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# Effectiveness of Music on Behavioural and Physiological Responses of Preterm Neonates in the Selected Neonatal Intensive Care Units of Mangalore

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**Abstract:** ***Premature birth, commonly used as a synonym for preterm birth, refers to the birth of a baby before its organs are mature enough to allow normal postnatal survival, and growth and development as a child. Premature infants are at greater risk for short- and long-term complications, including disabilities and impediments in growth and mental development. The popularity and credibility of alternative treatment modalities such as music therapy also has increased over the past decade. Music has been used in improving general health, decreasing the length of hospitalization, increasing tolerance for stimulation and reinforcing or structuring the achievement of developmental goals of infants. Specifically, three basic music therapy procedures have been documented as beneficial: playing recorded, carefully selected lullabies; singing lullabies to sustain homeostasis during multimodal stimulation; and using music as reinforcement for non-nutritive sucking. The aim of this study is to assess the effectiveness of music on behavioural and physiological responses of preterm neonates in the selected intensive care units of Mangalore. Objectives of the study: To assess the behavioural and physiological responses of the preterm neonates before, during, and after the music in the neonatal intensive care unit. To evaluate the effectiveness of music on the behavioural and physiological responses of the preterm neonates before and during, during and after, and before and after the administration of music in the neonatal intensive care unit. Methods: A quasi experimental design was used for the present study. The sample consisted of 30 preterm babies of gestational age 30-36 weeks. Music was played over 30 minutes for three consecutive days. Heart rate, respiratory rate, and oxygen saturation were assessed using a stethoscope and pulse oximeter. The behavioural responses were measured using a behavioural observation scale. The data was analysed using descriptive statistics, paired 't' test, and ANOVA. Results: Majority of the preterm neonates were male (60.00%), were 30-32 weeks of gestational age at maturity (63.30%), were delivered by caesarean section (53.30%), and weighed less than 1.5 kg at birth (60.00%).There was gradual increase in the mean score of the preterm neonates in all the parameters of the behavioural responses from before the intervention to after the intervention on all three days. Also there was increase in the mean score of all the parameters before starting the intervention on the first day when compared to the mean score after the cessation of the intervention on the third day. The effect of music on the behavioural responses of the neonates before, during and after the intervention on first, second and third days was calculated using ANOVA. The calculated values are higher than the table value except for rooting reflex (2.071) and sucking reflex (2.071) on Day 3. The calculated 't' values were higher than the table value except for rooting reflex on Day 3 ($t_{29}$=1.44, P≤0.05), sucking reflex on Day 3 ($t_{29}$=1.44, P≤0.05), and cry on Day 2 ($t_{29}$=1.44, P≤0.05). However, the overall 't' values for all three days were significant. Hence the null hypothesis is accepted only for rooting reflex on Day 3, sucking reflex on Day 3, and Cry on Day 2. There was difference in the mean score of the preterm neonates in all the parameters of the physiological responses from before the intervention to after the intervention on all three days. The heart rate had decreased from 144.07±11.934 to 133.70±12.183; the respiratory rate had increased from 45.73±6.570 to 48.17±5.266; and oxygen saturation had increased from 94.77%±2.285 to 97.73%±1.999. The effect of music on the physiological responses of the neonates before, during and after the intervention on first, second and third days was calculated using ANOVA. The calculated values are higher than the table value except for respiratory rate on Day 1 (1.882). But on the third day the values were significant. The calculated 't' values before and after the administration of music were higher than the table value except for heart rate on Day 1 ($t_{29}$=0.85, P≤0.05) and respiratory rate on Day 1 ($t_{29}$=0.37, P≤0.05) and Day 3 ($t_{29}$=1.35, P≤0.05). The calculated 't' values before and after the administration of music were higher than the table value except for respiratory rate on Day 1 ($t_{29}$=1.55, P≤0.05) and Day 3 ($t_{29}$=1.70, P≤0.70), and oxygen saturation on oxygen saturation on Day 2 ($t_{29}$=1.47, P≤0.05). Conclusion: Music stimulates the sense and has a positive effect in stabilising the cardio-respiratory and behavioural state of preterm neonates in the neonatal intensive care unit.***

**Keywords:** Preterm neonates; behavioural responses; heart rate; respiratory rate; oxygen saturation

## 1. Introduction

Nature is supreme the way it looks after all the needs of the baby in the womb. The baby is gently rocked in the warm amniotic fluid and is well protected from infections and effectively shielded against light and sound. The baby is comfortably "nested" in a flexed posture with hands in the midline close to his mouth. The uterine blood flow provides a soothing music akin to a waterfall while tick tack of the maternal heartbeat provides constant soothing beats of cuckoo clock.[1]

## 2. Problem Statement

Effectiveness of Music on Behavioural and Physiological Responses of Preterm Neonates in the Selected Neonatal Intensive Care Units of Mangalore.

