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Studying the Effects of Music on the Time to Gain Independent Oral Feeding in Premature Infants

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Abstract

Long periods of hospitalization will cause problems for the infants and can lead to the weakening of the parent-child relationship and make them feel incompetent. The current study was done to study the impact of music and pre-feeding oral stimulation on the time to gain independent oral feeding in two groups of premature infants. In this clinical trial study, 20 premature infants, girls and boys, with a fetal age of 28-32 weeks, were randomly specified to intervention groups 1 and 2. Intervention group 1 received pre-feeding oral stimulation alone and group 2 received music in addition to that. Based on the results obtained, the use of multiple musical interventions along with oral stimulation accelerates the achievement of independent oral feeding and they achieved independent oral feeding 1.7 days earlier; also, they were discharged on their own almost 1 day earlier than the oral stimulation intervention group. Although this reduction is valuable, in this study no significant effect was observed on the obtained results. Although pre-feeding oral stimulation is effective in reducing the duration of achieving oral feeding, music does not increase this effect.

Keywords: Music, Premature infants, Pre-feeding, Oral feeding

Introduction

Based on the definition of the World Health Organization, infants born earlier than 37 weeks are considered premature. In addition, infants who weigh less than 2,500 grams at birth are known as low birth-weight infants [1-3]. Every year more than 320,000 premature infants are admitted to the neonatal intensive care unit. Most of these infants require long-term hospitalization in the neonatal intensive care unit at birth. These infants lose the opportunity for sufficient and normal development of nerves inside the womb [4-6].

Many of these infants are facing many developmental and medical problems. The medical problems of this population include a high frequency of respiratory problems, instability of body temperature, and nutritional problems [7]. Very low birth weight (less than 1.5 kg) and insufficient nutrition during infancy lead to a decrease in the growth of the head circumference, and as a result, a decrease in the IQ and lack of development of the necessary cognitive skills. In premature infants, brain growth and synaptic connections can be increased through music [8]. Research on medical interventions for premature infants on life-saving techniques and nutrition, such as reducing environmental stimuli, such as reducing light, cold, noise, and manual manipulations. It focuses on non-nutritional sucking and touching and massage [6]. Some texts have suggested that early sensory-motor

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interventions of non-nutritional sucking and listening to music improve oral feeding abilities and facilitate the pattern of sucking, swallowing, and breathing in infants [9-11]. Research on music therapy in the last 20 years has indicated the existence of benefits in facilitating medical treatment and nutrition of premature infants [11]. Listening to music strengthens the nervous and neuronal organization [12]; it has a positive effect on heart rate, behavioral status, sucking and feeding abilities [11]; it increases the oxygen level and reduces stress; it reduces the length of hospitalization of the Infant [6, 11]; it has a great effect on gaining weight [13]; reduces environmental deprivation (sensory deprivation), facilitates the establishment of dependence on parents; It strengthens communication and social neural development, and since premature infants have a lower tolerance threshold, music can increase tolerance to tactile stimuli [6].

The findings of studies about the relationship between music and massage on weight gain and discharge time are contradictory and different results have been reported in different studies. Standley [11] used background music conditioned on sucking in his study, although his results could not be concluded due to the small sample size; positive changes in the Infants's behavior were observed during music playing. Stanley [14, 15] reported that music and multiple stimulation (tactile stimulation, tickling, and eye contact) play a vital role in the duration of hospitalization and weight gain of premature infants. Kane [16] stated that music has a significant effect on reducing weight loss at birth, daily weighing, the amount of calories and volume of milk powder received, as well as the duration of hospitalization of infants. Rabold [17] reported that music has a positive effect on the duration of hospitalization and the weight of the Infant; but in contrast to Whipple's study [18], which was conducted to investigate the effects of parent training on the use of music and multiple stimulations on the quality and quantity of parent-infant interactions, weighing and the length of hospitalization of premature and low-weight infants in the neonatal intensive care unit, the duration of hospitalization was shorter and the average weight of the infants in the experimental group was higher, but this difference was not significant. In Coleman's study [19], the duration of hospitalization in infants who received singing did not differ significantly from infants in the control group.

