

Are there differences between the expectations of parents, nurses and physicians when using music in NICU?

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ABSTRACT

This paper aimed to describe and explain the expectations concerning the use of music in NICU from the viewpoints of parents, nurses and physicians. The relevant questionnaires were distributed to 836 participants who were recruited from the country's five university hospitals (n = 508, response rate 61). Slightly over half of the participants preferred recorded music versus live music in the NICU. They strongly expected that their preferred music could be beneficial both for the infants, parents and staff. The parents agreed most that live music is the most suitable choice for infants (p < 0.001), and that the music could especially benefit the infant (p < 0.001) and parents (p < 0.001) compared with the nurses' and physicians' preferences. Some background details such as age, average length of time listening to music, musical training and experiences of using music provided significant explanations for the participants' expectations. In conclusion, there were significant differences between the groups of the respondents concerning the type of the preferred music and its expected effects. This highlights the importance of discussion with the caregivers when taking music into regular use in the neonatal intensive care units.

Keywords: Music; Neonatal Intensive Care; Parents; Health Care Providers; Expectations

1. INTRODUCTION

The neonatal intensive care unit (NICU) as an environment is a potential source of stress for infants. Preterm or ill term neonates are exposed to several painful procedures, but also to ambient noise caused by monitor alarms, mechanical noises and voices that often exceed recommendation levels [1-3]. By 26 - 28 weeks gestational age (GA), the auditory system is sufficiently mature for loud noise to induce negative short-term effects

in the cardiovascular and respiratory systems of infants [3].

It has been suggested that music is an auditory stimulus that could mask aversive auditory stimuli, and lead to a more harmonious, reassuring environment for the infants in NICU [4-6]. Music includes melody, rhythm, harmony, timbre, form and style, with many cognitive elements that enable the promotion of neurological organization. Sound in the NICU should be soothing, constant, stable and relatively unchanging, and therefore live singing and lullabies are usually most recommendable to infants [6]. However, music with irregular frequencies and inconsistent patterns is assumed to be particularly harmful for developing the auditory system of prematurely born infants [7]. Recommendations specify that continuous sound should not exceed an hourly equivalent sound level of 50 A-weighted decibels (dBA) [7,8], and music not exceeding 75 dB is preferred in NICU [9,10].

Music can produce many positive effects for infants during their hospitalization. For example, numerous studies have concluded that music can reduce stress and increase physiological stability, including improvement in physiological outcomes such as oxygen saturation, heart rate, respiratory rate and blood pressure, as well as in behavioral state, pain and sleep [5,11-13]. There is also evidence that music has positive consequences on long-term outcomes, including better growth rates and non-nutritive sucking, and reduced length of hospitalization [14-18]. In addition, a few studies have shown that music could also benefit parents and health care providers in the NICU. It has improved parent-infant bonding [19], and reduced maternal anxiety [20,21], but has also had positive effects on the staff's moods, attitudes and interaction with both infants and parents [11,22]. Most of the music interventions used in earlier studies have consisted of recorded music or combination music with other interventions, and only a few studies have examined merely the effects of live music [4,6].

Up to now, we have no studies on how the caregivers

including parents, nurses and physicians participating in the infants' care think about the preferred music and its use in NICU, and if there is any significant agreement between their viewpoints. Indeed, we know that parents have a crucial role in neonatal care, and we believe they should be encouraged to have greater involvement in their infants' pain care [23]. In addition, it is the health care providers' responsibility to reduce the infants stress, and, consequently, they have a very prominent role in determining what kinds of interventions are chosen in the hospital.

The purpose of our study was to describe and explain the expectations concerning the use of music in NICU from the viewpoints of parents, nurses and physicians. It is known that musical preferences play a significant role when selecting the music intervention in practice [24]. Therefore, the specific research questions were as follows: 1) Do parents, nurses and physicians prefer live or recorded music in the NICU? 2) What are the effects of their preferred music on the infants, parents and staff according to participants' expectations? 3) Which background details explain the expectations of using music in the NICU?