**Objectives**

1. To assess the behavioural and physiological responses of the preterm neonates before, during and after the music in the neonatal intensive care unit.
2. To evaluate the effectiveness of music on the behavioural and physiological responses of the preterm neonates before and during, during and after, and before and after the music in the neonatal intensive care unit.

## 3. Literature Survey

A study was conducted at AIIMS, New Delhi, to determine the immediate cardio-respiratory effects of classical music in pre-term neonates as a mode of ICN related stress relaxation. Indian classical music was selected as a series of 5 sets of 6 minutes each and played for babies through earphones and special of audio-tapes for a total duration of 30 minutes at 50-60 dB for three days. Listening to classical music was associated with a significant (5-5.6%, $p < 0.05$) lowering of the resting heart rate and a consistent improvement of oxygen saturation (by 1-1.4%). These effects appear to persist beyond the MT and may play a useful role to achieve stress relaxation for babies in the ICN.[2]

A comparative study was conducted at Israel Department of Neonatology, Meir Medical Centre. Music stimulation has been shown to provide significant benefits to pre-term infants. Thirty-one stable infants randomly received live music, recorded music, and no music therapy over 3 consecutive days. Heart rate, respiratory rate, oxygen saturation, and a behavioural assessment were recorded, every 5 minutes. The volume range of both music therapies was from 55 to 70 dB. Live music therapy had no significant effect on physiological and behavioural parameters during the 30-minute therapy; however, at the 30-minute interval after the therapy ended, it significantly reduced heart rate (150±3.3 beats/min before therapy vs. 127±6.5 beats/min after therapy) and improved the behavioural score (3.1±0.8 before therapy vs. 1.3±0.6 after therapy, $p < 0.001$).[3]

An experimental study was conducted at newborn intensive care units of a regional medical centre in southeastern United States sample size 10 infants listened to lullabies and 10 infants to recordings of their mother's voice through ear phones for 20 minutes across three consecutive days. Oxygen saturation levels and frequency of oximeter alarms were recorded. Results indicated a differential response to the two auditory stimuli as listening time progressed. On Day 1, the infants listening to music had significantly higher oxygen saturation levels, but these effects disappeared by Days 2 and 3. On Days 2 and 3, however, the babies hearing music had significantly depressed oxygen saturation levels during the post-test intervals after the music was terminated. Infants hearing music had significantly fewer occurrences of Oximeter alarms during auditory stimuli than did those listening to the mothers' voice.[4]

An experimental study was conducted at Georgia to know the effects of music listening on inconsolable crying in premature infants. This study explored the effects of music therapy on the crying behaviours of critically ill infants classified as inconsolable. Twenty-four premature infants with gestational age 32-40 weeks received a developmentally appropriate music listening intervention, alternating with days on which no intervention was provided. The results revealed a significant reduction in the frequency and duration of episodes of inconsolable crying as a result of the music intervention, as well as improved physiological measures including heart rate, respiration rate, oxygen saturation, and mean arterial pressure. Findings suggest the viability of using recorded music in the absence of a music therapist or the maternal voice to console infants when standard nursing interventions are not effective.[5]

## 4. Methodology

**Research design:** Quasi-experimental design (pre-treatment-post-treatment).

**Setting:** The study was conducted at NICUs of Father Muller Medical College Hospital and Government Lady Goschen Hospital. Father Muller Medical College Hospital is a multi-speciality hospital with 1050 beds. The NICU has 20 beds with observation room, septic room, preterm observation room and ventilator care room with all the facilities. Lady Goshen Hospital has a neonatal intensive care unit with 22 beds with ventilators, incubators, radiant warmers, and with all the facilities.

