Physical Intervention on Pain Scales in Babies after Immunization Procedures

Nurlaila[1*], Triana Sulandari[1], Wuri Utami[1]

[1]*Department of Pediatric Nursing, Faculty of Nursing Sciences, Universitas Muhamamdiyah Gombong, Indonesia*
Corresponding author's email: nurlaila@unimugo.ac.id

ABSTRACT

Immunization can cause pain and trauma in children. One of the strategies to deal with immunization-related pain is combination between physical intervention and cognitive therapy called 5S method, which includes swaddling side-stomach, shushing, swinging, and sucking. This method involves some senses, such as sight, hearing, touch, taste, and touch, which can effectively decrease immunization pain. Research aims to determine the effects of 5S method (Swaddling, Side-Stomach, Shushing, Swinging, Sucking) on the pain scales in babies after immunization procedures. This study employed a quasi-experimental method with a post-test-only control group design. The samples included 60 babies that were recruited using a cluster random sampling technique. The babies in the intervention group (n=30) received the 5S method, while those in the control group (n=30) were carried and cuddled by their mothers to calm them down. The pain scale was measured using the FLACC scale after the intervention in each group. The Mann-Whitney U test was used for data analysis. In the intervention group, 17 babies (56.7%) experienced mild pain while in the control group, 20 babies (66.7%) experienced severe pain. The Mann-Whitney U test showed a p-value of 0.000 ($p \leq 0.005$). There was an effect of the 5S method (swaddling, side-stomach, shushing, swinging, sucking) on pain scales in babies after immunization procedures. The 5S method can be used easily for immunization procedures among babies in hospitals, public health centres, and integrated service posts.

Keywords: *Customize Immunization; 5S Method; Pain*

1. INTRODUCTION

Pain is an important issue that needs to be well monitored by health workers. Pain may first occur in childhood. In general, pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage." Invasive procedures such as vaccinations, infusions, and intramuscular injections can cause pain, fear, and anxiety. Such feelings may negatively affect the children's treatment process [1]–[3].

Refusal of vaccinations can lead to decreased immunization coverage, resulting in disease outbreaks that can actually be prevented through vaccinations. Feelings of pain and fear during immunizations can also be a negative experience related to vaccination. This perception can continue in children to adults [1]. Therefore, nurses should have the skills in pain management during immunization procedures and be able to use non-pharmacological methods to reduce pain.

The non-pharmacological methods to reduce pain in children are grouped into cognitive therapy, supportive therapy, behavioural therapy, and physical therapy. Physical therapy to reduce pain in children includes warm-cold application, touch, physiotherapy, massage, and TENS/acupuncture. A combination of physical and cognitive therapy (distraction) is the base for choosing the 5S method (Swaddling, Side-Stomatch, Shushing, Swinging, Sucking). A combination of non-pharmacological methods significantly reduces pain, fear and anxiety in children while undergoing invasive procedures [4], [5]. Some alternative methods for reducing pain in babies of less than six months old include the provision of sucrose, breastfeeding, skin-to-skin contact (kangaroo method of care), hugs, pacifiers, and comfort support (hugging animal toys and using blankets) [2].

Non-pharmacological pain management has become a primary alternative since it has minimal side effects. One of the non-pharmacological methods that can be implemented to treat immunization-related pain is using the physical intervention of the Harvey's 5S method. This method teaches techniques of "reconditioning the baby

Z. B. Pambuko et al. (Eds.): BIS-HSS 2021, ASSEHR 667, pp. 240–245, 2023.
https://doi.org/10.2991/978-2-494069-49-7_41

like being in the womb" so that the baby feels calm and comfortable. The 5S method includes swaddling, side-stomach, shushing, swinging, and sucking. This technique aims to make the baby feel comfortable as if the baby is in the mother's womb. The 5S method combines several techniques of pain reduction in babies less than six months old, namely hugs, comfort support through swaddling, and breastfeeding. This method can be done easily by mothers and caregivers who take their babies for immunization. A previous study by Rahmawati and Setiyorini [6] showed that the 5S method affected the heart rate of neonates after venous blood sampling. However, the 5S method has not been widely used in infant immunization procedures. Most frequently, mothers directly carry their babies after the immunization procedure to calm them down.

Pain management techniques during vaccinations are not widely used despite abundant scientific evidence and clinical practice guidelines that show their effectiveness in minimizing vaccine-related pain. The gap between knowledge and clinical practices of pain management in infants is influenced by the level of understanding of health workers about how babies experience pain, rapid vaccination procedures that do not require pain management and worry about the effects or negative reactions of using pain reducing drugs. It is essential for nurses to understand that vaccines are the most common source of iatrogenic pain for babies [7].