2. METHODS

2.1. Participants and Settings

The questionnaires were distributed to 836 participants (300 parents, 256 nurses, 280 physicians) who were recruited from the country's five university hospitals (Helsinki, Kuopio, Oulu, Tampere and Turku) located in different geographical areas of Finland. All nurses working in neonatal intensive care units and physicians in pediatric units of the aforementioned hospitals were invited to participate in the study. In addition, parents who were the infant's mother or father, had their baby hospitalized in the NICU and were able to understand the Finnish language were recruited to the study.

The questionnaires were distributed to parents and nurses via the nursing managers and to physicians via the secretaries of the hospitals. Altogether 535 questionnaires were returned, out of which 34 were excluded due to missing data. Finally, 508 questionnaires were accepted, giving an average response rate of 61 (parents 66%, nurses 82%, physicians 36%). The completed questionnaires were mailed back to the researcher in pre-stamped return envelopes.

2.2. Survey Instrument

A survey instrument for this study was developed based on the earlier research literature [6,14,19], and the suggestions of an expert panel. In addition, a few questions were added and modified from the study of Kemper *et al.*

[25], who originally developed their instrument for staff working in a neonatal intensive care unit. The questionnaire reported in this study comprised three sections. Section 1 inquired about the demographic details of the participants (8 items) (see **Table 1**), and Section 2 included one question about participants' preferred music in the NICU (live or recorded music including alternative types of them) (see **Table 2**). The questions in the above-mentioned sections were dichotomous or multiple choice questions. Section 3 elicited information about the participants' expectations concerning the effects of their preferred music for infants, parents and staff (21 items) (see **Table 3**). The replies were given on a five-point Likert-type scale ranging from "totally agree", "agree to some extent", "don't know", "disagree to some extent", and "totally disagree".

The questionnaire was piloted among 69 nurses and 27 parents caring for infants in four pediatric units that were not included in the final study. An expert panel participated in revising the instrument, consisting of three music therapists, one neonatal intensive care nurse, one neonatologist, three researchers specialized in neonatal care, and one statistician. Based on the comments of the panel and the pilot study only a few questions needed to be clarified and added to the instrument, including the types of recorded music, and the expectations concerning the preferred type of music for infants.

Exploratory factor analysis was employed when evaluating the construct validity of the instrument. Only items that correlated with each other (correlations ≥ 0.3) were taken into the factor analysis. As a result, three factor solutions about the expectations regarding the preferred music for infants, parents and staff were generated, which accounted for 56% of the total variance. The eigenvalues varied between 1.4 and 7.9, and the factor loadings between 0.48 and 0.86, while the communalities were between 0.33 and 0.81. The internal consistency of the factors was evaluated by item analysis and Cronbach's alpha. The alpha values were 0.87, 0.84 and 0.86. Statistically, the validity and reliability of the instrument were good.

2.3. Ethical Consideration

Ethical permission was granted by the authorities of all participating hospitals, and the study was also approved by the Regional Ethical Review Boards. Each of the questionnaires for parents, nurses and physicians was accompanied by a covering letter which briefly described the study and its purpose, provided an affirmation of confidentiality and voluntary participation, and gave the researchers' contact information. The respondents were also able to leave the questionnaires in sealed envelopes that in themselves were clear evidence of voluntary par-

ticipation and anonymity.

2.4. Data Analysis

The data were analyzed using PASW® Statistics 18. Descriptive statistical analyses were undertaken to examine the demographic details, participants' preferred music and its expected effects on infants, parents and staff. The five dimensions in the Likert-scale statements were divided into three classes "agree" ("totally agree" to "agree to some extent"), "don't know", and "disagree" ("totally disagree" to "disagree to some extent").

The factor analysis, using principal component analysis with varimax rotation, produced a result of a total of three factors from the participants' expectations regarding the effects of preferred music. The sum variables were formed on the basis of factor analysis (factor loadings > 0.4), and the internal consistency of these were tested using Cronbach's alpha test. Correlations between the groups of respondents (parents, nurses and doctors) and background details were conducted with the Chi-square test. Logistic regression analysis was undertaken to examine which background details explained the par-

ticipants' expectations of using music in NICU. For that the dependent variables (sum variables) were reclassified into two responses: 1 = "totally agree"/"agree to some extent" (1 - 2.49) and 0 = "don't know"/"totally disagree"/"disagree to some extent" (2.5 - 5). P-values \leq 0.05 were interpreted as statistically significant.