Long periods of hospitalization will cause problems for the Infant and can lead to the weakening of the parent-child relationship and make them feel incompetent; the environment of the special care unit is full of noise and bright lights that disrupt the Infants's sleep-wake cycle, which has adverse effects on the Infants's development [20]. Infants are susceptible to hospital-acquired infections during hospitalization. Shortening the duration of hospitalization prevents the occurrence of secondary and hospital-acquired infections and also reduces the cost and increases the number of beds available in the neonatal intensive care unit [20, 21]. One of the main reasons for the delay in the discharge of infants from the hospital is their nutritional problems [22, 23]. Proper weighing of infants and achieving independent oral feeding are the main factors for their early discharge; however, there are conflicting studies regarding the factors affecting the initiation of independent oral feeding. Considering that according to the definition of the American Speech and Hearing Association, assessment and intervention of nutrition and swallowing is one of the main duties of the speech therapist [21], the researcher conducted a study with the aim of a comparative study of the effect of music on the time to achieve independent oral feeding in To perform two groups of premature infants receiving pre-feeding oral stimulation and hospitalization in the neonatal intensive care unit to use the results to provide a suitable solution to accelerate the establishment of independent oral feeding.

Materials and Methods

This study was conducted as a clinical trial for 5 months. The subjects were selected from among premature infants [22] hospitalized in the neonatal intensive care unit. Infants were selected and included in the study after considering the inclusion and exclusion criteria. Inclusion criteria include newborn age between 32-32 weeks (case), size according to gestational age (physician), receiving complete tube feeding, presence of physiologic stability in the newborn (physician), newborn hospitalized in NICU, not receiving sedatives (such as phenobarbital, etc.) by the Infant (doctor's file), confirming that the Infant is hearing healthy with a hearing screening; and the exclusion criteria included infants with chronic medical problems such as dysplasia, bronchopulmonary, cardiac and oral abnormalities, intraventricular hemorrhage, gastrointestinal necrosis. If the parents do not agree, the Infant becomes unwell, which prevents the continuation of the intervention, and if there is any disturbance in the physiological stability, the Infant will be excluded from the study.

Infants were selected considering the inclusion and exclusion criteria and according to the pediatrician's opinion. The first Infant was randomly placed in one of the two intervention groups and the rest of the infants were divided between the groups until the desired number of samples was obtained and there were 10 infants in each group. After the parents completed the consent form, the personal and medical information of the Infant was completed by asking the parents and the medical record, respectively. Information related to research variables such as weighing and the number of days of hospitalization were recorded in the forms prepared by the researcher.

The oral sensory-motor pre-feeding stimulation program was a 15-minute stimulation program consisting of 11 minutes of stimulation inside and around the mouth and 4 minutes of non-nutritive sucking (sucking the researcher's finger) [24]. External and internal stimulations were in the form of blows and pressure on the cheeks,

chin, lips, inner cheek, palate, and tongue. This program was performed 15-30 minutes before tube feeding daily for 10 consecutive days. Stimulations in full and partial form (number of stimulations, duration of execution, and method of execution) are mentioned in this program. Before starting the program, the hands were washed completely with soap and water according to the hand washing protocol in the newborn department, and latex gloves were used to make sure. The physiological parameters of the newborn were always completely controlled by the nurses of the ward during the program, and the program was stopped as soon as any problem occurred.

Music through a speaker with an intensity of 60 dB at a distance of 50 cm and an angle of 90 degrees from the infant's ear [25, 26] while the distance from both ears was equal [27]; it was broadcast from 3 minutes before the intervention, during the intervention and until 3 minutes after the end of the intervention. The intensity of playing music was adjusted with the help of a sound meter in the test environment. A hearing screening test was also performed for all the infants in the study.

The comparison group received oral sensorimotor stimuli alone, and the intervention group received musical stimuli in addition. The information related to the number of days required to achieve oral feeding in one and the researcher from the Infant's medical record and the Infant's nursing report register extracted eight oral feedings as well as the number of hospitalization days. These data were recorded in the form of forms designed by the researcher. The decision about the initiation of oral feeding, the number of times of feeding, and the discharge of the Infant from the ward was the responsibility of the pediatrician who was unaware of the type of intervention group of the Infant. The criterion for achieving oral feeding and discharge from the study was independent oral feeding eight times a day [9, 24, 28].

SPSS 21 software was used to analyze the data. At first, the data were checked with the Kolmogorov Smer-Yenf test, and the normality of the variable distribution of the data was shown. Then the analysis was done with an independent t-test.

Results and Discussion

Out of 20 infants participating in this research, 9 (45%) were boys and 11 (55%) were girls. The basic variables of sample selection (fetal age, chronological age at the time of gavage discharge, weight) are listed in **Table 1**.

Table 1. Fetal age, chronological age at the start of gavage, and birth weight in two intervention groups.