Based on the description as mentioned earlier, it is necessary to conduct a study to determine differences in pain scales after immunization procedures among babies who receive the 5S method and those who are only carried by their mothers. Accordingly, this study aimed to determine the effects of the 5S method (Swaddling, Side-Stomach, Shushing, Swinging, and Sucking) on pain scales in babies after immunization procedures.

2. METHOD

This study was a quasi-experiment with a post-test-only control group design. The respondents were babies who received DPT-HB-HiB immunizations in the working area of Ambal II Public Health Centre and were recruited using a cluster random sampling technique. The respondents were divided into the intervention group (n=30) that received the 5S method, and the control group (n=30), that were carried by the mothers after the immunization.

After the immunization procedure, the babies in the control group were given usual care by their mothers; the mothers carried the babies for seven minutes to calm them down. In the intervention group, after the immunization, the researcher applied the Harvey 5S method of swaddling using a swaddle or scarf brought by the baby's mother. The swaddle was not tied at the bottom and made a little bit loose, as it only served to limit the baby's movement to reduce the hitting movement of the baby. The swaddling was carried out by the researcher in one minute. Next, the side-stomach technique (positioning the baby on a side) was carried out by the mother; the mother carried the baby and slightly tilted the baby to the mother's side; this procedure aims to reduce stress on the baby. After the baby was tilted in a cradled position, the baby was then given the sound of "sushh sushh" (shushing) from the mother to calm down. At the same time, swinging was also performed slowly and relaxedly. The combination of side-stomach, shushing, and swinging was performed for three minutes by the baby's mother. After the baby felt calm, the baby was breastfed (sucking) by the mother in a sitting position for three minutes. The researchers observed the baby pain scale in the control group and the intervention group using the FLACC (Face, Leg, Activity, Cry, Consolability) scale after the action was completed. The collected data were analysed using the Mann-Whitney U test. This study received ethical approval from the Research Ethics Committee of Universitas Muhammadiyah Gombong with a reference number of 066.6/II.3.AU/F/KEPK/III/2021. The 5S method can be seen in the Figure 1-3.

Figure 1 Swaddling

Figure 2 Side Stomach, Sushing, Swinging

Figure 3 Sucking

3. RESULT AND DISCUSSION

3.1. Results of the Study

The characteristics of the respondents in the intervention group and the control group are presented in Table 1. The characteristics of the respondents (age and gender) in both groups were not much different. Most of the respondents were three months old in the intervention group (30%) and the control group (33%). Furthermore, the majority were female (63.3% in the intervention group and 53.3% in the control group).

Table 1 Characteristics of the respondents based on age and gender (n=60)

Characteristics	Intervention Group		Control Group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
		Age		
2 months	6	20.0	8	26.7
3 months	9	30.0	10	33.3
4 months	8	26.7	8	26.7
5 months	7	23.3	4	13.3
Total	**30**	**100**	**30**	**100**
		Gender		
Boy	11	36.7	14	46.7
Girl	19	63.3	16	53.3
Total	**30**	**100**	**30**	**100**
		Type of immunization		
DPT-HB-HiB 1	6	20.0	8	26.7
DPT-HB-HiB 2	9	30.0	10	33.3
DPT-HB-HiB 3	15	50.0	12	40.0
Total	**30**	**100**	**30**	**100**

The types of immunization in the intervention and control groups are also presented in Table 1. Most of the respondents received DPT-HB-HiB3 immunizations both in the intervention and control groups (50% and 40%, respectively).

Table 2 The Frequency Distribution of Pain Scales in Babies after the Application of Harvey's 5S Method

Pain Scale	Intervention Group		Control Group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
No Pain	3	10.0	0	0
Mild Pain	17	56.7	2	6.7
Moderate Pain	8	26.7	8	26.7
Severe Pain	2	6.7	20	66.7
Total	**30**	**100**	**30**	**100**

Table 2 shows that most babies (56.7%) in the intervention group experienced mild pain after the immunization procedure. Notably, three babies (10.0%) in the intervention did not experience any pain. Meanwhile, most babies in the control group experienced severe pain (66.7%).

Table 3 The Data Normality Test

	Statistic	Df	Sig
Intervention Group	.322	30	.000
Control Group	.407	30	.000

Table 3 shows that the significance mean value resulted from the Kolmogorov-Smirnov test was less than 0.05, indicating that the data were not normally distributed. Therefore, the Mann-Whitney U test was employed for data analysis.

Table 4 The Results of Data Analysis Using the Mann-Whitney U Test

	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Pain Scale	Intervention Group	30	17.62	528.50	63.500	528.500	-5.754	.000
	Control Group	30	43.38	1301.50				
	Total	**60**						

Table 4 shows the results of the Mann-Whitney U test with a p-value of 0.000 ($p<0.05$), indicating that there was a significant difference in the pain scale after the immunization procedures between the intervention group and the control group.