**Sampling:** The sample of the present study comprised 30 pre-term neonates admitted to the selected hospitals.

**Sampling:** The sample for the present study was selected by purposive sampling technique.

**Inclusion criteria:** Preterm babies of gestational age 30-36 weeks.

**Exclusion criteria:** Preterm babies who are critically ill.**,** Preterm neonates on ventilator support. Preterm babies with congenital anomalies**,** preterm babies with auditory defect.

**Data collection instrument:** In this study, observation scale is used to collect the data as investigator could directly observe the behavioural responses. Stethoscope and pulse oximeter were used to assess heart rate and oxygen saturation. The same instrument was used before during and after the intervention.

## 5. Method of Data Collection

The investigator obtained written permission from the authorities of The Father Muller Medical College Hospital and Government Lady Goschen Hospital. The mothers of the pre-term neonates were made aware of the purpose, nature of the study, duration and instruments used in data collection, and informed consent was obtained. The data was collected from August 23rd to September 18th, 2010.

The physiological and behavioural responses of the preterm neonates were assessed five minutes before playing the music. Then music was played for 30 minutes and physiological and behavioural responses were assessed at the 15th minute. Five minutes after the cessation of the music the physiological and behavioural responses were assessed again. The intervention was carried out for three days.

## 6. Results

**Section I: Sample characteristics**

The data was collected from 30 preterm neonates that fulfilled the inclusion criteria. This section presents the demographic characteristics of the neonates.

**Table 1:** Demographic characteristics of the sample
**N = 30**

| Variable | f | % |
|---|---|---|
| 1. Gender | | |
| a. Male | 18 | 60.00 |
| b. Female | 12 | 40.00 |
| 2. Gestational age at maturity | | |
| a. 30-32 weeks | 19 | 63.30 |
| b. 33-35 weeks | 10 | 33.30 |
| c. > 35 weeks | 1 | 3.30 |
| 3. Mode of delivery | | |
| a. Vaginal | 14 | 46.70 |
| b. Caesarean | 16 | 53.30 |
| 4. Birth weight | | |
| a. < 1.5 kg | 18 | 60.00 |
| b. 1.5-2.5 kg | 12 | 40.00 |

**Section II: Assessment of the behavioural and physiological responses of the preterm neonates before, during and after music**

**Table 2:** Assessment of the behavioural responses of the preterm neonates
N = 30

| Parameter | Mean±SD | | |
|---|---|---|---|
| | Day 1 | Day 2 | Day 3 |
| **General response** | | | |
| Before | 1.63±0.615 | 1.53±0.629 | 1.33±0.711 |
| During | 2.17±0.531 | 1.93±0.450 | 1.90±0.481 |
| After | 2.70±0.466 | 2.63±0.490 | 2.67±0.479 |
| **Activity** | | | |
| Before | 1.60±0.814 | 1.67±0.661 | 1.43±0.728 |
| During | 2.10±0.607 | 2.17±0.379 | 1.83±0.531 |
| After | 2.57±0.540 | 2.63±0.490 | 2.63±0.490 |
| **Facial expression** | | | |
| Before | 1.57±0.898 | 1.67±0.771 | 1.23±0.679 |
| During | 2.07±0.640 | 1.97±0.556 | 1.93±0.583 |
| After | 2.47±0.507 | 2.60±0.498 | 2.57±0.504 |
| **Oral posture** | | | |
| Before | 1.03±0.765 | 1.10±0.662 | 0.83±0.747 |
| During | 1.30±0.651 | 1.50±0.571 | 1.23±0.568 |
| After | 1.63±0.550 | 1.73±0.450 | 1.63±0.490 |
| **Rooting reflex** | | | |
| Before | 1.53±0.571 | 1.60±0.563 | 1.93±0.245 |
| During | 1.67±0.479 | 1.90±0.305 | 2.00±0.000 |
| After | 1.73±0.450 | 1.97±0.183 | 2.00±0.000 |
| **Sucking reflex** | | | |
| Before | 1.60±0.563 | 1.63±0.490 | 1.93±0.245 |
| During | 1.70±0.535 | 1.90±0.305 | 2.00±0.000 |
| After | 1.77±0.430 | 1.97±0.183 | 2.00±0.000 |
| **Cry** | | | |
| Before | 1.57±0.728 | 1.77±0.568 | 1.60±0.675 |
| During | 1.80±0.407 | 1.87±0.346 | 1.83±0.461 |
| After | 1.97±0.183 | 2.00±0.000 | 1.97±0.183 |

There was gradual increase in the mean score of the preterm neonates in all the parameters of the behavioural responses from before the intervention to after the intervention on all three days. However, there was marginal decrease in the mean score of the previous day after the intervention and the mean score of the next day before the intervention. But there was increase in the mean score of all the parameters before starting the intervention on the first day when compared to the mean score after the cessation of the intervention on the third day.

