A quasi-experimental study on the effect of a nursery rhyme on the comfort of infants after vaccination in selected barangay health centers in Quezon City

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Abstract

Introduction Administration of parenteral medications may cause pain in infants. This study aimed to assess the efficacy of a nursery rhyme in increasing the comfort of infants after vaccination.

Methods Infants who were brought to six barangay health centers for vaccination were recruited. Infants from three barangay health centers were randomly assigned to the experimental group, while infants from the other three were assigned to the control group. A Filipino nursery rhyme *Tatlong Bibe* was played to the experimental group. The comfort of each infant was then assessed by a pediatrician prior to, immediately after, and two minutes post-vaccination using the COMFORT-B scale. Results were analyzed using independent t-tests.

Results Prior to vaccination, the control and experimental groups had mean COMFORT-B scores of 12.46 and 12.74 ($p = 0.634$), respectively. The immediate post-vaccination mean COMFORT-B scores were 22.14 and 21.63 ($p = 0.420$), while the 2 minutes post-vaccination mean COMFORT-B scores were 16.40 and 16.49 ($p = 0.927$), respectively. There were no significant differences between groups for the three determinations.

Conclusion Based on the study results, the nursery rhyme had no significant effect on the comfort of infants after vaccination.

Keywords: Music therapy, vaccination, Filipino nursery rhyme

Pain is ubiquitous in the clinical setting. Aside from the disease process, methods of treatment, especially those which are invasive, may also cause pain. Administration of parenteral medications come at the cost of inflicting trauma to the injection site, thus causing pain. Although some vaccines may be administered orally, such as the oral polio and rotavirus vaccines, others are administered parenterally through the intramuscular, intravenous, and subcutaneous routes. Thus, conferring protective active immunity on an individual would entail some form of pain or discomfort in pediatric patients.

One of the most cost-effective, readily available, and easy to use modalities for decreasing pain

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perception in children is music. According to Kemper and Danhauer, music is known to effectively reduce anxiety and improve the mood of adult and pediatric medical and surgical patients, since music can distract them from pain and other unpleasant symptoms, thoughts, or feelings.[1] An observational study by Ozdemir and Tufekci found that a musical mobile with both visual and auditory elements effectively distracted infants from vaccination pain.[2]

Distraction is one of the interventions of pain management and though it does not eliminate the distress or pain, distracting patients helps them focus less on pain.[3] A study by Moon elicited a differential response in infants who listened to a voice in their native language and in a foreign language, interpreted as a preference by newborns for their native language.[4] Soley and Hannon found that familiarity of music had a powerful influence in the allocation of attention early in life, and familiarity preferences may facilitate the acquisition of culture-specific perceptual and cognitive abilities.[5] Hence, music in the form of nursery rhymes is proposed as an adjunct therapeutic modality and way of distracting infants during immunization due to its affordability and availability with no known side effects.

Aside from adding to the body of knowledge in the field of medicine and possibly decreasing the usual pain experienced during vaccination, the results of this study may also eventually contribute to diminishing learned crying behavior among children during health check-ups and vaccination as infants may vicariously learn from other infants crying in a healthcare setting. Likewise, when distraction and decrease in pain perception through nursery rhymes is found to be effective and is implemented, infants may also learn to be more comfortable through observation of other infants who are comfortable in these settings. They may learn that clinics or hospitals are not anxiety-provoking and may consequently have a more positive perception of them.

This study aimed to determine if a nursery rhyme in Filipino significantly increased the comfort of infants after vaccination. Specifically, this study compared the mean COMFORT-B scores of infants exposed and those not exposed to the nursery rhyme *Tatlong Bibe* prior to and after vaccination via intramuscular and subcutaneous routes.

