

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/309903277>

Effect of recorded lullaby on physiologic response of neonates in NICU

Article · November 2016

DOI: 10.1016/j.apnr.2016.11.003

CITATIONS

0

READS

34

4 authors, including:



Leila Taheri

Qom University of Medical Science and Health

18 PUBLICATIONS 23 CITATIONS

[SEE PROFILE](#)



Marzieh Kargar jahromi

Gerash University of Medical Sciences

52 PUBLICATIONS 48 CITATIONS

[SEE PROFILE](#)



Mohsen Hojat

Jahrom University of Medical Sciences

122 PUBLICATIONS 30 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



continuing medical education (CME) [View project](#)



assessing the performance of emergency nurses on ESI triage [View project](#)

All content following this page was uploaded by [Marzieh Kargar jahromi](#) on 11 December 2016.

The user has requested enhancement of the downloaded file. All in-text references [underlined in blue](#) are added to the original document and are linked to publications on ResearchGate, letting you access and read them immediately.



Effect of recorded male lullaby on physiologic response of neonates in NICU



Leila Taheri ^a, Marzieh Kargar Jahromi ^b, Mohammad Abbasi ^a, Mohsen Hojat ^{b,*}

^a School of Nursing and Midwifery, Qom University of Medical Sciences, Qom, Iran

^b College of Nursing and Paramedics, Jahrom University of Medical Sciences, Jahrom, Iran

ARTICLE INFO

Article history:

Received 15 October 2015

Revised 24 October 2016

Accepted 6 November 2016

Available online xxxx

Keywords:

Male lullaby

Neonate

Heart rate

Blood oxygen saturation

ABSTRACT

Purpose: Most infants in the NICU are exposed to sensory overloads and deprivations as part of their care. This study conducted to assess the effect of lullaby on physiologic response of neonates admitted to NICU.

Method: This is a randomized double-blind intervention trial which was performed on 52 neonates in Jahrom (Iran) 2013–2014. The samples were randomly assigned into lullaby group and a control group (sampling was sequential and randomization was by lottery). Neonates in lullaby group ($n = 26$) listened to male lullaby via headphones during 3 days and daily for 20 min. Headphones without sound were placed for the control group ($n = 26$) during this period. Immediately before the intervention, 10 min later, 20 min after the start and 20 min after the completion of it, changes in heart rate and oxygen saturation were recorded by heart monitor, then data were analyzed by software SPSS:V 21, Greenhouse-Geisser test, repeated measures and *t*-test.

Results: The mean of Heart rate in second day at 20th and 40th minutes in lullaby group were less than control and this differences were significant (respectively $p = 0.013, 0.026$).

Also the blood oxygen saturation levels on the first day at 20th minutes, second day at 10th minutes–20th and 40th minutes and the third on 40 min were significantly different among groups.

Conclusion: Lullaby (male voice and without music) could significantly reduce heart rate and increase blood oxygen saturation of neonates. Future studies are required to make music as a part of evidence-based strategies to promote outcome of neonates in NICUs.

© 2016 Elsevier Inc. All rights reserved.

1. Introduction

Although sensory stimulation is necessary for proper neurological development, but an infant in the NICU is exposed to average inappropriate noise levels ranging from 50 to 100 dB¹ from sources such as monitor alarms, ventilators, incubator fans and motors, radios, telephones, doors, conversations, and water faucets (Kisilevsky, Hains, Jacquet, Granier-Deferre, & Lecanuet, 2004).

In recent years, several studies have used music and music therapy as a means to reduce stress and promote growth for neonates in the NICU. Several studies using music with preterm neonates, have shown 3 to 5 days earlier discharge from the NICU (Kisilevsky et al., 2004). Several studies were conducted on pain reduction effect of music; For example Oh et al. evaluated the effect of hearing music on response to

pain during needling; they concluded that the music group had lower NIPS score (Neonatal Infant Pain Scale) than the controls (5.6 ± 1.1 vs 6.5 ± 0.7 , $p = 0.006$) (Oh, Yang, Lee, Park, & Kim, 2013).

