**Research Round-up**
**June 2022**

**Reference:** Shin, H.J., et al., *Comparison of Effects of Mothers' and Mozart's Lullabies on Physiological Responses, Feeding Volume, and Body Weight of Premature Infants in NICU.* Front Public Health, 2022. **10**: p. 870740.

**url:** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9189372/pdf/fpubh-10-870740.pdf

Welcome to the June 2022 Research Round-up. This month we will look at an article entitled " Comparison of Effects of Mothers' and Mozart's Lullabies on Physiological Responses, Feeding Volume, and Body Weight of Premature Infants in NICU." This article was published in 2022 in Frontiers in Public Health. I picked this because there is a thought that Mozart music is good for infants and makes them smarter. And we all know music therapy is being used more in NICU settings. I have been arguing that listening to parent's voices (and looking at parent faces) is the best auditory and visual stimulation available. So, I wanted to know more. Click on the URL above to go to the full text. Remember to download the handouts "Critical Review of the Literature" and the Research Roundups definitions file if you need information on any of the abbreviations used. We will go through this article to better understand what was done and what we can draw from this study.

**Title:** The title accurately describes the study; one note – feeding volume did not refer to oral feeding, which I thought would be much more interesting.

**Abstract:** The abstract summarizes the objectives, methods, results, and conclusion of the study.

**Background or Introduction**: We once again start with looking at the references, with <2012, or published ≥ 2012 as our separation window. For the entire article, there are 54 references; of these, 25 references were published prior to 2012 and 29 published in 2012 or later. The ones that are earlier than 2012 include several of the earliest works in this area. In the background section, of the 37 articles cited, 18 were published prior to 2012.

The authors begin with a statement of number of premature infants born yearly, and that prematurity is a leading cause of death in the first year. They then move to talking about poor adaptation to extrauterine life, and the challenges from the sensory inputs of the NICU. These sensory inputs can cause short-term physiologic distress and long-term alterations in sensory functioning. The authors also mention that physiologic distress can affect sleep, growth, and development. The interruption of mother-infant interaction may also lead to challenges for the infant in the early months as well as later in childhood. This study was done in Korea, where a mother often follows a practice called Taegyo. She interacts with her fetus during pregnancy in a systematic way to encourage bonding. According to a study, just over 90% of mothers practice these self-care behaviors that include singing, reading, and listening to music while pregnant. Premature birth interrupts this practice. The authors list several reported benefits of music as "suitable auditory stimulation and relief of environmental, psychological, and physiological stresses". Almost all the reported benefits come from one research group, and only two articles. They do go on to discuss the reported lack of benefits that have also been reported, and the limited (two) studies that looked at volume and body weight. They conclude by talked about the benefits of mother's voice (with seven different studies listed), but the lack of data regarding any

benefits related to volume and growth. Which led the study team to conduct the current study. I really like their study aim – to not only examine any effects of mother's voice singing a lullaby (which is part of Taegyo) on outcomes, but to compare the effects to any that might be found for listening to Mozart. Their hypothesis was that maternal voice lullaby would improve physiologic homeostasis, feeding volume and body weight and that these effects would be higher than in the Mozart group.

**Study Population:** This study included infants born at gestational ages of 29-35 weeks, older than 3 days, who were in an incubator (because all music was recorded and played back), with no feeding intolerance, sepsis, complications, or congenital anomalies, who were not intubated, and whose parents agreed to the study. They give as rationale for enrolling infants after 29 weeks the fact that the auditory structure of a fetus is complete around 25 weeks and can respond appropriately to stimuli after 28 weeks.

**Methodology:** The study design was a non-equivalent control group, non-synchronized, quasi-experimental design. What does that mean? There were three groups; a control group who received no stimulation (we will come back to that in a moment), a Mozart's lullaby group, and a mother's voice lullaby group. This was done in the same NICU, so each study group was done separately. First the study was done with a group who were in the control group. Once that group was finished, the Mozart group was studied, and once they were done the mother's voice lullaby group was studied. Infants were assigned based on order of admission, which is why it is considered a non-equivalent group design. Recall my bias against studies that do "nothing" with control groups – especially when we are talking about providing stimulation. Is it fair to not even interact with the control babies? Perhaps in this case as the intervention was strictly recorded music – there was no additional touching involved, or other beneficial inputs.

For all groups, physiological parameters, feeding volume and body weight were measured before the intervention. The intervention was applied. Physiological parameters were measured after intervention. The intervention and measurements were done at the same time and in the same way every day. For 15 minutes, mothers recorded their voice singing the lullaby they had been singing to their infant during Taegyo, as well as other vocal inputs they used (like talking to the baby, calling the baby by nicknames). The background noise was removed from the recording and the intensity was adjusted to 45dB. Mozart's lullaby was standardized and identified in the paper, and adjusted to 45dB for 15 min. No intervention was done with control group. These were done for seven consecutive days, during a time when no examinations or treatments were done in the NICU (8 pm). Outcome measures were collected during interventions, and physiological parameters were collected before and after interventions, feeding volume and body weight were measured once before the intervention.