Intervention groups / Variable	Comparison group		Intervention group		P value
	Mean	SD	Mean	SD	
Fetal age (weeks)	30.20	1.61	30.20	1.31	1
Calendar age at the time of starting gavage feeding (days)	2	0.94	1.70	0.82	0.458
Birth weight (grams)	1359	349.83	1320	329.44	0.800

By using the independent t-test, it was shown that the number of days required to achieve independent oral feeding in the two intervention groups, was clinically reduced, but no statistically significant difference was observed. In the comparison group, in comparison with the intervention group, the number of days required to achieve complete independent oral feeding is equal to eight feedings per day, which, although statistically, no significant difference was seen; But this reduction is clinically valuable. The number of days to reach from one oral feeding to eight times a day in the intervention group was 1.7 days earlier, which although this reduction is clinically valuable, but not statistically significant. In addition, there was a decrease of about one day in the number of hospitalization days, which is clinically and economically valuable. The results obtained are shown in **Table 2**.

Table 2. Mean and standard deviation of the studied variables.

Groups / Variable	Comparison group		Intervention group		P value
	Mean	SD	Mean	SD	
Days required to reach an independent oral feeding	12.70	7.30	12.20	6.86	0.438
The number of days required to achieve full independent oral nutrition	21.20	14.69	19.50	13.83	0.396
The interval of days between once and eight oral feedings per day	8.50	2.54	7.30	2.65	0.374
Number of days of hospitalization	22	13.07	22.80	12.03	0.444

Investigating the effect of music on the time to achieve independent oral feeding in premature infants receiving pre-feeding oral stimulation admitted to the neonatal intensive care unit was the main goal of this research. Demographic variables and some other relevant variables such as gender, not receiving sedatives and healthy

hearing status were completely the same in the two intervention groups. Some other variables such as fetal age, chronological age at the start of gavage feeding, and birth weight did not have significant differences.

The average number of days needed to reach one oral feeding per day is different in the two intervention groups, although it is not statistically significant. The intervention group received the first independent oral feeding of the day about one day earlier than the comparison group. Providing oral feeding earlier accelerates the transition time from tube feeding to full oral feeding [29]. In addition, the baby gets the opportunity to increase the motor oral abilities necessary for successful and safe feeding [29]. In addition, the average number of days required to achieve eight independent oral feedings per day and successful complete oral feeding was 1.7 days earlier in the intervention group. Since achieving independent oral feeding is one of the basic criteria in the discharge of a newborn from the hospital, about 2 days faster to achieve independent oral feeding despite not being statistically significant, but clinically valuable.

The nutritional progress from one oral feeding per day to eight oral feedings, the time interval from the initiation of oral feeding to the achievement of independent full oral feeding, was faster in the intervention group. There was no difference in the number of days of hospitalization in the neonatal intensive care unit. Since hospitalization of premature infants in the hospital will result in exorbitant costs [30], early discharge from the hospital can also play an effective role in saving health care services. It can also help establish the parent-child relationship more quickly after discharge [31]; however, this difference was not observed in this study, which could be due to the small sample size. In many studies that examined the effect of pre-feeding oral stimulation on the time to achieve independent oral feeding [1, 24] and the duration of hospitalization compared to the control group, the results were statistically significant. However, the decrease in the duration of these two variables in these studies indicates the existence of a positive effect of pre-feeding oral stimulation on successful oral feeding and length of hospitalization.

In the studies of Caine [16] and Standley [32], the length of hospitalization in the group receiving music was significantly reduced, but in contrast to this reduction in the study of Whipple [18] and Coleman *et al*. [19], it was not significant, which is consistent with the results of the present study. In Caine [16] and Standley [32], music was presented three times a day, while in this study, the intervention was performed only once a day, and this difference in the frequency of performance could be the reason for the non-significance of the results of this research. In addition, the existence of differences in other variables, such as the type of music chosen, the duration of playing, and the distance from the baby's ears, as well as stricter discharge to decide when to discharge the baby, can affect the lack of significance of the study results.

Conclusion

Although the results of this study were not statistically significant, this reduction was clinically valuable and it seems that playing music according to the results obtained from the research in the neonatal unit can calm the newborns, the newborns' families, and the personnel. Working in the department and achieving successful and faster oral feeding in infants have a positive effect. Music intervention is a harmless, easy, cheap, and accessible intervention that can be used in neonatal intensive care units if it is chosen appropriately and expertly.

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