Loewy et al. concluded that music intervention, significantly reduced in the frequency and duration of episodes of inconsolable crying and improved physiological measures including heart rate, respiration rate, oxygen saturation, and mean arterial pressure (Loewy, Stewart, Dassler, Telsey, & Homel, 2013).

Lubetzky et al. in a prospective, randomized clinical trial concluded that Exposure to Mozart music significantly lowers resting energy expenditure (REE) in healthy preterm infants (Lubetzky et al., 2010). Arnon et al. assessed the effect of live music, recorded music, and no music therapy on thirty-one stable infants over 3 consecutive days and 30 min daily. They concluded that at the 30-minute interval after the therapy ended, live music significantly reduced heart rate (Arnon et al., 2006).

Results of a research by Amiri et al. showed that mean change in oxygen saturation level increased in the music group significantly (Amiri et al., 2009). Lullaby song may be as predictable and stable source of stimulation which covers the sound of the NICU environment; therefore it may reduce the stress experienced by the neonates (Khani, Tr, Sv, Sabaghi, & Bavand, 2008).

* Corresponding author.

E-mail addresses: taheri.leila@gmail.com (L. Taheri), marzeiah.marziah66@gmail.com (M.K. Jahromi), mohamad_abbasi55@yahoo.com (M. Abbasi), mohsenhojat@yahoo.com (M. Hojat).

¹ Decibels.

Table 1
Demographic data of neonates.

Demographic variables	Lullaby (26) Mean \pm sd	Control (26) Mean \pm sd	p
Gestational age (week)	33 \pm 4	34 \pm 4	0.198
Mother age (year)	28.64 \pm 5.06	27.15 \pm 4.57	0.382
Father age (year)	33.54 \pm 9.33	31.81 \pm 6.29	0.266
5th Apgar score	7.54 \pm 1.74	8.78 \pm 1.26	0.233
Age of neonate (day)	1.25 \pm 0.44	1.92 \pm 0.34	0.258
Birth weight (gram)	1687.54 \pm 551.2	1751.05 \pm 46	0.342

Although Standley in a meta-analysis found that evidence-based NICU music therapy was extensively beneficial with an overall large significant effect size (Cohen's $d = 0.82$) (Standley, 2012), but most research were done on live music, recorded female lullaby, mother or womb voice, and little study have been done on the effect of lullaby with male sound and without music, so we conducted this research to identify the effect of lullaby using a male voice on heart rate and blood oxygen saturation of neonates in NICU.

2. Materials and methods

2.1. Setting

This double-blind intervention study took place in Neonatal Intensive Care Unit of Motahari Teaching Hospital affiliated to Jahrom University of Medical Sciences in Iran. In this unit approximately 250 neonates have been admitted annually.

2.2. Sample

This study was done on 52 neonates who were admitted to NICU during the study in 2013–2014. Considering the 95% confidence level, mean 7.2 ± 5.3 and power 0.8, sample size have been calculate 25 for each group (according compare mean formula). Written informed consent was obtained from both parents of each infant. Inclusion criteria were: Iranian nationality of parents, stay in the incubator, fifth minute Apgar score above or equal to 7, no severe reactions to sound stimuli and not using sedative or anticonvulsants drugs, no sign of significant complication, such as sepsis, intracranial hemorrhage (of any grade), necrotizing enterocolitis (NEC) and free of congenital abnormality and dysmorphism, no history of alcohol or drug abuse of mother. Also the exclusion criteria were: severe reactions to sound stimuli like screaming, crying and too much body movement of infants, difficulty in heart rate recording, for example, separation of the heart monitor probe, any serious physiological or behavioral changes such as a drop in oxygen saturation less than 75 or heart rate more than 200 bpm² that would need intervention and manipulation by nurse. To assess auditory responses, optimally, the infants were in the quiet, alert state. All neonates were thermally stable while cared for in a skin servo controlled incubator. They were fed and have received all necessary care to maximize receptiveness for testing.

2.3. Procedure

Allocation to group was done by randomization (drawing pieces of paper from a bag). Then, their hearing sense was evaluated using startle reflex. Each neonate was observed in flat position on 3 consecutive days and 40 min daily.