**Table 3:** Assessment of the physiological responses of the preterm neonates
N = 30

| Parameter | Mean±SD | | |
|---|---|---|---|
| | Day 1 | Day 2 | Day 3 |
| **Heart rate** | | | |
| Before | 144.07±11.934 | 141.93±14.174 | 139.53±12.741 |
| During | 134.50±10.827 | 136.60±12.673 | 136.50±12.776 |
| After | 133.13±11.518 | 132.73±11.371 | 133.70±12.183 |
| **Respiratory rate** | | | |
| Before | 45.73±6.570 | 46.40±5.223 | 46.73±4.734 |
| During | 46.77±5.667 | 47.87±5.131 | 47.67±4.971 |
| After | 46.97±4.789 | 46.83±5.153 | 48.17±5.266 |
| **Oxygen saturation** | | | |
| Before | 94.77±2.285 | 95.10±2.746 | 95.57±2.144 |
| During | 96.10±2.657 | 95.57±2.788 | 96.77±2.128 |
| After | 96.87±2.460 | 97.67±2.523 | 97.73±1.999 |

There was difference in the mean score of the preterm neonates in all the parameters of the physiological responses from before the intervention to after the intervention on all three days. The heart rate had decreased from 144.07±11.934 to 133.70±12.183; the respiratory rate had increased from 45.73±6.570 to 48.17±5.266; and oxygen saturation had increased from 94.77%±2.285 to 97.73%±1.999.

**Section III: Evaluation of the effect of music in terms of variations in the behavioural and physiological responses by comparing before and during, before and after, and during and after the music**

**Table 4:** ANOVA showing the effect of music on the behavioural parameters of the preterm neonates
N = 30

| Parameter | Mean score | | | ANOVA |
|---|---|---|---|---|
| | Before | During | After | |
| **Day 1** | | | | |
| General response | 1.63±0.615 | 2.17±0.531 | 2.70±0.466 | 45.268 |
| Activity | 1.60±0.814 | 2.10±0.607 | 2.57±0.540 | 24.431 |
| Facial response | 1.57±0.898 | 2.07±0.640 | 2.47±0.507 | 19.876 |
| Oral posture | 1.03±0.765 | 1.30±0.651 | 1.63±0.556 | 13.984 |
| Rooting reflex | 1.53±0.571 | 1.67±0.479 | 1.73±0.450 | 5.342 |
| Sucking reflex | 1.60±0.563 | 1.70±0.535 | 1.77±0.430 | 4.206 |
| Cry | 1.57±0.728 | 1.80±0.407 | 1.97±0.183 | 6.438 |
| **Day 2** | | | | |
| General response | 1.53±0.629 | 1.93±0.450 | 2.63±0.490 | 50.255 |
| Activity | 1.67±0.661 | 2.17±0.379 | 2.63±0.490 | 32.160 |
| Facial response | 1.67±0.771 | 1.97±0.556 | 2.60±0.498 | 31.916 |
| Oral posture | 1.10±0.662 | 1.50±0.572 | 1.73±0.450 | 10.812 |
| Rooting reflex | 1.60±0.563 | 1.90±0.305 | 1.97±0.183 | 13.159 |
| Sucking reflex | 1.63±0.490 | 1.90±0.305 | 1.97±0.183 | 11.278 |
| Cry | 1.77±0.568 | 1.87±0.346 | 2.00±0.000 | 3.322 |
| **Day 3** | | | | |
| General response | 1.33±0.711 | 1.90±0.481 | 2.67±0.479 | 74.439 |
| Activity | 1.43±0.728 | 1.83±0.531 | 2.63±0.490 | 41.641 |

| Parameter | Mean score | | | ANOVA |
|---|---|---|---|---|
| | Before | During | After | |
| Facial response | 1.23±0.679 | 1.93±0.583 | 2.57±0.504 | 61.211 |
| Oral posture | 0.83±0.747 | 1.23±0.568 | 1.63±0.490 | 20.272 |
| Rooting reflex | 1.93±0.254 | 2.00±0.000 | 2.00±0.000 | 2.071* |
| Sucking reflex | 1.93±0.254 | 2.00±0.000 | 2.00±0.000 | 2.071* |
| Cry | 1.60±0.675 | 1.83±0.461 | 1.97±0.183 | 6.034 |

