ORIGINAL ARTICLE

The clinical effect of classical music and lullaby on term babies in neonatal intensive care unit: A randomised controlled trial

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Abstract

Objective: To investigate the effect of music during routine nursing care on full-term newborns physiological measurements, hospital stay and stress symptoms.

Methods: The randomised controlled trial was conducted at the Level II neonatal intensive care unit of a state hospital in Turkey from November 2014 to August 2015, and comprised full-term newborns. Three groups were formed by simple randomisation according to babies' Score for Neonatal Acute Physiology with Perinatal Extension-II; classical music, lullaby, and a control group. An audio system was installed in the incubators, and the sound level was set at 65dB for 30 minutes of classical music or lullabies during daily routine nursing care. Vital signs and stress indicators of the babies were measured before, during and after care. Their weight was measured daily, while length and head-chest circumference were measured weekly.

Results: There were 45 newborns; 15(33.3%) in each of the three groups. Classical music had a positive effect on maintaining body temperature and oxygen saturation values of the babies ($p<0.05$). Classical music and lullabies reduced stress symptoms compared to the controls ($p<0.05$).

Conclusion: Lullaby and classical music application during routine nursing care showed the potential to maintain physiological parameters and in reducing stress.

Keywords: Neonatal intensive care, Classical music, Lullaby, Nursing care. (JPMA 69: 459; 2019)

Introduction

Newborns in neonatal intensive care units (NICUs) face negative and painful stimuli such as noise, light and invasive applications, and because they are isolated in the incubator, the usual mother-baby interaction is lacking. All of these factors cause psychological stress in addition to physiological stres.[1] Since stress increases oxygen and calorie expenditure, it affects growth and discharge time negatively.[2] NICUs use developmental care to take care of this situation. With developmental care, extra-uterine adaptation to life is facilitated by considering newborns' individuality and behaviour. Thus, environmental factors, such as light, smell and sound, are arranged. The concept of developmental care includes different interventional techniques such as positioning, kangaroo care and music. Among these developmental techniques, music is known to be a safe and effective technique for calming newborns who interpret mothers' cardiovascular sounds, bowel and placenta sounds as music because they are rhythmic.[3] Recently, music is used in many areas, such as intensive care, dementia, pain-anxiety management and outpatient surgery, in order to reduce stress.[4,5] Music is thought to be an important method of care for newborns in NICUs because it can reduce stress, positively affect physiological measurements and support cognitive and speech development.[6-9] However, all these studies work on preterm babies. In NICUs, term newborns are also given care, especially Level I-II NICUs. Therefore, we hypothesised that classical music and lullaby would be effective on physiological parameters and stress in full-term newborns. The current study, as such, was planned to determine the effects of classical music and lullaby on the physiological measurements, stress indications and hospital stay durations in full-term newborns hospitalised in Level II NICU, and to compare the two with a control group.

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Subjects and Methods

The randomised controlled trial was conducted at the Level II NICU of a state hospital in Turkey from November 2014 to August 2015, and was registered with the Ankara University Clinical Trials Ethical Board. Institutional Review

Board's permission was obtained from the hospital. The sample was raised from among the full-term newborns who were hospitalised in the NICU. Those included were full-term newborns with Appearance, Pulse, Grimace, Activity, and Respiration (Apgar) score at 5th minute >7, no intracranial haemorrhage, hearing-related congenital or acquired malfunction, hyperbilirubinaemia resulting in blood exchange, and with spontaneous respiration. Parental consent was obtained for each subject. The sample size (power: 0,85; β: 0.15; n:15) was based on the number of patients who met the inclusion criteria at the same NICU in the preceding year.

Data was collected using a Patient Identification Form (gender, delivery method, Apgar score and gestational age) and a Patient Follow-Up Form (weight, length, heart-respiration rate, temperature, blood pressure, oxygen saturation) developed in line with literature.[6-8]

Stratified simple computerised randomisation according to Score for Neonatal Acute Physiology with Perinatal Extension-II (SNAPPE-II) scores was used. Stratified randomisation prevents imbalance between groups for known factors that influence. SNAPPE-II is an illness severity score that has been established to predict mortality and morbidity in NICUs.[10] Because the NICU was Level 2 and the sample comprised term neonates, all newborns' SNAPPE-II score was 0. Consequently, simple computerised randomisation was used.

All patients in the sample were in good general condition followed by diagnosis of indirect hyperbilirubinaemia, hypoglycaemia etc., were fed orally and no antipyretics were used. Three groups were formed through randomisation; classical music, lullaby, and a control group.