The study was partially blinded. They state "the premature infants were unaware of being involved" which I think is unusual. ECG was monitored automatically before and after the intervention. Researchers received data from the monitor. NICU staff members who were unaware of the group assessed feeding volume and body weight, and daily feeding volume was calculated by a physician who also did not know the assignment of the group. Although this might be a bit misleading. My question – if this was a study where the first group were all in the control group, the second in the Mozart group and the third in the maternal voice lullaby group – wouldn't anyone know the group assignment based solely on timing? If no one in the NICU knew the study was being conducted, it would be blinded I guess. Also, feeding volume was calculated based on body weight – so why look at both? Won't feeding volume reflect body weight? As you will see – the authors were smart in looking at both body weight and feeding volume.

Study variables included sex, gestational age, birth weight, 1- and 5-min APGAR scores, delivery type, intubation (yes/no), corrected age at start of study, body weight, daily feeding volume and lactation method. Physiologic parameters included heart rate, blood pressures (systolic and diastolic), respiratory rate and O2 saturation. HR and RR were measured for one minute after attaching a pulse oximetry sensory to the participant during treatment.

**Statistical Analysis:** The authors describe their sample size calculation. Data analysis included descriptive statistics for the sample, and the similarity (homogeneity) of the three samples was calculated. They used one-way ANOVAs as well as repeated-measures ANOVA to look at differences in values as an average of difference before and after interventions for seven days.

**Outcomes/Results:** Statistical analyses indicated no significant differences amongst the three groups in demographic characteristics, and the pre-intervention parameters were similar as well. The primary outcome of changes in physiologic parameters showed the mean difference between pre- and post-intervention was largest with maternal input; Mozart's lullaby group had higher changes than the control group. All measures were statistically significant. They looked at the effect of time (with volume and body weight increasing over time as expected). There was also a significant interaction between time and group in feeding volume (over time, there were differences in feeding volume by group). Body weight did increase over time, but there was no interaction with group. This means the intervention does not appear to have influenced body weight. I found it fascinating to look at the tables. When they say maternal voice lullabies improved physiologic parameters compared to Mozart, they were not kidding. Differences between before and after (mean) between mother's lullaby and Mozart's lullaby were as follows:

| Variable | Maternal lullaby | Mozart lullaby |
|---|---|---|
| HR beats/min | 23.99 | 7.32 |
| Systolic blood pressure mmHg | 10.73 | 4.50 |
| Diastolic blook pressure mmHg | 7.55 | 3.49 |
| RR breaths/min | 8.56 | 2.62 |
| O2 saturation % | -2.29 | -0.22 |

Interesting that O2 saturations dropped a bit in maternal lullaby even though RR breaths/min increased. But remember, as the tummy fills the breaths may not have been as effective. All these differences were $p<0.001$.

**Discussion/Conclusions:** The authors begin their discussion by restating their aims. They also reminded the reader of Taegyo. They found that both mother's voice and Mozart lullabies were effect interventions for physiologic homeostasis, but maternal lullaby was more effective for stability and feeding volume than was Mozart's lullabies. They relate this improved outcome to the familiarity of the mother's voice due to Taegyo. The lack of finding of an increase in body weight was tied in part to the age (3 days) of the participants, since infants lose weight initially. They describe the brain changes related to maternal voice inputs in previous studies, and then discuss the implications for NICU practice. They discuss the negative effects of the pandemic and parental restrictions.

The authors do an impressive job of describing the limitations of their study. These limitations included lack of control of other NICU auditory inputs. This was also not an RCT study and sample size may have influenced the ability to see differences in weight gain. They could not control for other confounding variables due to the consecutive enrollment of infants. And finally, they would encourage attachment levels of the mother, in future studies. They then go on to say that, despite these limitations, they did their best to control for the

other noises in the NICU by playing the stimuli inside the incubator. The authors also remark that this is a cost-effect and easily implemented intervention – that can be especially useful when mothers are not able to be at the bedside.

**Does this fit with your experience:** I loved this study! I have seen videos of infants while their mothers sang to them, in NICU settings. The infants clearly respond to their mother's voices. Those videos were done with live singing rather than recorded, and the mothers routinely would alter their singing based on their infant's responses. I would rather the singing, talking, reading be done live than recorded. But in the absence of the parents being in the NICU, it appears that recorded parental voices could be a nice substitute.

**Other:** The authors report no conflicts of interest to disclose. The original article has the research approvals listed. This study was approved by the institutional review board (40525-201805-HR-32-04) of Keimying University in Korea. The authors offer their raw data upon request. Author contributions are listed. They also report research funding, but the funder (Bisa Research Grant of Keimyung University) had no role in the study other than funding. The authors acknowledge the infants and mothers who participated.

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