Table value of ANOVA: 3.11, df (2, 86) * Not significant

The effect of music on the behavioural responses of the neonates before, during and after the intervention on first, second and third days was calculated using ANOVA. The calculated values are higher than the table value except for rooting reflex (2.071) and sucking reflex (2.071) on Day 3. Hence it is inferred that music was effective in improving the behaviour responses of the preterm neonates.

**Table 5:** ANOVA showing the effect of music on the physiological parameters of the preterm neonates
N = 30

| **Parameter** | **Mean score** | | | **ANOVA** |
|---|---|---|---|---|
| | **Before** | **During** | **After** | |
| **Day 1** | | | | |
| Heart rate | 144.07±11.934 | 134.50±10.827 | 133.13±11.518 | 20.442 |
| Respiratory rate | 45.73±6.570 | 46.77±5.667 | 46.97±4.789 | 1.882* |
| Oxygen saturation | 94.77±2.285 | 96.10±2.657 | 96.87±2.460 | 17.001 |
| **Day 2** | | | | |
| Heart rate | 141.93±14.174 | 136.60±12.673 | 132.73±11.371 | 24.106 |
| Respiratory rate | 46.40±5.223 | 47.87±5.131 | 46.83±5.153 | 3.207 |
| Oxygen saturation | 95.10±2.746 | 95.57±2.788 | 97.67±2.523 | 14.976 |
| **Day 3** | | | | |
| Heart rate | 139.53±12.741 | 136.50±12.776 | 133.70±12.183 | 15.778 |
| Respiratory rate | 46.73±4.734 | 47.67±4.971 | 48.17±5.266 | 4.945 |
| Oxygen saturation | 95.57±2.144 | 96.77±2.128 | 97.73±1.999 | 21.969 |

Table value of ANOVA: 3.11, df (2, 86) * Not significant

The effect of music on the physiological responses of the neonates before, during and after the intervention on first, second and third days was calculated using ANOVA. The calculated values are higher than the table value except for respiratory rate on Day 1 (1.882). But on the third day the values were significant. Hence it is inferred that music was effective in improving the physiological responses of the preterm neonates.

## 7. Discussion

In the present study, nearly two-thirds of the preterm neonates were of 30-32 weeks of gestational age of maturity (63.30%). Sixty percent were male preterm. More than half of the neonates were delivered by caesarean section (53.30%). Majority of the neonates weighed less than 1.5 kg at birth (60.00%).

Music was effective in improving the behaviour responses of the preterm neonates except for rooting reflex (ANOVA=2.071) and sucking reflex (ANOVA=2.071) on Day 3.

This finding is in agreement with a comparative study conducted at Israel Department of Neonatology, Meir Medical Centre on 31 stable infants who randomly received live music, recorded music, and no music therapy over 3 consecutive days. Live music therapy had no significant effect on behavioural parameters during the 30-minute therapy; however, at the 30-minute interval after the therapy ended, it significantly improved the behavioural score (3.1±0.8 before therapy vs. 1.3±0.6 after therapy, $p<0.001$).[3]

An experimental study conducted at Georgia to know the effects of music listening on inconsolable crying in premature infants of gestational age 32-40 weeks who received a developmentally appropriate music listening intervention on alternative days revealed a significant reduction in the frequency and duration of episodes of inconsolable crying as a result of the music intervention.[5]

Contradictory findings related to sucking and rooting reflex were observed in an experimental study conducted to assess the effects of pre-feeding auditory, tactile, visual and vestibular intervention on the behavioural state, frequency of feeding readiness behaviours, and oral feeding efficiency in 22 pre-term stable neonates. Experimental infants were more alert after the intervention ($p<0.0001$) and showed more FRBS during the intervention for 5 of the 8 behaviours ($p<0.05$). A trend toward decreased feeding time was noted for experimental group infants.[6]

Music was effective in improving the physiological responses of the preterm neonates except for respiratory (ANOVA=1.882) on Day 1.