3. RESULTS

3.1. Demographic Details

Most of the participants were female (88%) and their age ranged from 18 to 62 years, with a mean of 36.3 (SD = 9.9). About half of them had at least two children of their own. Forty-four percent of the participants were used to listening to music for one hour or more during their leisure time per day, and a few (25%) of them had some musical training. Experiences of using music in NICU was not common among the participants, and slightly over half of them had experienced disturbing noises in the intensive care unit caused mainly by the alarm sounds of monitors or disruptive talking.

All the demographic details shown in **Table 1** indicated

Table 1. Demographic details of the participants (n = 508).

Demographics	Parents n (%)	Nurses n (%)	Physicians n (%)	All n (%)
<i>Gender</i>				
Male	26 (13)	1 (1)	33 (33)	60 (12)
Female	171 (87)	209 (99)	68 (67)	448 (88)
<i>Age (years)</i>				
34 or less	139 (71)	89 (44)	24 (24)	252 (50)
35 or more	58 (29)	115 (56)	77 (76)	250 (50)
<i>Number of their own children</i>				
0 - 1	107 (54)	107 (52)	33 (33)	247 (49)
2 or more	90 (46)	100 (48)	67 (67)	257 (51)
<i>Average length of time of listening to music daily during leisure time</i>				
<1 hour	108 (55)	100 (48)	78 (77)	286 (56)
1 hour or more	89 (45)	109 (52)	23 (23)	221 (44)
<i>Musical training</i>				
No	160 (82)	163 (78)	58 (57)	381 (75)
Yes	37 (18)	46 (22)	43 (43)	126 (25)
<i>Experiences of using music in NICU</i>				
No/not sure	176 (89)	116 (56)	89 (88)	381 (75)
Yes	21 (11)	92 (44)	12 (12)	125 (25)
<i>Experiences of disturbing noise in NICU</i>				
No/not sure	159 (81)	28 (13)	37 (37)	224 (44)
Yes	38 (19)	182 (87)	64 (63)	284 (56)

that there were significant differences between the parents', nurses' and physicians' demographics ($p < 0.001$).

3.2. Participants' Preferred Music

Slightly over half of the participants (64%) preferred recorded music for infants in the NICU. The most frequent choices were classical music, children's songs, and other sounds such as instrumental or sounds of nature soothing the infants. Pop/rock, hit, religious or folk songs were rarely preferred. Thirty six percent of the participants preferred live music; the most frequently reported type of live music was singing or humming by nurses or mothers (**Table 2**).

The groups of respondents were significantly related to the preferred music in NICU. The parents agreed live music to be the more suitable choice for infants, compared with the nurses' and physicians' musical preferences ($p < 0.001$, parents 49% vs. nurses 26% vs. physicians 30%).

3.3. Effects of Preferred Music for Infants, Parents and Staff

The participants strongly expected that music would have many positive effects on the infants in the NICU (**Table 3**). The majority agreed that the preferred music, recorded or live, could increase the feeling of security (81%), decrease stress (80%), improve sleep (74%), reduce heart rate (70%), and decrease crying (67%) among infants. However, over half of the participants answered

Table 2. Participants' preferred music in NICU (n = 508).

Type of preferred music	n	%
<i>Recorded music</i>	322	64
Classical music	175	54
Children's songs	81	25
Other music/sounds*	37	11
Pop/rock music	15	5
Hit songs	7	2
Religious song	4	1
Folk song	1	1
Don't know	2	1
<i>Live music</i>	179	36
Nurse's/mothers' singing or humming	129	72
Other music/sounds*	13	7
Don't know	37	21

*Other music/sounds included instrumental or relaxation music, as well as different sounds of nature in order to sooth the infants.

“don't know” about the effects of music on their infant's growth and weight gain, and the length of hospitalization.