3.2. Discussion

In this study, the babies who received the DPT-HB-HiB 1, 2, 3 immunizations were aged two to five months old (table 1). It is congruent with the schedule for giving DPT-HB-HiB 1, 2, 3 immunizations, namely at the age of 2 months, 3 months, and maximally, before reaching the age of 5, children should have received DPT-HB-HiB immunization four times. It is also in line with a previous study by Trimawati [8] which reported that babies who received pentavalent immunization were in the age range of 2-6 months. Furthermore, it is easier to apply a swaddle to younger babies, as in the intervention group receiving the 5S method in this study, than the older babies since older babies may feel uncomfortable when swaddled.

In table 1, the number of female babies (63,3%) was higher than the males (36,7%). The majority of the babies living in the surrounding area where the study took place were female babies. As a result, the chance of female babies to become the respondents in the study is higher. The result of this study is similar to a study by Mamentu, Apriliawati, and Suhendar [9], which found that the number of female respondents in their study was higher than the male, i.e., 17 babies.

Regarding the difference in pain scales between the intervention group and the control group, it is shown that the average crying time of the babies in the intervention group was shorter than the control group (table 2). The 5S method administered to the intervention group, involving the senses of sight, hearing, taste, and touch by the baby's mother, was proven to be more effective. In the control group, the mother instinctively tried to stop the baby from crying after the immunization by carrying the baby, representing physical intervention. Carrying a baby aims to make the baby feel calm when experiencing stress or discomfort. Carrying involves only the senses of taste and touch. The non-pharmacological pain management that promotes parent-infant bonding is natural analgesia for babies with minimal risk of side effects. This situation also reduces parents' concerns about the pain that the baby experiences during immunization procedures [7]. This study is congruent with a previous study by Trimawati [8], which showed the effect of the 5S method on reducing baby's responses to immunization-related pain

This study showed that those babies who received the 5S intervention, on average, demonstrated good responses towards pain (mean 17,62), such as having a shorter crying time and showing no resistance and kicking responses (table 3). The 5S method is a combination of some non-pharmacological pain management methods. Based on the concept of pain control, the body has a neuromodulator or a natural pain reliever, which can release endorphins and dynorphins, thereby turning off the body's defence mechanisms against pain. The 5S method consists of swaddling, which is wrapping the baby in a soft cotton cloth; it aims to provide limited space and continuous contact for the baby, to focus the baby's attention, stop the movement, and prevent the baby from making noise. Another action in the 5S method is positioning the baby tilted towards the mother's stomach position (side/stomach position). When they are born, babies will feel panic if they are in the supine position; there is a Moro reflex that surprises the babies when they think they will fall. Therefore, the proper way to calm a baby in a stressful situation is to tilt the baby to the mother's stomach side. This position is the same as the baby in the womb, tilted to the left or right. Swinging, another act of the 5S method, describes a slight swinging movement to keep the baby's head in line with his body, while in the womb, the baby is used to constantly swinging in the amniotic fluid. Next, sushing is implemented by producing the "sushh sushh" sound, which is whispered in the baby's ear in a soft and calm voice. The sound reminds the baby when it is still in the womb, which is similar to the sound of the mother's blood flow, providing comfort to the baby. Parental reassurance, swaddling, and providing soothing sounds and movements can support a calm response in a crying and fussy baby. Such actions have important clinical implications for calming a fussy and crying infant [10].

Breastfeeding provides a combination of feeding, holding, skin-to-skin contact, and nutritional intervention. Several quasi-experimental studies have shown that breastfeeding before, during, and after immunization procedures affects a statistically significant decrease in the baby's total crying time. Also, skin-to-skin contact alone has been shown to reduce crying, grimacing, and heart rate during immunizations

[2]. In general, pain relief is directly related to the baby's active participation and the number of sensory modalities used in the stimulation. Therefore, it is more effective to involve many senses in relieving pain than stimulating one sense alone [11].

This study showed that most babies in the control group (66,7%) experienced severe pain after immunization procedures (table 2). The baby's mother and health workers did not provide pain relief techniques for the baby; the mother only took the usual actions, namely carrying the baby to calm down. As a result, the baby felt anxious and uncomfortable with this situation. The family, especially parents, has a vital role in pain management towards the pain response that the baby experiences when undergoing painful procedures or when they have immunizations. The side effect of immunization is pain. This pain can have a negative impact on the baby's development if it is not properly and appropriately handled. To minimize the adverse effects of pain, appropriate pain management is required. Pain management can be done in two ways, namely pharmacological and non-pharmacological pain management. The non-pharmacological pain management to reduce immunization-related pain includes breastfeeding, giving sugar solutions, family support, and the physical intervention of 5S [2], [10]–[12].