Stress was rated separately by two NICU nurses observing the behaviour of the baby according to the Stress List.[9] Each baby received a score according to the stress symptoms on the list: no stress=1, mild stress (disturbance from eye contact, turning right and left, hiccup, grimacing, hanging down in the chin, closing the eyes, opening the mouth, sticking out the tongue, sneezing, coughing)=2, moderate stress (blush, colour changes in the body, sighing, regurgitation, outwardness of hand fingers, extension in the arms-legs, sudden withdrawal movements, weakness)=3, and severe stress (paleness, cyanosis, tachypnoea, bradypnoea, apnoea, low oxygen levels, tachycardia, bradycardia, dysrthymia)=4. It was assessed across the procedure through consensus between the two NICU nurses. The duration of the stress was also observed and recorded.

An average of 10-15min of standard nursing care (including oral, nose, eye, perineum and skin care) was given to each baby. Heart rate, body temperature, blood pressure, oxygen saturation, respiration rate were measured with the monitor at the 10th, 20th and 30th min of care and 10min afterwards. The weight of the babies was measured daily. The length, head and chest circumferences were measured weekly. The same standard procedure was continued until the patient was discharged.

Physiological data was gathered using a Thermoflash LX-26 thermometer (CLS France LAB, France), a Mennen VL4000 bed-side monitor (Mennen Medical Ltd., Israel), a Charder MS3100 baby scale, and a tape measure (Charder Electronic Co., Ltd., Taiwan). The Mozart for Babies music CD[11] (Valley Entertainment Inc, USA) and a Baywonder loudspeaker (Baywonder GSM, Turkey) were used for classical music. For the lullabies, the mothers were taken to a quiet room and asked to sing their favourite lullaby and a Sony PX333 audio recorder (Sony Electronics, USA) was used to record them. The sound level was measured with a Trotec BS15 (Trotec Heinsberg, Germany). The audio system for the intervention groups was set up in the incubators toe-side. The sound level was measured and set at a level of 65dB. The control group was only exposed to ambient noise.

Descriptive statistics were used to summarise the characteristics of the infants. One-way analysis of variance (ANOVA), chi-square and Kruskal-Wallis tests were used to compare the data among the groups. Tukey's honestly significant difference (HSD) was used for post-hoc tests. The stress levels of the newborns were analysed by inter-observer agreement and t test for matched groups. The level of significance was set at $p<0.05$. Statistical analyses were conducted using SPSS 21.

Institutional Review Board permission was obtained from the hospital.

Results

Of the 435 full-term newborns in the NICU, 45(10.3%) subjects were included in the study; 15(33.3%) in each group. There was no statistically significant difference in terms of gender, delivery method, Apgar score and gestational age of the groups ($p>0.05$ each) (Table 1). Mean body temperature was statistically different among

Table-1: Demographic characteristics (n=15).

	Classical n (%)	Lullaby n (%)	Control n (%)	X^2	*p*-value
Gender					
Female	6 (40)	6 (40)	5 (33,3)	0,189	>0,05
Male	9 (60)	9 (60)	10 (66,7)		
Delivery Method					
C-section	6 (40)	9 (60)	7 (46,7)	1,245	>0,05
Vaginal	9 (60)	6 (40)	8 (53,3)		
	Median±SD	**Median±SD**	**Median±SD**	**X^2**	***p*-value**
Apgar score 1st	19,9±2	24,4±2	24,7±2	2,589	>0,05
Apgar score 5th	10	10	10	*	*
	Mean±SD	**Mean±SD**	**Mean±SD**	**F**	***p* -alue**
Birth weight (g)	3359,3±338,3	3301,6±413,9	3266,6±401,6	0,201	>0,05

* The 5th minute Apgar score was not analyzed because it was the same in all groups. C: Caesarian, SD: Standard Deviation, Apgar: Appearance, Pulse, Grimace, Activity, and Respiration

Table-2: Comparison of Mean Body Temperature, Oxygen Saturation and Stress Scores Between Groups.

Time				F	p value
Mean Body Temperature Values (°C)					
Before care	36,9 ± 0,3	36,8 ±0,2	36,8± 0,4	0,362	0,698
10th minute	36,5± 0,4	36,3 ± 0,2	36,3±0,2	1,425	0,252
20th minute	36,7 ±0,3	36,5 ± 0,2	36,6±0,2	0,858	0,431
30th minute	36,9 ± 0,3*	36,7 ± 0,1	36,6±0,2*	4,23	0,021
40th minute	36,9± 0,3*#	36,7 ± 0,2#	36,7±0,2*	3,461	0,041
Mean Oxygen Saturation Values (%)					
Before care	97±2.8	97±2.2	97.5±1.6	0.2	0.792
10th minute	97.2±2.6*	95.5±2.2	95±1.8*	3.6	0.036
20th minute	98.2±1.5*	97.5±1.5	96.8±1.4*	3.4	0.042
30th minute	98.9±1.1*	98.2±1.2	97.3±1.3*	6.2	0.004
40th minute	98.9±1.0*	98±1.4	97.6±1.0*	4.3	0.020
Stress scores					
Before care	1.7±0.7	1.4±0.5	1.3±0.4	1.7	0.187
During care	3.2±0.6	3.1±0.5	3.2±0.6	0.1	0.839
After care	1.5±0.7*	1.2±0.3#	2.2±0.8*#	8.2	0.001
Duration of stress (min)	19.9±7.7*	21.5±7.0	27.7±9.0*	3.9	0.027