Using music in NICU was also beneficial for the parents and staff (**Table 3**). Most of the participants agreed that music, in particular, could increase coziness and comfort in the ward (87%), having a positive effect on the parents' mood (81%), stress (78%) and satisfaction with the care (76%). In addition, music could also improve the staff's mood (71%), increase their job satisfaction (70%), and increase overall staff satisfaction (52%).

The parents were in greater agreement that the music could benefit the infants compared with the nurses' and physicians' expectations of the effects of music ($p < 0.001$, parents 71% vs. nurses 58% vs. physicians 43%). The same tendency was observed concerning the effects of music on parents ($p < 0.001$, 81% vs. 77% vs. 66%). Instead, it was the nurses who agreed most that the music could have positive effects on the staff in NICU ($p < 0.001$, nurses 61% vs. parents 45% vs. physicians 42%).

3.4. Background Details Explaining the Effects of Preferred Music

The background details including age, average length of time listening to music, musical training and experiences of using music in NICU as shown in **Table 1** explained significantly the participants' expectations concerning the effects of their preferred music. Respondents who themselves listened to music a lot agreed more that their preferred music could also benefit the infants ($p = 0.035$, OR 1.20) and staff ($p < 0.001$, OR 1.47). It also appeared that respondents with musical training ($p < 0.001$, OR 2.11) and experiences of music in NICU ($p < 0.001$, OR 2.41) agreed more that music could have positive effects on the infants, while younger participants were more convinced about the benefits of music to parents ($p = 0.002$, OR 0.96).

4. DISCUSSION

Our study yielded knowledge about using music in NICU from the viewpoints of parents, nurses and physicians, and looked for the possible differences between them. It appeared that slightly over half of the participants preferred recorded music for infants. However, it must be noted that the parents agreed that live music, including mostly singing or humming, was the more suitable choice for infants than nurses and physicians. The explanation for this result might be that health care providers are probably much more familiar with recorded music in the NICU environment, and this kind of music is assumed to be easily implemented in practice. Otherwise, parents might expect that live music is more beneficial because it can, for example, enhance interaction

Table 3. Participants' expectations concerning the effects of preferred music on infants, parents and staff in NICU (n = 508).

Expectations concerning the effects of preferred music	Agree f (%)	Don't know f (%)	Disagree f (%)	Number of items	α
<i>Infants</i>	303 (60)	196 (38)	9 (2)	9	0.87
Increases the feeling of security in infants	410 (81)	83 (16)	13 (3)		
Decreases the stress experience of infants	405 (80)	92 (18)	10 (2)		
Improvement in infants' sleep	373 (74)	117 (23)	17 (3)		
Reassures the heart rate	352 (70)	139 (27)	16 (3)		
Decreases the infants' crying	336 (67)	138 (27)	32 (6)		
Relieves the infants' pain	260 (51)	203 (40)	44 (9)		
Influences reduction of blood pressure	248 (49)	243 (48)	16 (3)		
Enhances the infants' growth and weight gain	187 (37)	261 (52)	57 (11)		
Reduces the length of hospitalization	74 (15)	315 (62)	118 (23)		
<i>Parents</i>	385 (76)	113 (22)	9 (2)	7	0.84
Increases coziness and comfort in the ward	440 (87)	55 (11)	11 (2)		
Has a positive effect on the caregiver's mood	412 (81)	82 (16)	13 (3)		
Decreases the parent's stress	394 (78)	88 (17)	25 (5)		
Increases satisfaction with the care their infant receives	383 (76)	107 (21)	17 (3)		
Alleviates anxiety	360 (71)	111 (22)	36 (7)		
Influences the parents' desire to continue music at home	361 (71)	123 (24)	23 (5)		
Helps a mother/father get acquainted with their baby	229 (45)	210 (42)	68 (13)		
<i>Staff</i>	258 (51)	218 (43)	30 (6)	5	0.86
Improves the staff's mood	359 (71)	126 (25)	21 (4)		
Increases staff's enjoyment in their job	353 (70)	126 (25)	26 (5)		
Increases staff's satisfaction	263 (52)	222 (44)	21 (4)		
Helps to concentrate and outperform the tasks	175 (35)	217 (43)	114 (22)		
Enables staff to feel proud of their job	138 (27)	249 (49)	119 (24)		

between the infants and their caregivers, and is a more natural way to communicate with the infants. In the study of Arnon [11] parents considered live music therapy significantly more effective than the other therapies. The results also showed that both medical personnel and parents preferred live music therapy to recorded music and no music therapies, which in part conflicts with the results of our study. According to Standley [6] live singing is recommended when it is steady, quiet, soothing and infant directed. It also enables the infants to hear parent voices live at the bedside [8], a factor which is important to the infant's development.