Methods

This was a quasi-experimental study performed in the immunization rooms of six barangay health centers in the Second District of Quezon City: Barangays Holy Spirit, Batasan Hills, Commonwealth, Lupang Pangako, NGC, and Payatas B. These were assigned by the City Health Officer in pairs based on location. Hence, a matched-pair clustered randomization was employed by performing a toss coin for each pair to divide the six centers into experimental and control groups. Participants belonging to centers in the experimental group were exposed to the nursery rhyme with Filipino lyrics *Tatlong Bibe* played repeatedly and continuously in the immunization room throughout the duration of the experiment, while no nursery rhyme was played in the immunization rooms of the control centers. Tatlong Bibe has a simple tune and is rhythmically repetitive. It was popular at the time of the study and was constantly played on radio and television. The comfort of infants was assessed by a pediatrician using the COMFORT Behavior Scale pre-vaccination, immediately post-vaccination, and 2-minutes post-vaccination. The scores of the two groups were compared using an independent t-test.

The target population consisted of infants aged 1 year old and below who were brought to the barangay health centers for measles, MMR (measles-mumps-rubella), or pentavalent vaccination. Participants were then conveniently sampled from those present at the assigned health centers on the days of the experiment. Infants whose families use Filipino as their main mode of communication at home were included, since use of native language was considered a form of familiarity with nursery rhymes. Those who were premature, had hearing impairment, nervous system disorders, congenital anomalies and/or disorders, as determined by a pediatrician, as well as those given pain relievers within 24 hours prior to the study, were excluded, since these may affect their expression and perception of pain. Based on a similar study which explored the effects of a music therapy intervention in the PICU as measured by the Comfort Behavior Scale, the computed sample size was 32 infants each for the experimental and the control group, resulting to a total sample size of 64.[6]

The comfort of the infants was measured using the COMFORT Behavior Scale, a scale based on

observable behavior, mainly used to assess pain and distress in pediatric intensive care patients 0 to 3 years old. It is a modified version of the COMFORT Scale developed by Ambuel, wherein two physiologic factors originally included are omitted without compromising the quality of data.[7] Also considered as a "discomfort scale", higher final scores in the COMFORT Scale correspond to less comfort and lower scores imply a greater degree of comfort. Although this scale is primarily used in assessing postoperative infants or those in PICU, it was used in healthy infants subjected to heel prick, a procedure similar to vaccination which also induces acute pain.[9] In addition, this scale was used in a study also involving music and comfort.[6] Hence, the COMFORT Behavior Scale was selected based on its use in previous researches similar to this study, the way it relates the constructs of comfort and pain, and the availability of a free online training module upon request from its authors. To ensure the quality of the scores, a pediatrician who completed the online training module provided by the author of the scale assessed the participants prior to, immediately after, and two minutes after vaccination.

Written informed consent was secured from parents at least 18 years, who accompanied the infant to the health center. Anonymity and confidentiality were ensured by using patient codes. The study was approved by the University of the East Ramon Magsaysay Memorial Medical Center, Inc. Research Institute for Health Sciences Ethics Review Committee.

Table 1. Demographic profile of 70 participants.

Demographic characteristic	n (%)
Sex	
Female	38 (54.3)
Male	32 (45.7)
Age	
0 to 6 months	36 (51.4)
≥ 6 months 34 (48.6)	
Religion	
Roman Catholic	54 (77.1)
Iglesia ni Cristo	6 (8.6)
Others	10 (14.3)
Participants per Barangay Health Center	
Barangay Holy Spirit - Sta. Catalina	19 (27.1)
Barangay NGC Sentrong Sigla	16 (22.9)
Barangay Batasan Hills Super	11 (15.7)
Payatas B	11 (15.7)
Barangay Commonwealth	10 (14.3)
Lupang Pangako	3 (4.3)
Vaccine administered	
Pentavalent	37 (52.9)
MMR	20 (28.6)
Measles	13 (18.5)

Results

Out of 82 infants recruited, a total of 70 participants, 35 in each group, were included for analysis. Majority were female, three-fourths were Catholic and half of them came from Holy Spirit-Catalina and NGC Sentrong Sigla Health Centers. Their demographic profile is shown in Table 1.