A combination of non-pharmacological interventions is needed to provide comfort and reduce pain due to immunization procedures. This study supports the hypothesis that physical interventions involving all babies' senses are more effective than only carrying alone. Each combination of analgesic methods is a complex experience for the baby because their nerves catch on in different patterns. Therefore, nurses need to understand a multidimensional approach (e.g., behavioural, physiological, neurophysiological, and hormonal) to achieve optimal analgesic effectiveness [13].

4. CONCLUSION

This study showed a significant effect of the Harvey 5S method (swaddling, side-stomach, shushing, swinging, and sucking) on the pain scale in babies after immunization procedures. In addition, the 5S method can be performed easily by mothers and caregivers and does not require any cost.

ACKNOWLEDGMENT

The researchers would like to thank the village midwives in the work area of Ambal II Public Health Centre who helped in this study. We also thank all mothers and babies who were willing to be the respondents and participated very well in implementing the non-pharmacological interventions to reduce pain according to the instructions in this study.

REFERENCES

[1] A. Taddio *et al.*, “Reducing pain during vaccine injections: Clinicalpractice guideline,” *Cmaj*, vol. 187, no. 13, pp. 975–982, 2015, doi: 10.1503/cmaj.150391.

[2] C. M. Cwynar and K. Osborne, “Immunization-Associated Pain: Taking Research to the Bedside,” *Journal of Pediatric Health Care*, vol. 33, no. 4, pp. 446–454, 2019, doi: 10.1016/j.pedhc.2018.12.004.

[3] E. Galiza and P. Heath, “Immunization,” *Medicine (United Kingdom)*, vol. 49, no. 10, pp. 618–623, 2021, doi: 10.1016/j.mpmed.2021.07.004.

[4] H. Kahsay, “Assessment and treatment of pain in pedi | Biomedical Research,” *International Journal of Pediatrics*, 2017. .

[5] E. Avcin and S. Kucukoglu, “The effect of breastfeeding, kangaroo care, and facilitated tucking positioning in reducing the pain during heel stick in neonates,” *Journal of Pediatric Nursing*, vol. 61, pp. 410–416, 2021, doi: 10.1016/j.pedn.2021.10.002.

[6] H. Rahmawati and E. Setiyorini, “Pengaruh 4SS (Swaddling, Side, Shushing, Swinging) terhadap Heart Rate Neonatus Paska pengambilan Darah Vena di Ruang Edelweis RSUD Ngudi Waluyo Wlingi,” *Jurnal Ners dan Kebidanan (Journal of Ners and Midwifery)*, vol. 4, no. 1, pp. 085–092, 2017, doi: 10.26699/jnk.v4i1.art.p085-092.

[7] M. Abukhaled and S. Cortez, “Nonpharmacological Methods for Reducing Parental Concern for Infant Vaccine-Associated Pain,” *Journal of Pediatric Health Care*, vol. 35, no. 2, pp. 180–187, 2021, doi: 10.1016/j.pedhc.2020.09.006.

[8] Trimawati, “Efektifitas Metode 5 S (Swaddling, Side/stomach Position, Sushing, Swinging, Sucking) Terhadap Respon Nyeri pada Bayi Saat Imunisasi Pentavalen,” *Jurnal Keperawatan Anak*, vol. 3, no. 1, pp. 34–38, 2016.

[9] P. Mamentu, A. Apriliawati, and Suhendar, “Intervensi Fisik Terhadap Penurunan Respon Nyeri Bayi Saat Imunisasi BCG,” *Jurnal Ilmiah Kesehatan Pencerah*, vol. 9, no. 2, pp. 65–72, 2020.

[10] E. L. Möller, W. de Vente, and R. Rodenburg, “Infant crying and the calming response: Parental versus mechanical soothing using swaddling, sound, and movement,” *PLoS ONE*, vol. 14, no. 4. 2019, doi: 10.1371/journal.pone.0214548.

[11] G. Arslan and E. Geçkil, “Atraumatic Care In Childhood Immunization,” in *Pediatric Practice and Research*, 2019, pp. 592–596.

[12] R. P. Riddell, M. C. O'Neill, L. Campbell, A. Taddio, S. Greenberg, and H. Garfield, "Featured article: The ABCDs of pain management: A double-blind randomized controlled trial examining the impact of a brief educational video on infants' and toddlers' pain scores and parent soothing behavior," *Journal of Pediatric Psychology*, vol. 43, no. 3, pp. 224–233, 2018, doi: 10.1093/jpepsy/jsx122.

[13] S. Bembich, G. Cont, E. Causin, G. Paviotti, P. Marzari, and S. Demarini, "Infant analgesia with a combination of breast milk, glucose, or maternal holding," *Pediatrics*, vol. 142, no. 3, pp. 1–9, 2018, doi: 10.1542/peds.2017-3416.