In this study, the neonates heard a recorded male lullaby through a headphone, which was played on a MP3-player device at a volume of 50 to 60 dB in their incubator. The same procedure was applied to control group but no music was played for them during the 40 min period. These interventions were applied at the same time of the day (noon time) for all neonates.

Heart rate and blood oxygen saturation were recorded through the Monitor at four times: immediately before playing music, 10 min after the start of music, 20 min after (end of music), and finally 20 min after its completion (40th minutes).

2.4. Instruments

The instrument used in this study was cardiac monitor device of Saadat Novin company model S1800 made in Iran which its probe was attached to the neonate's right foot. The media player device was a MP3-playere of Marshal Company, model FD1 and headphones of Generous model GH615mv. These instruments have been calibrated before and during the study to assure reliable and valid results. Also a sound level meter was used to measure the intensity of audio in dB, under the supervision of an occupational health expert.

2.5. Data analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS 21). Greenhouse-Geisser test, repeated measures, t -test for control the confounding variables were used. Considering the number of subjects, Shapiro test was used to evaluating the normality of the data. $p < 0.05$ was considered significant.

3. Findings

Fifty five neonates were recruited to the study. Two neonates due to crying were excluded and one of them was excluded because of drop in blood oxygen saturation before the beginning of the intervention. Characteristics of Subjects are listed in Table 1 and contain their gender, gestational age, type of delivery, birth weight, 5th Apgar score, age of their parents. The subjects of the two groups had no significant difference in terms of demographic characteristics; using t -test (Table 1).

Total changes of heart rate in three record times after intervention compare with baseline heart rate in all groups were not statistically different (Table 2), although mean heart rate in 20th minutes in lullaby group (129.95 beats/min) was less than control group (135.68 beats/min), but this difference was not significant ($p = 0.075$).

t -Test showed that mean changes in heart rate of neonates in the first and third days of study were not significant in two groups (Table 2). But the second day, the mean changes in heart rate of lullaby group, 20 and 40 min after the intervention compared to the base line, using t -test was significantly lower than control group ($p = 0.013$ and $p = 0.026$ respectively).

As Table 3 shows, the oxygen saturation levels on the first day at 20th minutes ($p = 0.025$, second day at baseline, 10th minutes–20th and 40th minutes (respectively $p = 0.03$, 0.015, 0.005, 0.028) and the third day at baseline and 40th minutes ($p = 0.018$, 0.021) were significantly different between groups using t -test; Although the changes in blood oxygen saturation within groups, in the three days of study showed no significant difference by Repeated Measurement test (Table 3).

4. Discussion

These findings suggest that recorded male lullaby can reduce heart rate and increase oxygen saturation; it seems that lullaby can relax and soothe neonates in NICU. As we know infants who have immature auditory function may be more responsive and attentive to lower

² Beats per minute.

Table 2

Mean of heart rate of neonates at four times in three study days.

Group		Mean \pm SD of heart rate				p
		Baseline	10th min	20th min	40th min	
Control	First day	132.21 \pm 25.21	134.03 \pm 15.99	135.39 \pm 17.24	134.39 \pm 15.93	0.486
Lullaby		135.77 \pm 16.15	131.81 \pm 17.47	132.29 \pm 16.91	135.23 \pm 16.48	
p		0.376	0.511	0.788	0.975	
Control	Second day	138.50 \pm 16.93	136.08 \pm 17.03	134.31 \pm 18.31	135.94 \pm 17.67	0.255
Lullaby		133.03 \pm 17.81	127.33 \pm 11.94	126.67 \pm 11.22	129.03 \pm 11.36	
p		0.899	0.094	0.013	0.026	
Control	Third day	139.5 \pm 18.7	131.31 \pm 24.79	136.97 \pm 22.95	134.22 \pm 21.80	0.335
Lullaby		137.62 \pm 13.67	132.00 \pm 13.85	131.38 \pm 16.40	136.74 \pm 18.49	
p		0.79	0.45	0.388	0.346	

pitched sounds, that is, the male voice, than to higher pitched sounds (Lee & White-Traut, 2014).