The mean scores of the experimental and control groups in the respective times are shown in Table 2. No significant differences in the mean COMFORT-B scores at baseline were noted. A uniform increase in discomfort was then observed immediately post-vaccination, with mean scores of 21.63 and 22.14 for the experimental and control groups, respectively. At two minutes post-vaccination, both groups had lower mean scores compared to the immediate post-vaccination scores, though these scores remained higher than baseline. The group exposed to the nursery rhyme had lower increases in the immediate post-vaccination ($p = 0.420$) and 2 minutes post-vaccination scores ($p = 0.927$) but the differences were not significant.

A significant increase in the COMFORT-B scores, shown in Table 3, from baseline to immediately post-vaccination in both experimental (+8.89, $p < 0.001$) and control (+9.68, $p < 0.001$) groups. A significant but smaller increase from baseline was also noted 2 minutes post-vaccination in both experimental (+3.75, $p < 0.001$) and control (+3.94, $p < 0.001$) groups, as seen in Table 4. As shown in Table 5, the route of administration of the vaccines was a significant factor in the comfort of the infant participants immediately post-vaccination ($p = 0.007$) and at 2 minutes post-vaccination ($p = 0.003$).

Discussion

The pre-vaccination and post-vaccination mean scores for the group with nursery rhyme were expected

Table 2. Comparison of mean COMFORT-B scores.

	With Nursery Rhyme (n=35)	Without Nursery Rhyme (n=35)	p-value
Pre-vaccination	12.74	12.46	0.634
Immediately post-vaccination	21.63	22.14	0.420
2 min post-vaccination	16.49	16.40	0.927`

Table 3. Comparison of pre-vaccination and immediately post-vaccination mean COMFORT-B scores within groups.

		Mean	p-value
Without nursery rhyme	Pre-vaccination	12.46	< 0.001
	Immediately post-vaccination	22.14	
With nursery rhyme	Pre-vaccination	12.74	< 0.001
	Immediately post-vaccination	21.63	

Table 4. Comparison of pre-vaccination and 2 minutes post-vaccination mean COMFORT-B scores within groups.

		Mean	p-value
Without nursery rhyme	Pre-vaccination	12.46	< 0.001
	2 minutes post-vaccination	16.40	
With nursery rhyme	Pre-vaccination	12.74	< 0.001
	2 minutes post-vaccination	16.49	

Table 5. Comparison of Pentavalent versus Measles/MMR mean COMFORT-B scores.

	Vaccine Type	Mean	p-value
Immediately post-vaccination	Pentavalent (n=37)	22.68	0.007
	MMR and measles (n=33)	21.00	
2 minutes post-vaccination	Pentavalent (n=37)	17.70	0.003
	MMR and measles (n=33)	15.03	

to have no significant difference. Likewise, the scores of the group without nursery rhyme were hypothesized to have a significant difference, which could have implied that infants became less comfortable after vaccination. However, contrary to the expected results, not only did the pre-vaccination and post-vaccination scores of the control group turn out to be significantly higher, so did those of the group with nursery rhyme. Hence, the baseline level of comfort was not maintained despite the nursery rhyme.

This study aimed to test the hypothesis that nursery rhymes in Filipino significantly increase the comfort of infants after vaccination. However, it was found that there was no significant difference between the COMFORT-B scores of those exposed to the nursery rhyme *Tatlong Bibe* and those who were not. This may be attributed to several factors. Most

studies on music therapy and pain in infants made use of music without lyrics and were performed in a controlled environment. Ozdemir and Tufekci, used both visual and auditory elements as part of the intervention in the form of a musical mobile and this was found to decrease pain scores and crying duration among infants.[2] In this study, a purely auditory intervention with lyrics was used in a field experiment, where there was less control of the environment. Another possible contributory factor may be the use of the COMFORT Behavior Scale, which was more strongly validated for use in NICU and PICU settings and procedures rather than in healthy infants in acute pain.