*Tukey HSD (Difference between the classical music and control groups). #Tukey HSD (Difference between the lullaby and control groups), SD: Standard deviation

the groups at the 30th (p=0.021) and 40th mins (p=0.041). The saturation values of the classical music group were higher than those of the control, and this difference was observed from the 10th min (p=0.036) until the end of the music application (p=0.041, 0.004, 0.020) (Table 2). The mean stress scores before (p=0.187) and during (p=0.839) care were not different among the groups. After care, the stress scores of both the intervention groups were found to be lower than those of the control group (p=0.001). The stress in the control group during the care lasted 8 minutes longer than that of the classical music group (p=0.027) (Table 2).

Differences between the heart-respiration rate and blood pressure values of the three groups during and after care were not statistically significant (p>0.05).

Discussion

The current study investigated the effect of classical music and lullaby during routine nursing care on full-term newborns' physiological measurements, hospital stay and stress symptoms. Results demonstrated that both classical music and lullaby provided effective stress reduction, but classical music had a comparably better effectiveness with shorter stress duration, higher body temperature and oxygen saturation.

In this study, body temperature of term babies who

listened to classical music was higher than lullaby and control groups at 30-40th min ($p<0.05$). It's reported that the body temperature of preterm babies who listened to lullabies was higher than those who did not.[12] On the other hand, Silva et al. found no significant difference between preterm babies who listened to classical music and those who did not.[13] The study has shown that classical music is effective in maintaining body temperature in newborns.

Despite the positive effects of music on the oxygen saturation values of premature newborns,[8,14] there are also studies that found no significant difference.[6,15] In our study, the oxygen saturation values of classical music group increased from the 10th min and remained stable until the end of the care ($p<0.05$). The fact that lullabies did not affect oxygen saturation may be due to the fact that listening to a recorded voice is not as effective as listening to mothers' live voices. It has been shown that listening to mothers' live voices singing lullabies is more effective than listening to recordings of them.[7]

The stress scores ($p<0.001$) and the stress duration of the classical music group ($p<0.05$) were lower than the scores of the control group. Although there are studies that do not report any effect on stress,[15,16] most studies in the literature suggest that music in NICUs reduces stress levels of preterm babies and has a calming effect on newborns.[15,17,18] It is seen that this effect is similar for term newborns.

The stress symptom scores of the newborns who listened to lullabies were lower than the control group ($p<0.001$). This may be the result of the mothers' voices being familiar from intrauterine life and positively affecting their behaviour state and soothing them. In our study, classical music and lullaby seemed to regulate stress response.

It has been reported in literature that music shortens the hospital stay of premature newborns.[19,20] However, it has also been concluded that music did not affect the durations.[21] In our study, the classical music and lullaby groups were discharged one day earlier than the control group ($p>0.05$). Considering the financial and psychosocial burden of NICUs, this difference, which is not statistically significant, is thought to be clinically important. It is reported that music increases weight-gain in premature infants.[17,22] On the other hand, Chorna et al. have shown that music has no effect on anthropometric measurements and growth values.[21] The present study showed no statistically significant effect of music on anthropometrics of term infants.

Heart-respiratory rate and blood pressure values between the classical music, lullaby and control groups were not statistically significant ($p>0.05$). Studies have shown that music has a positive effect on the respiration rate[6] and heart rate of premature babies,[7,15] but some studies did not find a significant effect on heart rate and respiration rate values.[8,22] Although Teckenberg-Jansson et al. argue that music affects blood pressure positively, Hatem et al. did not find a statistically significant difference between music and control groups.[23,24] Our study differs from the literature in terms of factors such as gestational age, duration and type of music and recorded voices.

In terms of limitations, the current study had a short observation period and long-term effects of music could not be observed. Another limitation of the study is that the interventions were not blinded.

Conclusion

Implementing classical music during care was found to be effective in maintaining body temperature, increasing oxygen saturation values, and decreasing stress level and duration of hospital stay. Using music as a part of NICU care seems to be a good idea. Parents who can overcome their reluctance to sing lullabies should be able to participate in music, interaction and care for their babies. Music is an individualised developmental supportive care model that should be preferred because of its reduction of physiological effects caused by stress, its low cost and ease of use.

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