The finding is similar to a study was conducted at AIIMS, New Delhi, to determine the immediate cardio-respiratory effects of classical music in pre-term neonates as a mode of ICN related stress relaxation. Listening to classical music was associated with a significant (5-5.6%, $p < 0.05$) lowering of the resting heart rate and a consistent improvement of oxygen saturation (by 1-1.4%).[2]

The 't' value calculated to find the significant difference in the behavioural responses before and after the intervention showed that there was difference between the behavioural responses between the two time intervals. However, the difference was not significant ($t_{58}=1.238$, $P>0.05$).

A comparative study was conducted at Israel Department of Neonatology, Meir Medical Centre where 31 stable infants randomly received live music, recorded music, and no music therapy over 3 consecutive days. Live music therapy had no significant effect on physiological and behavioural parameters during the 30-minute therapy; however, at the 30-minute interval after the therapy ended, it significantly improved the behavioural score (3.1±0.8 before therapy vs. 1.3±0.6 after therapy, $p<0.001$).[3]

**Significant difference in the weight before and after the intervention**

There was no significant difference between the weight of the neonates between Day 1 and Day 3 (ANOVA=0.11).

A study was conducted to assess the benefits of lullaby singing and multimodal stimulation on premature infants in neonatal intensive care 40 infants in a Level III Newborn Intermediate Care Unit were divided into control (n=20) and experimental (n=20) groups by pair matching on the basis of gender, birth weight, gestational age at birth and severity of medical complications. The results showed that music and multimodal stimulation significantly increased weight gain/day for both males and females.[7]

## 8. Implications for Nursing

Paediatric nursing is no more tasks-oriented, fragmented care, but demands of a nurse to provide holistic care to children. The administration of music is essential in the provision of preterm neonates, but is a distressing experience for the preterm neonates, parents and the nurse. In the NICU the newborn nursery is designed and operated according to specific stipulations or standards. The multiple adjustments that the neonate makes are challenging, even in a quiet, unobtrusive environment. The nursery environmental characteristics present additional challenges because neonates undergo profound physiological adjustments and are particularly vulnerable to hazardous environmental conditions.

Today there is increasing demand for quality and holistic care. Nursing administrators are in a key position to prepare policies and execute them based on the research findings. They can implement alternative complementary therapies in the management of physiological and behavioural responses of the preterm neonates. This could include music as an important strategy to stabilise the cardio-respiratory and behavioural state of preterm neonates in the NICU. In-service education for the staff nurse should be provided with special emphasis on alternative complementary therapy in the management of behavioural and physiological parameters of the preterm neonates.

## 9. Future Scope

On the basis of the findings of the study the following recommendations have been offered for further research:

1. The study can be replicated on larger sample for generalisation of the findings.
2. The study can be undertaken on term healthy neonates in the newborn nursery.
3. The study can be undertaken on preterm neonates during painful procedures.
4. A comparative study can be done on noise and music.
5. A comparative study can done music and mother's voice for preterm neonates to assess the improvement of physiological and behavioural parameters.
6. A comparative study can done using music and multimodal stimulation for preterm neonates to assess the improvement of physiological and behavioural parameters.
7. A study can be under taken music for preterm neonates in weight gain.

## 10. Conclusion

Premature infants may face a number of health challenges, including, low birth weight, breathing problems because of underdeveloped lungs, underdeveloped organs or organ systems, greater risk for life-threatening infections, greater risk for a serious lung condition, known as respiratory distress syndrome, greater risk for cerebral palsy (CP), and greater risk for learning and developmental disabilities.

Healing with sound has become increasingly popular and well documented as an effective holistic treatment. Music is credited to have numerous qualities and capabilities and it has been shown even to enhance the growth of plants. Studies have shown that soft and soothing music to individual babies enhances their physiologic stability and improve weight gain. Babies like and enjoy gentle and classical or gentle instrumental music. Music causes autonomic stability, reduces stress and quietens the baby, increase oxygen saturation and reduce heart rate.

The present study, in short, gave the investigator a new experience, a chance to widen the knowledge and helped to understand the effect of intervention on preterm neonates in maintaining the physiological and behavioural responses. The direction from the guide, various experts, cooperation from hospital management and staff nurses from NICU in both the hospitals made a contribution to the success of the study.

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