It was found that the route and type of immunization and the age of the participants, which are closely related in this study given that immunizations are given at particular ages, were significantly different immediately post-vaccination and 2-minutes post-vaccination between infants who received the pentavalent vaccine and those who received measles/MMR.

Unlike other similar researches which used audiovisual materials as independent variable, the intervention in this study was purely auditory. In addition, only one nursery rhyme was used, *Tatlong Bibe*. The acoustics, geographic location, and other logistical characteristics of the health center were not under the control of the researchers. Although having more than one rater may have been more ideal, a single expert was invited due to budget constraints, the time and days she was required to participate, and the small area for observation in the immunization room of barangay health centers. Furthermore, the type and route of the vaccines received by the participants were not limited to a single type or route, which may have confounded study results.

The results showed that the nursery rhyme used did not significantly increase comfort in infants after vaccination. The researchers suggest the use of audiovisual materials such as music videos or animated videos of nursery rhymes, use of other nursery rhymes, a pain measurement scale more suitable for healthy infants in acute pain, and strict control of the environment where the infant would be vaccinated, in future studies.

References

1. Kemper KJ, Danhauer SC. Music as therapy. Complement Alternat Med [Internet]. 2015 [cited 2017 Jun 5]. Available from: https://www.researchgate.net/profile/Kathi_Kemper2/publication/264954368_Music_as_Therapy/links/5524322a0cf2caf11bfcc2da/Music-as-Therapy.pdf
2. Özdemir FK, Tüfekci FG. The effect of using musical mobiles on reducing pain in infants during vaccination. J Res Med Sci [Internet]. 2012 [cited 2016 Nov 9]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3685783/
3. Thrasybule L. Music therapy may help kids cope with immunization shots [Internet]. Reuters. 2016 [cited 2016 Nov 9]. Available from: http://www.reuters.com/article/us-health-kids-vaccines-music-iduskcn11x1s5
4. Moon C, Cooper RP, Fifer WP. Two-day-olds prefer their native language. Infant Behav Dev [Internet]. 1993 Dec; 16(4): 495-500. Available from: http://infantstudies-psych.sites.olt.ubc.ca/files/2015/03/Moon-et-al.-1993.pdf
5. Soley G, Hannon EE. Infants prefer the musical meter of their own culture: a cross-cultural comparison. Dev Psychol [Internet]. 2010 Jan; 46(1): 286. Available from: https://faculty.unlv.edu/ehannon/publications/Soley_Hannon_2010.pdf
6. Del Olmo MJ, Tarrío FR, Garrido CR, Marina PC. The effects of a music therapy intervention in PICU as measured by the Comfort Behavior Scale. Music Med [Internet]. 2015 Apr; 7(2): 20-4. Available from: https://mmd.iammonline.com/index.php/musmed/article/viewFile/399/272
7. Van Dijk M, Peters JW, Van Deventer P, Tibboel D. The COMFORT Behavior Scale: a tool for assessing pain and sedation in infants. Am J Nurs [Internet]. 2005 Jan; 105(1): 33-6. Available from: https://www.researchgate.net/publication/270804540_The_Comfort_Behavior_Scale
8. Medina A, Fernandez PA, Galan CR, Mendiola PA, Blanco SA, Allende AV. Comfort and noise level in infants with helmet interface. Anales de Pediatrica (English edition) [Internet]. 2015 Oct; 83(4): 272-6. Available from: http://appswl.elsevier.es/publicaciones/item/pdf?idApp=UINPBA00005H&pii=S2341287915001696&origen=analesdepediatria&web=analesdepediatria&urlApp=http://www.analesdepediatria.org&estado Item=S300&idiomaItem=en
9. Tristao RM, Garcia NV, Jesus JA, Tomaz C. COMFORT behaviour scale and skin conductance activity: what are they really measuring? Acta Paediatr [Internet]. 2013 Sept; 102(9). Available from: http://onlinelibrary.wiley.com/ doi: /10.1111/apa.12325/abstract