When using recorded music it should also be soothing for the infants, in which case lullabies and classical music are the most suitable alternatives [6,15]. In our study, the participants reported choosing mostly classical music

or children's songs, while pop/rock, hit, religious or folk songs were rarely preferred. This probably indicates that the participants choose the type of music for the needs of infants and not based on their own entertainment in NICU.

However, the participants expected that the music they preferred would have significantly positive effects not only on the infants but also on the parents and staff. The majority agreed that music could have many beneficial effects for the infants, such as increasing the feeling of security and the decrease of stress, but would also improve the parents' and staff's mood and thereby increase the overall feeling of comfort in the ward. The results are congruent with the study of Kemper *et al.* [25] about the positive effects of music. The authors examined attitudes and expectations regarding music therapy for premature

infants among nurses and physicians in NICU. According to the results, the staff expected that music could especially reduce infants' stress and crying, but also decrease parental stress and help them to focus and enhance their performance of required tasks. In addition, several randomized studies have been conducted that demonstrate that music has positive consequences both on the short-term and long-term outcomes in infants [5,11,14, 17], but there is a lack of studies dealing with the outcomes among caregivers [11,22].

There were differences between the groups of respondents concerning the expectations about the effects of music in NICU. The parents agreed most that their preferred music could benefit the infants and themselves as parents, while nurses agreed most that the music could have positive effects on the staff. It is understandable that it is easier for the participants to assess the effects of music on themselves than on others, because the choice of music has an individual meaning to everyone, something which also influences the expectations regarding the benefits of music. When looking at the demographic details of the participants, it was interesting to note that only a few parents had experiences of disturbing noise in NICU when compared to experiences among the health care providers. The explanation for this result might be that the latter are for the most part nurses who spend much of their time in caring for the infants and are continually exposed to the noises caused by the alarm sounds of the monitors on a daily basis.

The results of our study indicated that some of the background details explained the participants' expectations concerning the effects of their preferred music. Respondents who themselves listened to music a lot, or had some musical training or experiences of music in NICU, were in greater agreement that music could have positive effects on the infants or parents. The results are partly congruent with the survey study of staff [25] in which the respondents who reported some musical training were more likely to desire music in NICU than those without such training. It seems that the participants' personal experiences of music will influence their expectations of the beneficial effects of music more than the general demographics, but more study is needed about this topic in the future.

5. LIMITATIONS

Although a valid and reliable survey instrument was used to collect the data from the viewpoints of parents, nurses and physicians, the results may appear to be more positive than they really were in practice, because the participants who were against using music in NICU might have refused to fill in the questionnaire. In addition, it must be emphasized that this study approves results only

about the expectations concerning the possible effects of music among caregivers. In reality, there are several factors that should be considered when making the decision to use music in hospital. First of all, the use of music should be based on the infant's current needs of appropriate stimulation, but, unfortunately, these characteristics could not be taken into account in this questionnaire. However, we assume that our study gives an overall picture about the topic on the caregivers' expectations of using music in NICU and allows the generalization of the results in Finnish neonatal intensive care units.

6. CONCLUSION

The participants preferred recorded music for infants in NICU. However, the parents agreed live music to be the more suitable choice for their babies than nurses and physicians. This disagreement is important to consider in practice when making the decision as to whether to use music in NICU. Overall, the participants strongly expected that their preferred music could be beneficial both for the infants, parents and staff. This result may positively influence the introduction of music in the future because only a few respondents actually reported having experiences of using music in their units during the period of data collection. The personal experiences of music seemed to possess the expectations concerning the possible effects of music in NICU.

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