Consistent with this study, the results of the study by Garunkstiene et al. also show that lullabies effectively reduce the heart rate of premature infants less than 32 weeks postmenstrual age (Garunkstiene, Buinauskiene, Uloziene, & Markuniene, 2014). Amini et al. concluded that music can affect vital signs of preterm infants; it may be related to the reduction of stress during hospitalization (Amini, Rafiei, Zarei, Gohari, & Hamidi, 2013).

Results indicate that exposure to recorded lullaby significantly affect the oxygen saturation levels. It is in line with the study by Amiri et al. which showed that music increased mean change in oxygen saturation level significantly (Amiri et al., 2009). Also Bruton (2014) reported that music used in NICU can increase oxygen saturations and decrease heart rate and respiratory rate in the fussy/irritable neonate (Bruton, 2014). Schwillling reported that salivary cortisol was significantly lower 25 min and 4 h after music than at baseline 4 h before exposure. Also the number of apneas, oxygen desaturations, the number of bradycardia episodes and pain scores were significantly reduced after music (Schwillling et al., 2015). But Garunkstiene concluded that no changes were observed in oxygen saturation level by lived or recorded lullaby in preterm neonates (Garunkstiene et al., 2014). This difference in our results may be related to gestational age of samples.

This finding is inconsistent with the study by Arnon et al., they concluded that live music therapy had no significant effect on physiological and behavioral parameters during the 30-minute therapy (Arnon et al., 2006); this inconsistency may be related to duration of intervention in two research: their intervention was done in one day, but in our study it was done in three consecutive days; also they studied preterm neonates in their research. These inconsistencies need to do more powerful research in this field.

Music therapy can improve neonatal function and reduce anxiety in parents during neonatal intensive care unit (NICU) stays (Loewy, 2015). Perhaps the effect of music on physiological responses can be explained that music affects the nervous system (limbic and autonomic nervous system) so it leads to comfort, relaxation, stress reduction and set the

heart rate and improve oxygenation (Thoma et al., 2013). Lullaby is also an available noninvasive, non-pharmacologic, and relatively low-cost intervention that can be implemented at neonates' bedside by nurses.

5. Conclusions

We knew that recorded music, parent voices, and song lullabies have been shown to increase oxygen saturation, nonnutritive sucking, and weight gain in premature infants (Loewy et al., 2013). We expect this effect, because normally developing fetuses hear in the womb and develop a preference for women's voices. But this study adds *male Lullaby without music* also may enhance stability in physiologic indicators in neonates and significantly reduce heart rate and increase blood oxygen saturation level.

Despite the fact that the use of music therapy has been shown to be effective, there are very few NICUs that have permanent music therapy programs in place, especially in developing countries. This may, to some extent be due to the limited amount of study validating the need for a therapist with the necessary training and expertise. Future studies are essential to determine whether music will take its place in the Neonatal Intensive Care Unit environment and be part of evidence-based strategies to promote outcome of hospitalized neonates.

Conflict of interest

There is no conflict of interest.

Acknowledgment

The study was approved by the research ethics committees of Jahrom University of Medical Sciences (JUMS.REC.1392.048). The authors would like to thank authorities and nurses of NICU in Motahari hospital of Jahrom. Also we would like to thank Mr. Saeed Sobhanian for statistical consultation and Mr Hossein Banaei for editorial assistance.

Table 3Mean of O₂ saturation of neonates at four times in three study days.

