behaviour were examined per minute; the findings indicated that the oxygen saturation rate increased significantly during the female voice [24].

Amiri's et al. study, 'The Effect Of Lullaby On The Preterm Infants' Oxygen Saturation Rate ' examined randomly 40 infants; both groups were examined daily forty minutes for eight days. The test group had 20 minutes lullaby daily. The findings indicated that the oxygen saturation rate changes were more in the test group compared to the witness one [1]. Standly et al. in their study (Comparing The Music Remedial Effect And Mother's Voice On Preterm Infants' Oxygen Saturation Rate ) stated that the witness group had daily the mother's voice for 20 minutes by headphone for three days and the treatment group had the same lullaby; the oxygen saturation rates of both were recorded during 40 minutes and the alarms were registered by the pulse oximetry device; the findings indicated that the treatment group had significantly higher the oxygen saturation rate in in second 10 minute music play first day than the witness group [25]. In his study, 'The Effect Of Music On Preterm Infants' Physiological And Behavioural Responses' Alipoor examined ninety 28-37 week preterm infants; the test group had music for 20 minutes by headphone, but the witness one had not; the heartbeat, oxygen saturation rates and behavioural stress were examined each five minutes in both groups; the findings showed no significant changes in the oxygen saturation rates of both groups (26) so the present study findings are not in accordance with the Alipoor's et al. study.

## References

1. Mary B, Jane W, Kliegman R, Stanton B, Geme J. Nelson Textbook of Pediatrics. .2015
2. Cignacco E, Hamers JP, van Lingen RA, Zimmermann L, Müller R, Gessler P, et al. Pain relief in ventilated preterms during endotracheal suctioning: a randomized controlled trial. *Swiss medical weekly*. 2008;138(44-43):45-635
3. Edraki M, Paran M, Montaseri S, Nejad MR, Montaseri Z. Comparing the Effects of Swaddled and Conventional Bathing Methods on Body Temperature and Crying Duration in Premature Infants: A Randomized Clinical Trial. *Journal of caring sciences*. 2014;3(2):.83
4. Tramo MJ, Lense M, Van Ness C, Kagan J, Settle MD, Cronin JH. Effects of Music on Physiological and Behavioral Indices of Acute Pain and Stress in Premature Infants Clinical Trial and Literature Review. *Music and Medicine*. 2011;3(2):.83-72
5. Hadian Shirazi Z, Kargar M, Edraki M, Ghaem H, Pishva N. The effect of instructing the principles of endotracheal tube suctioning on knowledge and performance of nursing staff working in neonatal intensive care units in shiraz university of medical sciences. *Iranian Journal of Medical Education*. 2010;9(4):.70-365
6. Simon S, Van dijk M, Anand k, etal. do we still hurt newborn babies? A prospective study of procedurral pain and analgesia in neonates. *archive of pediatric adolescent medicine*. 2003;.64-157:1058
7. Carbajal R, Rousset A, Danna D, Coquery S, Nolent P, Docrocq S, et al. Epidermiology and treatment of painfull procedures in neonatal intensive care units. *American medical association* 2008; 70-60:(1)300
8. mathew P, mathew L. assessment and management if pain in infant. . *postgard Med* 2003;934(79):.43-438
9. Loewy J, Stewart K, Dassler A-M, Telsey A, Homel P. The effects of music therapy on vital signs, feeding, and sleep in premature infants. *Pediatrics*. 2013;131(5):.18-902
10. Gooding LF. Using music therapy protocols in the treatment of premature infants: An introduction to current practices. *The Arts in Psychotherapy*. 2010;37(3):.4-211
11. Chou L-L, Wang R-H, Chen S-J, Pai L. Effects of music therapy on oxygen saturation in premature infants receiving endotracheal suctioning. *Journal of nursing research*. 2003;11(3):.16-209

12. zarshenas M, s. f. normal and abnormal neonate. .2005
13. Care AAFR. AARC Clinical Practice Guidelines. Endotracheal suctioning of mechanically ventilated patients with artificial airways 2010. *Respiratory care*. 2010;55(6):.758
14. Calabro J, Wolfe R, Shoemark H. The effects of recorded sedative music on the physiology and behaviour of premature infants with a respiratory disorder. *Australian Journal of Music Therapy*. 2003;14(2003):.3
15. Bernatzky G, Presch M, Anderson M, Panksepp J. Emotional foundations of music as a non-pharmacological pain management tool in modern medicine. *Neuroscience & Biobehavioral Reviews*. 2011;35(9):.99-1989
16. Gilad E, Arnon S. The role of live music and singing as a stress-reducing modality in the neonatal intensive care unit environment. *Music and Medicine*. 2010;2(1):.22-18
17. Symington AJ, Pinelli J. Developmental care for promoting development and preventing morbidity in preterm infants. *The Cochrane Library*. .2006
18. Mörelius E. Stress in infants and parents: studies of salivary cortisol, behaviour and psychometric measures. .2006
19. Nguyen TN, Nilsson S, Hellström A-L, Bengtson A. Music therapy to reduce pain and anxiety in children with cancer undergoing lumbar puncture: a randomized clinical trial. *Journal of Pediatric Oncology Nursing*. 2010;27(3):.55-146
20. Amini E, Rafiei P, Zarei K, Gohari M, Hamidi M. Effect of lullaby and classical music on physiologic stability of hospitalized preterm infants: A randomized trial. *Journal of neonatal-perinatal medicine*. 2013;6(4):.301-295
21. Chang H-M, Chiang L-C, editors. Evaluating effectiveness of swaddling on physiological indicators among preterm-infants during suction period-on the application of levine's conservation model of nursing. Paper presented at the 18th International Nursing Research Congress Focusing on Evidence-Based Practice; .2007
22. Maleki M, Ghaderi M, Ashktorab T, Jabbari Nooghabi H, Zadehmohammadi A. Effect of light music on physiological parameters of patients with traumatic brain injuries at intensive care units. *The Horizon of Medical Sciences*. 2012;18(1):.74-66
23. Collins S, Kuck K. Music therapy in the neonatal intensive care unit. *Neonatal network: NN*. 1991;9(6):.6-23
24. Coleman JM, Pratt RR, Stoddard RA, Gerstmann DR, Abel H-H. The effects of the male and female singing and speaking voices on selected physiological and behavioral measures of premature infants in the intensive care unit. *International Journal of Arts Medicine*. .1997
25. Standley J. Music therapy research in the NICU: an updated meta-analysis. *Neonatal Network*. 2012;31(5):.6-311
26. Alipour Z, Eskandari N, Hossaini SKE, Sangi S. Effects of music on physiological and behavioral responses of premature infants: A randomized controlled trial. *Complementary therapies in clinical practice*. 2013;19(3):.32-128