Group		Mean \pm SD of heart rate				p
		Baseline	10th min	20th min	40th min	
Control	First day	90.55 \pm 12.07	90.73 \pm 10.36	91.28 \pm 8.81	91.07 \pm 13.19	0.486
Lullaby		92.90 \pm 6.38	93.80 \pm 4.30	94.00 \pm 4.32	94.00 \pm 4.11	
p		0.105	0.13	0.025	0.057	
Control	Second day	90.88 \pm 8.04	89.66 \pm 12.17	91.00 \pm 8.97	90.52 \pm 9.94	0.255
Lullaby		93.43 \pm 4.83	94.66 \pm 3.97	94.36 \pm 4.58	95.30 \pm 3.43	
p		0.028	0.005	0.015	0.03	
Control	Third day	91.63 \pm 6.52	90.30 \pm 11.90	90.63 \pm 10.91	90.05 \pm 12.65	0.335
Lullaby		95.13 \pm 2.92	93.93 \pm 5.30	92.00 \pm 8.37	93.82 \pm 4.46	
p		0.018	0.073	0.803	0.021	

References

- Arnon, S., Shapsa, A., Forman, L., Regev, R., Bauer, S., Litmanovitz, I., & Dolfin, T. (2006). Live music is beneficial to preterm infants in the neonatal intensive care unit environment. *Birth*, 33(2), 131–136.
- Amiri, R., Farhat, A. S., Karbandi, S., Esmali, H., Mohammadzadeh, A., & Looye, E. S. (2009). Effect of lullaby music listening on SPO2 in premature infants. *Journal of Birjand University of Medical Sciences*, 15(4), 12–18.
- Amini, E., Rafiei, P., Zarei, K., Gohari, M., & Hamidi, M. (2013). Effect of lullaby and classical music on physiologic stability of hospitalized preterm infants: A randomized trial. *Journal of Neonatal-Perinatal Medicine*, 6(4), 295–301.
- Bruton, C. (2014, September). Does Music Soothe the Soul. *STTI Leadership Connection 2014*. STTI.
- Garunkstiene, R., Buinauskienė, J., Uloziene, I., & Markuniene, E. (2014). Controlled trial of live versus recorded lullabies in preterm infants. *Nordic Journal of Music Therapy*, 23(1), 71–88.
- Khani, S., Mohamadpour, R. A., Ghafari, V., Sabaghi, R., & Bavand, M. (2008). Neonatal survival rate and its related causes in NICU of private and governmental hospitals in Sari by survival analysis technique during 2005–2007. *Journal of Mazandaran University of Medical Sciences*, 17(62), 54–62 (Persian).
- Kisilevsky, B. S., Hains, S. M. J., Jacquet, A. Y., Granier-Deferre, C., & Lecanuet, J. P. (2004). Maturation of fetal responses to music. *Developmental Science*, 7(5), 550–559.
- Lee, H., & White-Traut, R. (2014). Physiologic responses of preterm infants to the male and female voice in the NICU. *Journal of Pediatric Nursing*, 29(1), 3–5.
- Loewy, J. (2015). NICU music therapy: Song of kin as critical lullaby in research and practice. *Annals of the New York Academy of Sciences*, 1337(1), 178–185.
- Loewy, J., Stewart, K., Dassler, A. M., Telsey, A., & Homel, P. (2013). The effects of music therapy on vital signs, feeding, and sleep in premature infants. *Pediatrics*, 131(5), 902–918.
- Lubetzky, R., Mimouni, F. B., Dollberg, S., Reifen, R., Ashbel, G., & Mandel, D. (2010). Effect of music by Mozart on energy expenditure in growing preterm infants. *Pediatrics*, 125(1), e24–e28.
- Oh, H. L., Yang, E. J., Lee, H. J., Park, H. K., & Kim, C. R. (2013). The effect of hearing music on pain response during blood sampling in neonates. *Neonatal Medicine*, 20(4), 470–475.
- Schwilling, D., Vogeser, M., Kirchhoff, F., Schwaiblmair, F., Boulesteix, A. L., Schulze, A., & Flemmer, A. W. (2015). Live music reduces stress levels in very low-birthweight infants. *Acta Paediatrica*, 104(4), 360–367.
- Standley, J. (2012). Music therapy research in the NICU: An updated meta-analysis. *Neonatal Network: The Journal of Neonatal Nursing*, 31(5), 311–316.
- Thoma, M. V., La Marca, R., Brönnimann, R., Finkel, L., Ehlert, U., & Nater, U. M. (2013). The effect of music on the human stress response. *PLoS ONE*, 8(8), e70156 (<http://doi.org/10.1371/journal.pone.0070156>).